Sveučilište u Zagrebu
University of Zagreb

Fakultet prometnih znanosti
Faculty of Transport and Traffic Sciences

KATALOG LABORATORIJSKE OPREME
LABORATORY EQUIPMENT CATALOGUE

IMPRESUM

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MJESTA POHRANE IZVORNIKA

Dekanat
Knjižnica
Izdavačka djelatnost
Zavodi:

- Zavod za cestovni promet
- Zavod za gradski promet
- Zavod za informacijsko-komunikacijski promet
- Zavod za poštanski promet
- Zavod za vodni promet
- Zavod za zračni promet
- Zavod za željeznički promet
- Zavod za inteligentne transportne sustave
- Zavod za transportnu logistiku
- Zavod za aeronautiku
- Zavod za prometno planiranje
- Zavod za prometno-tehnička vještačenja
- Zavod za prometnu signalizaciju

Katedra za opće programske sadržaje
Laboratoriji:

- Laboratorij za modeliranje i optimiranje informacijsko-komunikacijskih mreža i usluga
- Laboratorij za sigurnost i forenzičku analizu informacijsko-komunikacijskog sustava
- Laboratorij za modeliranje i simulacije u zračnom prometu / upravljanje zračnim prometom
- Laboratorij za modeliranje i simulacije željezničkih sustava
- Laboratorij za sigurnost željezničkog prometa
- Laboratorij za inteligentne transportne sustave
- Laboratorij za aerodinamiku
- Laboratorij za kontrolu zračne plovidbe
- Laboratorij za simulaciju letenja
- Laboratorij za zrakoplovne emisije
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- Laboratorij za prometno-tehnička vještačenja
- Ispitni laboratorij Zavoda za prometnu signalizaciju
- Laboratorij za primijenjenu ergonomiju u prometu
- Laboratorij za planiranje i modeliranje u cestovnom i gradskom prometu

LOCATION OF THE ORIGINAL

Dean's office
Library
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Departments:

- Department of Road Transport
- Department of Urban Transport
- Department of Information and Communication Traffic
- Department of Postal Transport
- Department of Water Transport
- Department of Air Transport
- Department of Railway Transport
- Department of Intelligent Transport Systems
- Department of Transport Logistics
- Department of Aeronautics
- Department of Transport Planning
- Department of Traffic Accident Expertise
- Department of Traffic Signalling

Chair of Fundamental Courses
Laboratories:

- Laboratory for Modelling and Optimizing Information and Communication Networks and Services
- Laboratory for Security and Forensic Analysis of Information Communication Systems
- Laboratory for Modelling and Simulation in Aviation / Air Traffic Management
- Laboratory for Modelling and Simulation of Railway Systems
- Laboratory for Rail Traffic Safety
- Intelligent Transportation Systems Laboratory
- Aerodynamics Laboratory
- Laboratory for Control of Air Navigation
- Flight Simulation Laboratory
- Laboratory for Aircraft Emissions
- Laboratory for Georeferential Video System
- Laboratory for Traffic Accidents Expertise
- Department of Traffic Signalling Testing Laboratory
- Laboratory for Applied Ergonomics in Traffic and Transport
- Laboratory for Planning and Modelling in Road and Urban Traffic

PREDGOVOR

Suvremena visokoškolska nastava i znanstveni rad u tehničkom području je nezamisliv bez laboratorija. Fakultet prometnih znanosti u svom *Statutu i Pravilniku o ustrojstvu radnih mjesta iz 2007.* nema predviđen ustroj laboratorija. Strategija razvoja Fakulteta za razdoblje 2012.-2017. iz siječnja 2012. predviđa uspostavu laboratorija radi unapređenja znanstvene, stručne i nastavne aktivnosti. Zbog toga se dana 24. travnja 2012. donosi odluka o privremenom ustrojavanju i poslovanju koje se odnosi na rad laboratorija, specijaliziranih učionica i praktikuma Fakulteta prometnih znanosti. Ovom odlukom stvoren je organizacijski okvir i omogućen formalni postupak za osnivanje novih jedinica za znanstveni, nastavni i praktični rad nastavnika, istraživača i stručnjaka Fakulteta i suradnika.

Od donošenja navedenih dokumenata postignut je značajan napredak u opremanju Fakulteta informatičkom i laboratorijskom opremom. Potpuno su opremljene suvremenom informatičkom opremom sve predavaonice Fakulteta, nova specijalizirana računalna učionica, te je ustrojeno i opremljeno 12 novih laboratorija. Postojeći laboratoriji su dodatno opremljeni novom laboratorijskom opremom. Na taj način ostvareni su preduvjeti za unapređenje znanstveno-istraživačke djelatnosti Fakulteta što značajno utječe i na stalno usavršavanje obrazovnog procesa na svim razinama studija, kao i na podizanje kvalitete stručnog rada.

Svrha izrade ovog kataloga je prvenstveno u informiranju studenata, posebno doktoranada, nastavnika, znanstvenika i istraživača Fakulteta o postojanju opreme po laboratorijima pojedinih zavoda čime se unapređuje planiranje i izvođenje nastavnog, istraživačkog i stručnog rada. Postojanje kataloga omogućava analizu korištenja pojedine opreme, kao i sustavno planiranje nabave nove opreme. Uz to prikaz opremljenosti Fakulteta laboratorijskom opremom i programskim paketima omogućava potencijalnim partnerima iz drugih visokoškolskih i znanstveno-istraživačkih ustanova te gospodarstva bolji uvid u mogućnosti Fakulteta i služi za poticanje međusobne suradnje u radu na zajedničkim projektima.

Zahvaljujem svim kolegama koji su sudjelovali u izradi kataloga, od voditelja laboratorija koji su popisivali i opisivali opremu, koordinatora koji je objedinio prikupljene opise do djelatnika koji su oblikovali katalog i pripremili ga za tisak. Hvala svima koji su sudjelovali u nabavi opreme. Zahvaljujem i tvrtkama koje su donirale pojedinu opremu.

U Zagrebu, studeni 2013.

DEKAN
Prof. dr. sc. Ernest Bazijanac

FOREWORD

Modern higher education teaching and scientific work in the technical area is unthinkable without laboratories. The Faculty of Transport and Traffic Sciences *Statute and Workplace Organisation Regulations* from 2007 did not foresee the organisation of such units. *The Development Strategy of the Faculty of Transport and Traffic Sciences* for the 2012-2017 period envisages organisation of laboratories in order to advance scientific, professional and teaching activities. Therefore, on April 24, 2012 a decree on the temporary organisation and activities of laboratories, specialised classrooms and practicums of the Faculty was made. The decree created the organisational framework and enabled the formal proceedings for the organisation of new teaching units for scientific, teaching and practical work of the Faculty's teachers, researchers and experts, as well as external associates.

Since the issuing of the decree, significant progress has been made in the acquisition of IT and laboratory equipment. All Faculty classrooms have been furnished with modern IT equipment, a new specialised classroom has been created and 12 new laboratories organized and furnished. The equipment of existing laboratories has been updated. This has created the necessary conditions for the advancement of scientific and research activities at the Faculty which significantly affected the continuous development of the teaching process on all study levels and contributed to the quality of professional activities.

The primary purpose of this catalogue is to inform students, especially postgraduate students, teachers, scientists and researchers at the Faculty on the existence of equipment in the various department laboratories which will contribute to teaching, research and professional activities. The catalogue will enable future analysis of equipment usage and systematic planning in acquisition of new items. The Faculty catalogue of laboratory equipment and software packages will provide potential partners from other research, higher education and professional institutions with a better insight into the Faculty's abilities and encourage cooperation on joint projects.

I would like to thank my colleagues who participated in the creation of this catalogue, from heads of laboratories who listed and described the equipment, the coordinator who integrated the descriptions, to the staff members who designed and prepared the catalogue for print. I would also like to thank everyone who participated in the acquisition of the equipment and the businesses which donated certain items.

November 2013, Zagreb

DEAN
Prof. Ernest Bazijanac, Ph.D.

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Laboratorij za modeliranje i optimiranje informacijsko-komunikacijskih mreža i usluga
Laboratorij za sigurnost i forenzičku analizu informacijsko-komunikacijskog sustava

ZAVOD ZA ZRAČNI PROMET

Laboratorij za modeliranje i simulacije u zračnom prometu / upravljanje zračnim prometom

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ZAVOD ZA GRADSKI PROMET

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Laboratorij za planiranje i modeliranje u cestovnom i gradskom prometu

DIVISION OF TRANSPORT

DEPARTMENT OF INFORMATION AND COMMUNICATION TRAFFIC

Laboratory for Modelling and Optimizing Information and Communication Networks and Services
Laboratory for Security and Forensic Analysis of Information Communication Systems

DEPARTMENT OF AIR TRANSPORT

Laboratory for Modelling and Sumulation in Aviation / Air Traffic Management

DEPARTMENT OF RAILWAY TRANSPORT

Laboratory for Modelling and Simulation of Railway Systems
Laboratory for Rail Traffic Safety

DIVISION OF ITS AND LOGISTICS

DEPARTMENT OF INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transportation Systems Laboratory

DIVISION OF AERONAUTICS

DEPARTMENT OF AERONAUTICS

Aerodynamics Laboratory
Laboratory for Control of Air Navigation
Flight Simulation Laboratory
Laboratory for Aircraft Emissions

INDEPENDENT DEPARTMENTS

DEPARTMENT OF TRANSPORT PLANNING

Laboratory for Georeferential Video System

DEPARTMENT OF TRAFFIC ACCIDENT EXPERTISE

Laboratory for Traffic Accidents Expertise

DEPARTMENT OF TRAFFIC SIGNALLING

Department of Traffic Signalling Testing Laboratory

INDEPENDENT CHAIRS

CHAIR OF FUNDAMENTAL COURSES

Laboratory for Applied Ergonomics in Traffic and Transport

JOINT LABORATORIES

DEPARTMENT OF ROAD TRANSPORT

DEPARTMENT OF URBAN TRANSPORT

DEPARTMENT OF TRANSPORT PLANNING

Laboratory for Planning and Modelling in Road and Urban Traffic

POPIS LABORATORIJSKE OPREME

- Program za projektiranje komunikacijskih mreža OPNET Modeler
- Program za projektiranje bežičnih mreža OPNET Wireless Module
- Program za modeliranje utjecaja terena TMM
- VoIP komutacijsko čvorište
- IP VoIP-GSM sučelje MobiLink
- Komutacijski čvor BP 50
- Aktivna mrežna oprema
- Uređaj za forenzičku analizu mobilnog podatkovnog prometa UFED Touch Ultimate Standard
- Uređaj za forenzičku analizu komunikacijskog prometa Summit x450-24t
- Uređaj za forenzičku analizu komunikacijskog prometa Summit 200-24
- Uređaj za forenzičku analizu komunikacijskog prometa FortiGate 200A
- Uređaj za forenzičku analizu komunikacijskog prometa TippingPoint 210e
- Ethernet usmjerivač RouterBoard 450G
- Uređaj za forenzičku analizu bežičnog komunikacijskog prometa TL-WA801N
- Uređaj za forenzičku analizu bežičnog komunikacijskog prometa D-Link DAP-1160
- Program za modeliranje i simulaciju zračnog prostora
- Program za procjenu i vizualizaciju kapaciteta kontrole zračnog prometa
- Program za planiranje aerodromskog sustava SIMMOD PLUS
- Program za modeliranje i simulacije u željezničkom prometu OpenTrack
- Program za izradu aplikacija upravljanja željezničkim uređajima RoboPro
- Aplikacija za programiranje mikrokontrolera ALPHA 2 – Software
- Program za analizu pouzdanosti sustava Open FTA
- Program za modeliranje i simulacije u željezničkom prometu RailSys
- Komplet za simulaciju rada uređaja za detekciju zauzeća kolosijeka
- Komplet za testiranje uređaja za detekciju prolaza kotača vlaka u svrhu uključenja/isključenja željezničko-cestovnog prijelaza
- Laboratorijski komplet za ispitivanje i simulaciju rada Autostop uređaja RAS 8385
- Magnetski tračnički kontakt
- Skretnička brava (Robel)
- Elektromagnetska brava
- Model izoliranog odsjeka
- Programabilan logički kontroler (PLC)
- Komplet za robotiku Mindstorms
- GPS prijamnik GPS 10
- Dlanovnik iPAQ hx2750
- Uređaj za praćenje pokreta Kinect
- Sučelje za komunikaciju čovjeka s računalom korištenjem električnih aktivnosti mozga EPOC
- Komplet mikrokontrolera s osjetilima
- Komplet mikrokontrolera
- Digitalni multimetar UT151
- Program za izradu geografskog informacijskog sustava ArcGIS
- Programski alati za modeliranje i analizu prostornih podataka ArcGIS Spatial Analyst
- Program za prostornu analizu mrežnih podataka ArcGIS Network Analyst
- Program za modeliranje vozilom aktiviranog upravljanja semaforiziranim raskrižjem VisVAP
- Program za optimizaciju ruta dostavnih vozila OPTiRUT
- Zaštitno kučište za kameru H-606

- Stup za kameru
- Radar za mjerenje brzine s pokazivačem BT2258
- Podzvučni aerotunel
- Piezometarska harfa
- Model aeroprofila NACA 2421 s otvorima za mjerenje tlaka
- Simulator za radarsku kontrolu zračnog prometa
- Radarski trenažer
- Program za modeliranje i simulaciju zračnog prostora
- Simulator leta BT-220
- Simulator leta BT-222
- Zvukomjer PCE-322A
- Audiometar Bell Plus HDA280
- Zvukomjer Nor140
- Mjerni mikrofon ECM800
- Slušalice SHURE SRH440
- Vanjska zvučna kartica C400
- Digitalno analogni konverter – DAQPad-6070E
- Digitalna kamera visoke rezolucije HD HERO2
- Aplikacija za upravljanje kamerom HD Hero2
- Daljinski upravljač Wi-Fi BacPac
- Brojač / klasifikator prometa - model NC200
- Brojač / klasifikator prometa - model TQ (TCR100)
- Program za obradu i upravljanje podatcima o prometu HDM
- Sučelje geoprostornih podataka prometnog modela Cube Base
- Program za modeliranje i planiranje prometnog sustava Cube Voyager
- Program za dinamičku dodjelu prometa na mrežu Cube Avenue
- Mjerač temperature PCE-313
- Mjerač buke PCE-355
- Mjerač debljine laka PCE-CT 28
- Uređaj za mjerenje dinamike kretanja vozila Pocket DAQ
- Uređaj za mjerenje usporenja i ubrzanja vozila XL - Meter
- Ručni uređaj za mjerenje duljine puta tipa M4
- Uređaj za prikupljanje podataka o dinamici vozila SBX-110
- Program za simulaciju prometnih nesreća PC CRASH
- Uređaj za ispitivanje debljine prevlake oznaka na kolniku PosiTector 6000 FNS3
- Uređaj za ispitivanje debljine prevlake oznaka na kolniku PosiTector 200
- Uređaj za ispitivanje debljine prevlake oznaka na kolniku ZMM 5000
- Uređaj za ispitivanje vlage na podlogama CME4
- Uređaj za ispitivanje vidljivosti oznaka na kolniku ZRM 1021
- Komplet za kontrolu kvalitete oznaka na kolniku ZMK 5050
- Uređaj za ispitivanje retrorefleksije prometnih znakova ZRS 5060
- Uređaj za ispitivanje retrorefleksije prometnih znakova ZRS 6060
- Uređaj za ispitivanje kvalitete oznaka na kolniku ZRM 6013
- Uređaj za ispitivanje kvalitete oznaka na kolniku ZRM 6014
- Uređaj za ispitivanje retrorefleksije oznaka na kolniku ZDR 6020
- Uređaj za ispitivanje hrapavosti oznaka na kolniku SRT 5800
- Program za kartiranje i analizu podataka Mapping Tools

- Program za pregled rezulata ispitivanja retrorefleksije Retrorefleksija
- Mjerni komplet Reakciometar CRD4
- Program za makrosimulaciju prometa Visum
- Program za mikrosimulaciju prometa Vissim
- Program za analizu prometa u raskrižju Sidra Intersection
- Program za modeliranje prometnog toka na raskrižju JUNCTION – ARCADY
- Program za projektiranje raskrižja i prometnica AutoTURN Pro 3D
- Program za simulaciju pješačkog toka SimWalk Transport
- Program za potporu višekriterijskom odlučivanju Expert Choice

- Software for communication network design OPNET Modeler
- Software for wireless network design OPNET Wireless Module
- Terrain Modelling Module TMM
- VoIP Switching Node
- IP VoIP-GSM Gateway MobiLink
- Switching Node BP 50
- Active network equipment
- Device for forensic analysis of mobile data traffic UFED Touch Ultimate Standard
- Device for forensic analysis of communications traffic Summit x450-24t
- Device for forensic analysis of communications traffic Summit 200-24
- Device for forensic analysis of communications traffic FortiGate 200A
- Device for forensic analysis of communications traffic TippingPoint 210e
- Ethernet router RouterBoard 450G
- Device for forensic analysis of wireless communication traffic TL-WA801N
- Device for forensic analysis of wireless communication traffic D-Link DAP-1160
- System for traffic Assignment and Analysis at a Macroscopic level (SAAM)
- Network Estimation Visualization of ACC Capacity (NEVAC)
- Airport and Airspace Simulation Model SIMMOD PLUS
- Software for modelling and simulation of railway system OpenTrack
- Software for programming of railway control units RoboPro
- Micro controller programming software ALPHA 2 - Software
- Sofware for conduction of Fault Tree AnalysisOpen FTA
- Software for modelling and simulation of railway system RailSys
- Railway track occupation detection simulation set
- Set for simulation of railway level crossing activation and deactivation by wheel sensors
- Set for simulation and testing of automatic train protection device RAS 8385
- Magnetic wheel sensor
- Point lock (Robel)
- Electromagnetic lock
- Track circuit model
- Programmable logic controller (PLC)
- Robotic system kit Mindstorms
- GPS receiver GPS 10
- Pocket PC iPAQ hx2750
- Motion sensing device Kinect
- Neuroheadset EPOC
- Arduino starter kit
- Raspberry Pi, starter pack
- Digital multimeter UT151
- Gographic information system software ArcGIS
- Spatial modeling and analysis software tools ArcGIS Spatial Analyst
- Network based spatial analysis software ArcGIS Network Analyst
- Vehicle Actuated Programming Software VisVAP
- Software for delivery vehicle route optimisation OPTiRUT
- External case for camera H-606
- Telescopic post

- Radar LED Display BT2258
- Subsonic windtunnel
- Multilevel piezometer
- NACA 2421 airfoil model with pressure taps
- Air traffic control radar simulator (MICRONAV BEST RADAR SIMULATOR)
- Radar Skills Trainer (RST)
- System for traffic Assignment and Analysis at a Macroscopic level (SAAM)
- Flight Synthetic Training Device BT-220
- Flight Synthetic Training Device BT-222
- Sound Level Meter PCE-322A
- Audiometer Bell Plus HDA280
- Sound Analyser Nor140
- Microphone ECM800
- Headphones SHURE SRH440
- Exterior Sound Card C400
- Digital Analog Converter – DAQPad-6070E
- High-resolution digital camera HD HERO2
- HD Hero2 camera control application
- Remote controller Wi-Fi BacPac
- Traffic Counter - Model NC200
- Traffic Counter - Model TQ (TCR100)
- Highway data management software HDM
- Traffic model geospatial data interface Cube Base
- Transport system modeling and planning software Cube Voyager
- Dynamic traffic assignment software Cube Avenue
- Hydrometer PCE - 313
- Noise gauge PCE -355
- Coating thickness gauge PCE-CT 28
- Device for measuring vehicle dynamics Pocket DAQ
- Device for measuring vehicle deceleration and acceleration XL - Meter
- Handheld device for measuring travel distance M4
- Smart Black Box recorder SBX-110
- Traffic accidents simulation software PC CRASH
- Device for mesuring coating thickness of road markings PosiTector 6000 FNS3
- Device for mesuring coating thickness of road markings PosiTector 200
- Device for mesuring coating thickness of road markings ZMM 5000
- Device for measuring moisture on surfaces CME4
- Device for testing visibility of road markings ZRM 1021
- Set for quality control of road markings ZMK 5050
- Device for measuring retroreflection of traffic signs ZRS 5060
- Device for measuring retroreflection of traffic signs ZRS 6060
- Device for quality control of road markings ZRM 6013
- Device for quality control of road markings ZRM 6014
- Device for measuring retroreflection of road markings ZDR 6020
- Device for testing roughness of road markings SRT 5800
- Mapping and data analysis software Mapping Tools
- Sofware for analysis of retroreflection test results Retrorefleksija

- Equipment kit Reactionmeter CRD4
- Traffic macrosimulation software Visum
- Traffic microsimulation software Vissim
- Software for traffic analysis at intersections Sidra Intersection
- Software for intersection traffic flow modelling JUNCTION - ARCADY
- Software for intersections and roads design AutoTURN Pro 3D
- Software for simulation of pedestrian flow SimWalk Transport
- Software for multicriteria decision making Expert Choice

ODSJEK PROMET

ZAVOD ZA INFORMACIJSKO-KOMUNIKACIJSKI PROMET

Laboratorij za modeliranje i optimiranje informacijsko-komunikacijskih mreža i usluga

Voditelj
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DIVISION OF TRANSPORT

DEPARTMENT OF INFORMATION AND COMMUNICATION TRAFFIC

Laboratory for Modelling and Optimizing Information and Communication Networks and Services

Head
Ivan Forenbacher, Dipl.Ing.
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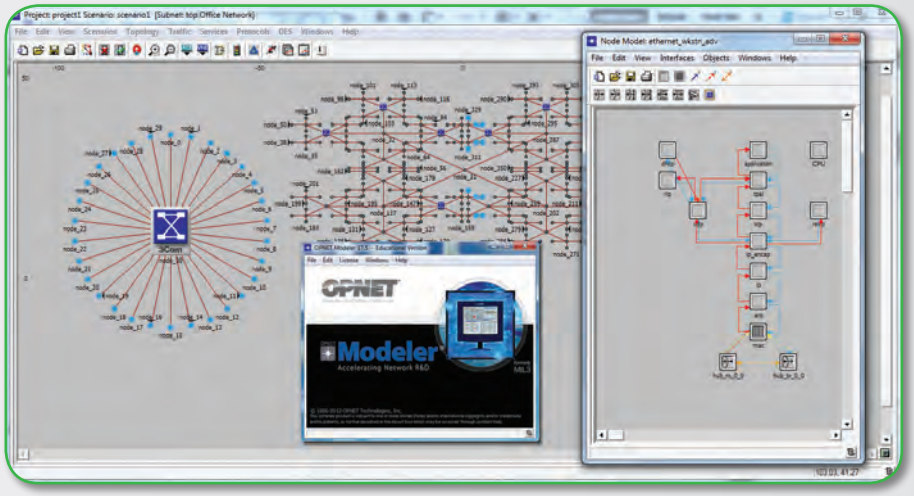
Naziv opreme / Equipment name

Program za projektiranje komunikacijskih mreža
OPNET Modeler
Software for communication network design
OPNET Modeler

Proizvođač / Manufacturer

OPNET Technologies, Inc., Bethesda, Maryland, USA



Namjena i opis / Purpose and description

Softver za napredno modeliranje i simuliranje informacijsko komunikacijskih mreža:

- najbrži mehanizam u funkciji simulacije diskretnih događaja
- stotine (800+) žičnih/bežičnih protokola i uređaja raznih proizvođača sa izvornim kodom
- intuitivno, hijerarhijsko okruženje za modeliranje
- skalabilne bežične simulacije uključivanjem terena, mobilnosti i path-loss modela
- diskretni događaji, hibridna i analitička simulacija
- 32 i 64 bitna simulacijska jezgra (u cijelosti paralelna)
- integrirano GUI debugiranje i analiza
- otvoreno sučelje za integraciju vanjskih datoteka objekata, biblioteka i drugih simulatora

Specialized software for advanced modelling and simulation of information and communication networks:

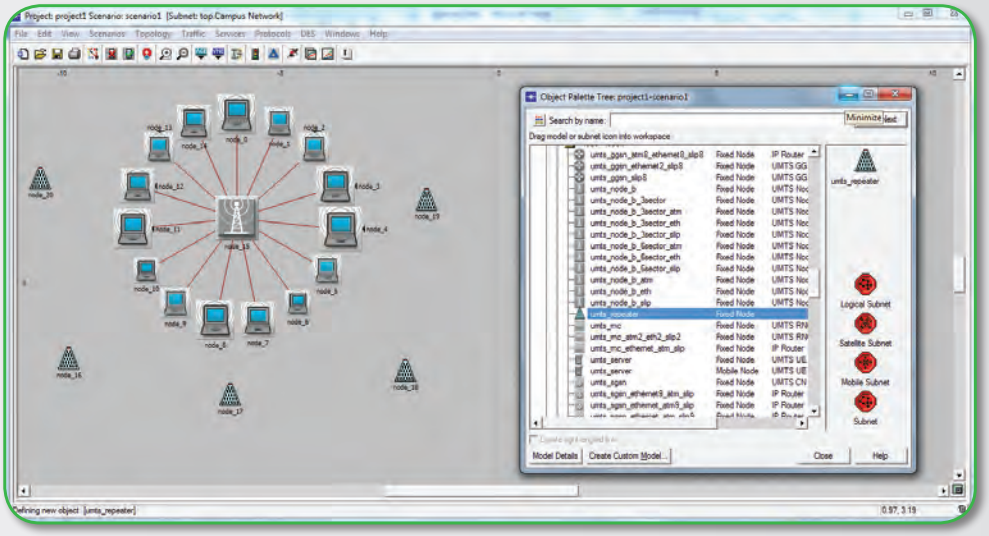
- the fastest engine for discrete event simulation
- hundreds (800+) of wired/wireless protocols and devices of different vendors (including source code)
- an intuitive, hierarchical environment for modelling
- scalable wireless simulation with inclusion of terrain, mobility and path-loss models
- discrete events, hybrid and analytical simulation
- 32 i 64 bit simulation kernel (full-parallel)
- integrated GUI debugging and analysis
- open interface for integrating external object files, libraries, and other simulators

Naziv opreme / Equipment name

Program za projektiranje bežičnih mreža
OPNET Wireless Module
Software for wireless network design
OPNET Wireless Module

Proizvođač / Manufacturer

OPNET Technologies, Inc., Bethesda, Maryland, USA



Namjena i opis / Purpose and description

Softver služi za napredno modeliranje, simulaciju i analizu širokog raspona bežičnih mreža za potrebe dizajna i optimizacije vlasničkih bežičnih protokola, poput kontrole pristupa i algoritama raspoređivanja.
Bežična funkcionalnost omogućuje simulaciju mreža koje uključuju entitete u pokretu (čvorovi i pod-mreže), radio komunikacije, ili i jedno i drugo.
Simulacije uključuju kretanje u mobilnim mrežama, tlo, zrak i satelitske sustave. Podržava sve mreže s mobilnim uređajima, uključujući mobilne (GSM, CDMA, UMTS, IEEE 802.16 WiMAX, LTE, itd.), mobilne ad hoc, bežični LAN (IEEE 802.11), osobne mreže (Bluetooth, ZigBee, itd.) i satelitske mreže.

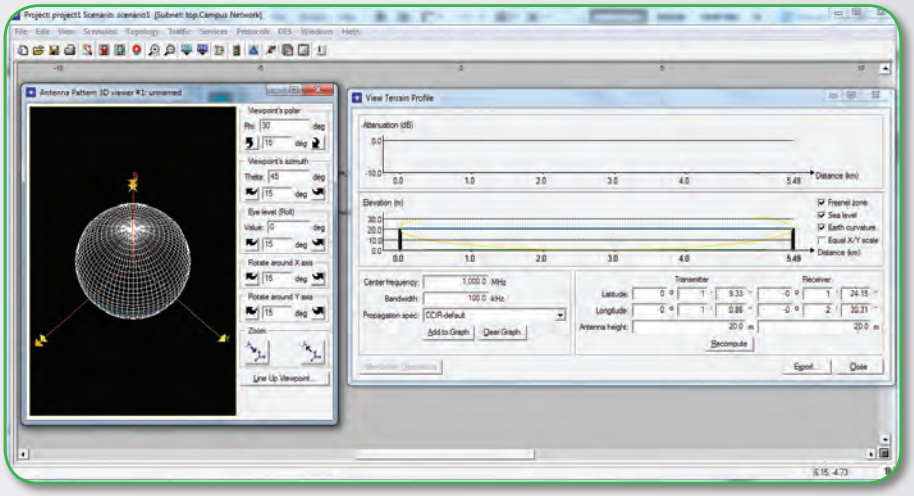
Software for advanced modelling, simulation and analysis of a wide range of wireless networks for the design and optimization purposes of proprietary wireless protocols, such as access control and scheduling algorithms.
Wireless functionality allows you to simulate networks that include moving sites (both nodes and sub-networks), radio communications, or both.
Simulations include the movement in mobile networks, ground, air and satellite systems. Supports all networks with mobile devices, including mobile (GSM, CDMA, UMTS, IEEE 802.16 WiMAX, LTE, etc.), mobile ad hoc, wireless LAN (IEEE 802.11), personal area network (Bluetooth, ZigBee, etc.) and satellite networks.

Naziv opreme / Equipment name

Program za modeliranje utjecaja terena TMM
Terrain Modelling Module TMM

Proizvođač / Manufacturer

OPNET Technologies, Inc., Bethesda, Maryland, USA



Namjena i opis / Purpose and description

Terrain Modeling Module (TMM) omogućuje povećanje točnosti simulacija uzimajući u obzir gubitak signala zbog efekata okoline, odnosno terena.
TMM može koristiti fizičke značajke (poput planina i zakrivljenosti Zemaljske kugle) i faktora okoline (vodljivost tla i prelamanje površine) kao ulazne podatke pri izračunu gubitka signala. Može se točno odrediti propagacijski model i koje parametre koristiti u funkciji izračuna razine gubitka signala.

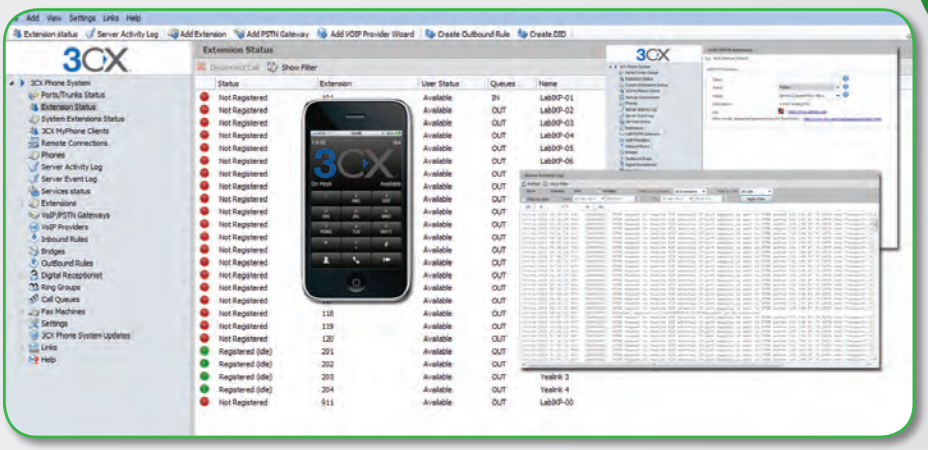
The Terrain Modeling Module (TMM) enables you to enhance the accuracy of simulations by taking into account signal loss due to terrain effects.
TMM can use both physical features (such as mountains and the curvature of the earth) and environmental factors (such as ground conductivity and surface refractivity) as inputs to calculate signal loss. You can specify the propagation model and parameters used to perform signal-loss calculations.

Naziv opreme / Equipment name

VoIP komutacijsko čvorište
VoIP Switching Node

Proizvođač / Manufacturer

3CX, Georgia, USA



Namjena i opis / Purpose and description

3CX VoIP komutacijsko čvorište za Windows operativni sustav je IP PBX specijalizirani softver koji zamjenjuje fizičku PBX / PABX centralu. Sustav je prvenstveno razvijen za Windows okruženje i temelji se na SIP standardu što omogućuje upravljanje i korištenje raznih SIP uređaja (softverskih i hardverskih).
IP PBX / PABX sofversko komutacijsko čvorište pruža određene pogodnosti:

- Call Centre Module – nadzor agenata, nadzor redova čekanja u stvarnom vremenu, napredna statistika po višestrukim kriterijima
- Voice Application Designer – dizajn Interactive Voice Response aplikacija
- softverski telefoni – upućivanje i primanje poziva preko PC-a
- kompletan telefonski sustav – pruža prosljeđivanje poziva, usmjeravanje i redove čekanja
- unificirana komunikacija – primanje glasovne pošte preko e-pošte i indikacija prisutnosti korisnika
- skalabilnost – neograničene ekstenzije i telefonske linije

3CX Switching Node for Windows is a software-based IP PBX that replaces a proprietary hardware PBX / PABX. 3CX's IP PBX has been developed specifically for Microsoft Windows and is based on the SIP standard, making it easier to manage and allowing you to use any SIP phone (software or hardware).
A software-based IP PBX / PABX offers many benefits:

- call centre module – agents control, real time queue monitoring, advanced statistics based on multiple criteria
- voice application designer – interactive voice response application design
- soft phones – making and receiving phone calls from PC
- complete phone system – provides call switching, routing and queueing
- unified communications – receive voice mail via e-mail and see user presence
- scaleable – unlimited extensions and phone lines

Naziv opreme / Equipment name

IP VoIP-GSM sučelje MobiLink
IP VoIP-GSM Gateway MobiLink

Proizvođač / Manufacturer

ROHDE & SCHWARZ TOPEX, Bucharest, Romania

Namjena i opis / Purpose and description

Omogućava usmjeravanje između IP, digitalne, analogne i GSM/UMTS mreže. TOPEX MobiLink posjeduje VoIP sučelje za povezivanje sa IP PBX sustavom utemeljenim na SIP i H.323.
Glavne značajke su:

- 2 istovremena poziva (2 GSM kanala 850/900/1800/1900 Mhz)
- 1 SIM kartica po kanalu (ukupno 2 SIM kartice)
- terminacija (VoIP to GSM)
- originacija (GSM to VoIP)
- 2 SIP kanala, G.711 codec
- RJ45 priključak
- vanjska antena

Enables direct routing between IP, digital, analog and GSM / UMTS networks. TOPEX MobiLink IP is a gateway with VoIP interfaces interconnection with IP-PBXs based on SIP and H.323.
Main features are:

- 2 simultaneous calls (2 GSM channels 850/900/1800/1900 Mhz)
- 1 SIM card per channel (total 2 SIM cards)
- termination (VoIP to GSM)
- origination (GSM to VoIP)
- 2 SIP channels, G.711 codec
- RJ45 jack
- external antenna

Naziv opreme / Equipment name

Komutacijski čvor BP 50
Switching Node BP 50

Proizvođač / Manufacturer

ERICSSON, Stockholm, Sweden

Namjena i opis / Purpose and description

Središnji sustav BusinessPhone 50 sastoji se od kompaktnog zidnog ormara sa 5 utora na matičnoj ploči (engl. Board slot), koji može povezati između 8 i 64 ekstenzije. Sustav ima ugrađeno napajanje sa mogućnošću spajanja vanjske baterije ili alternativnog napajanja.
Glavna namjena je povezivanje analognih i digitalnih korisničkih linija. BP50 sustav je pogodan za manja okruženja – posjeduje višefunkcijsku ploču koja kombinira "trunk" i sučelja ekstenzija s obradom glasa i poruka.

BusinessPhone 50 central system is a single compact wall cabinet with five board slots, that can cater for between 8 and 64 extensions. The cabinet has a built-in switched-mode power supply, with the option of an external battery back-up unit or alternative DC power supply.
BusinessPhone 50 system is particularly cost-effective for small offices - a multi-function board that combines trunk and extension interfaces with voice processing and messaging functions means only two boards are needed to build a fully featured business telephone system, leaving three slots free to add more capacity or additional functionality.

Naziv opreme / Equipment name

Aktivna mrežna oprema
Active network equipment

Proizvođač / Manufacturer

CISCO, San Jose, California, USA

Namjena i opis / Purpose and description

Oprema se sastoji od nekoliko komponenata, uglavnom CISCO prespojnika i usmjernika: Cisco Router 1841, 2621, 2620, Cisco Switch Catalyst 2950, Catalyst 2960, Catalyst 3500 Series XL itd.
Glavna namjena je povezivanje računala, instalacija, konfiguracija, upravljanje, održavanje i analiza računalnih mreža.

The equipment consists of several components, mainly CISCO switches and routers: Cisco Router 1841, 2621, 2620, Cisco Switch Catalyst 2950, Catalyst 2960, Catalyst 3500 Series XL etc.
The main purpose is connecting computers, installation, configuration, management, maintenance and analysis of computer networks.

ODSJEK PROMET

ZAVOD ZA INFORMACIJSKO-KOMUNIKACIJSKI PROMET

Laboratorij za sigurnost i forenzičku analizu informacijsko-komunikacijskog sustava

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DEPARTMENT OF INFORMATION AND COMMUNICATION TRAFFIC

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Naziv opreme / Equipment name

Uređaj za forenzičku analizu mobilnog podatkovnog prometa UFED Touch Ultimate Standard
Device for forensic analysis of mobile data traffic UFED Touch Ultimate Standard

Proizvođač / Manufacturer

Cellebrite Ltd., Petah Tikva, Israel

Namjena i opis / Purpose and description

Tehnološki najnapredniji sustav ekstrakcije, dekodiranja, analize i izvještavanja o podacima na mobilnim uređajima. Uređajem je moguće raditi fizičku, logičku i datotečnu ekstrakciju svih podataka (čak i izbrisanih) iz širokog raspona mobilnih uređaja, uključujući *legacy i featurephone*, *smartphone,* prijenosnih GPS uređaja, tableta te uređaja proizvedenih s kineskim komponentama. S vlastito razvijenim hardverom, integriranom baterijom, intuitivnim grafičkim sučeljem i zaslonom osjetljivim na dodir, UFED Touch Ultimate ubrzava istražni postupak, ispunjavajući stroge zahtjeve forenzičke analize mobilnih uređaja.

Most technologically advanced extraction, decoding, analysis and reporting of mobile data. It performs physical, logical, file system and password extraction of all data (even if deleted) from the widest range of devices including legacy and feature phones, smartphones, portable GPS devices, tablets and phones manufactured with Chinese chipsets. With proprietary hardware, an integrated battery, an intuitive GUI and touch screen, the UFED Touch Ultimate speeds up the investigation process, meeting the demands of the mobile forensic industry. The UFED Touch Ultimate solution comes with a range of applications, invaluable for investigators to close cases faster:

- UFED Physical Analyzer – advanced application for decoding, analysis and reporting
- UFED Phone Detective – instant mobile phone identification
- UFED Reader – enables authorized personnel to share information with others.

Naziv opreme / Equipment name

Uređaj za forenzičku analizu komunikacijskog prometa
Summit x450-24t
Device for forensic analysis of communications traffic
Summit x450-24t

Proizvođač / Manufacturer

Extreme Networks, San Jose, California, USA

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje sigurnosti i forenzičku analizu komunikacijskog prometa. Summit X450a ima *non-blocking switching fabric* i nudi *wire-speed* Layer 3/Layer 2 preklapanje na svim portovima uz definiranje QoS-a i sigurnosne značajke kao što su ACL liste. Sa svojim mogućnostima na Layer 2-4, Summit X450a zadovoljava različite zahtjeve na rubu mreže, kao i agregacije u jezgrenim mrežama manjih tvrtki.
Tehničke značajke:

- propusnost 128 - 256 Gbps
- SummitStack ™ 40 Gbps stacking
- 10-gigabitni Ethernet portovi za redundantne uplinkove
- 9216 Byte maksimalna veličina paketa (Jumbo Frame)
- 8 QoS que/port
- 4094 VLAN-ova

The device is used for security testing and forensic analysis of communications traffic. Summit X450a has a non-blocking switching fabric and offers wire-speed Layer 2/Layer 3 switching for all ports with Quality of Service and security features such as hardware-based Access Control Lists (ACLs). With its rich Layer 2-4 intelligence, Summit X450a meets a variety of requirements at the edge of the converged enterprise network as well as aggregation and small core.
Technical specifications:

- 128-256 Gbps switch fabric bandwidth, 95.2-130.9 Mpps Layer 2 and IPv4/IPv6 Layer 3 packet forwarding rate

- SummitStack™ 40 Gbps stacking support
- optional dual 10-gigabit Ethernet ports for redundant uplinks
- 9,216 Byte maximum packet size (Jumbo Frame)
- 8 QoS queues/port
- 4,094 VLANs

Naziv opreme / Equipment name

Uređaj za forenzičku analizu komunikacijskog prometa
Summit 200-24
Device for forensic analysis of communications traffic
Summit 200-24

Proizvođač / Manufacturer

Extreme Networks, San Jose, California, USA

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje sigurnosti i forenzičku analizu komunikacijskog prometa.
Karakteristike uređaja:

- 24 10/100 auto-negotiating Ethernet porta u 1RU
- 24 fixed 100BASE-FX (MMF) porta
- 2-10/100/1000BASE-T copper porta i 2 mini-GBIC uplink porta
- jednostruko AC napajanje
- arhitektura non-blocking wire-speed
- 11.8 Gbps propusnost
- limitiranje flow-based central rate
- 255 port bazirani i MAC bazirani VLAN-ovi
- 8,191 MAC adresa
- 4 hardverska queue po portu
- 4 Gigabit Ethernet uplink porta, 2 aktivna i 2 redundantna sa Layer 1 failover
- ACL-ovi za optimalnu sigurnost i klasifikaciju prometa

This device is used for security testing and forensic analysis of communications traffic.
Characteristics of the device:

- 24 10/100 auto-negotiating Ethernet ports in a 1RU footprint allow more network connections per inch of rack space
- 24 fixed 100BASE-FX (MMF) ports deliver high-density fiber connectivity in 1.75-inch high (1RU) form factor

- 2-10/100/1000BASE-T copper ports and 2 mini-GBIC ports deliver two active gigabit uplinks for greater throughput and two redundant uplinks
- single AC power supply
- non-blocking wire-speed architecture,
- 11.8 Gbps switching fabric enabling all ports to operate at line-rate
- flow-based central rate limiting that can be applied to any classified packet flow
- 255 port based and MAC based VLANs
- 8,191 MAC addresses
- 4 hardware queues per port
- 4 Gigabit Ethernet uplink ports, 2 active and 2 redundant with Layer 1 failover
- ACLs for optimal security and diverse traffic classification

Naziv opreme / Equipment name

Uređaj za forenzičku analizu komunikacijskog prometa
FortiGate 200A
Device for forensic analysis of communications traffic
FortiGate 200A

Proizvođač / Manufacturer

Fortinet, Sunnyvale, California, USA

Namjena i opis / Purpose and description

FortiGate-200A omogućava dvostruku WAN link podršku za redundantne Internet konekcije te sadrži integrirani preklopnik s 4 porta. Dvostruki DMZ portovi omogućavaju višestruke konekcije prema web i email poslužiteljima omogućavajući tako granulirano konfiguriranje mrežne segmentacije. Karakteristike uređaja omogućavaju ispitivanje sigurnosti i forenzičku analizu komunikacijskog prometa.

Vatrozid:

- neželjena pošta
- antivirus
- filtriranje sadržaja
- blokiranje *cookiea*
- Dead Peer Detection
- Denial of Service (DoS)
- Distributed Denial of Service (DDoS)
- detekcija upada
- spriječavanje upada
- filtriranje IP adresa
- blokiranje Java i ActiveX
- filtriranje prema ključnim riječima
- blokiranje MAC adresa
- Stateful Packet Inspection
- filtriranje URL-ova
- filtriranje Web sadržaja

Virtualizacija:

- 400000 konkurentnih konekcija
- 4000 konkurentnih sesija
- 2000 pravila
- 80 dediciranih VPN tunela

Enkripcijski standardi:

- 3DES
- AES
- DES

The FortiGate-200A platform features dual WAN link support for redundant internet connections, and an integrated 4-port switch that eliminates the need for an external hub or switch, giving networked devices a direct connection to the FortiGate-200A unit. Dual DMZ interfaces allow for multiple connections to web and email servers for granular network segmentation. This device is used for security testing and forensic analysis of communications traffic.

Firewall Protection:

- anti-spam
- antivirus
- content filtering
- cookie blocking
- Dead Peer Detection
- Denial of Service (DoS)
- Distributed Denial of Service (DDoS)
- intrusion detection
- intrusion prevention
- IP address filtering
- Java and ActiveX blocking
- keyword filtering
- MAC address blocking
- Stateful Packet Inspection
- Trojan Horse
- URL filtering
- Web content filtering
- worm scanning

Virtualization:

- 400000 x Concurrent Connection
- 4000 x Concurrent Session
- 2000 x Policies
- 80 x Dedicated VPN Tunnel

Encryption Standard:

- 3DES
- AES
- DES

Naziv opreme / Equipment name

Uređaj za forenzičku analizu komunikacijskog prometa TippingPoint 210e
Device for forensic analysis of communications traffic TippingPoint 210e

Proizvođač / Manufacturer

HP/3Com, Palo Alto, California / Massachusetts, USA

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje sigurnosti i forenzičku analizu komunikacijskog prometa te mogućnosti IPS sustava.

Vatrozid:
- crvi
- anti-phishing
- anti-spyware
- antivirus
- Denial of Service (DoS)
- Distributed Denial of Service (DDoS)
- Trojan Horse
- P2P blokiranje
- *Reconnaissance* zaštita
- *Backdoor* detekcija
- Zero Day
- sprečavanje upada
- DNSGuard
- filtriranje email sadržaja

Sučelja:
- 10 x RJ-45 10/100/1000Base-T LAN
- 1 x RJ-45 10/100Base-TX Mgmt
- 1 x Serial Mgmt

Virtualizacija:
- 1000000 konkurentnih konekcija
- 8000 konekcija po sekundi

This device is used for security testing and forensic analysis of communications traffic. Device characteristics:

Firewall Protection

- worm scanning
- Anti-phishing
- Anti-spyware
- antivirus
- Denial of Service (DoS)
- Distributed Denial of Service (DDoS)
- Trojan Horse
- P2P Blocking
- Reconnaissance Protection
- Backdoor Detection
- Zero Day Event
- intrusion prevention
- DNSGuard
- email content filtering

Interfaces/Ports

- 10 x RJ-45 10/100/1000Base-T LAN
- 1 x RJ-45 10/100Base-TX Mgmt
- 1 x Serial Mgmt

Virtualization

- 1000000 concurrent session
- 8000 connections per second
- Management & Protocols

Naziv opreme / Equipment name

Ethernet usmjerivač RouterBoard 450G
Ethernet router RouterBoard 450G

Proizvođač / Manufacturer

Mikrotik, Riga, Latvia

Namjena i opis / Purpose and description

RB450G je Gigabitov ethernet usmjerivač s pet ulaza. RB450G omogućava Gigabit brzine, te sadrži 256MB RAM, CPU i microSD utor za potrebe pohrane podataka. Uređaj se temelji na AR7161 680MHz Atheros CPU te se za zaštitu procesora brinu temperaturni i naponski senzori. RB450G radi na RouterOS operativnom sustavu koji omogućava da ovaj uređaj radi kao usmjerivač, vatrozid ili upravitelj propusnošću. Koristi se za ispitivanje sigurnosti i forenzičku analizu komunikacijskog prometa.

The RB450G is a five port Gigabit ethernet router. The RB450G adds Gigabit speed capability, but also 256Mb of RAM, a faster CPU and a microSD card slot for file storage. The device is powered by a fast AR7161 680MHz Atheros CPU, and also includes a temperature sensor and voltage monitor.
RB450G includes RouterOS - the operating system, which will turn this powerful system into a highly sophisticated router, firewall or bandwidth manager.

Naziv opreme / Equipment name

Uređaj za forenzičku analizu bežičnog komunikacijskog prometa TL-WA801N
Device for forensic analysis of wireless communication traffic TL-WA801N

Proizvođač / Manufacturer

TP-Link, Shenzhen, China

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje sigurnosti i forenzičku analizu bežičnog komunikacijskog prometa. Neke od mogućnosti ove bežične pristupne točke su:

- Wireless N brzine do 300 Mbps
- MIMO ™ tehnologija
- CCA ™ tehnologija
- podržava više načina rada (Access Point, Multi-SSID, Client, Universal/ WDS repeater, bridge)
- podržava Wi-Fi Multimedia (WMM)
- PoE injektori
- Do 4 SSID i VLAN podrška
- WPA/WPA2 enkripcija
- kompatibilan sa 802.11b/g
- vanjski odvojiva antena
- mogućnost montaže na zid

This device is used for security testing and forensic analysis of communications traffic. Characteristics of the device:

- Wireless N speed up to 300 Mbps makes it ideal for bandwidth consuming or interruption sensitive applications like video streaming, online gaming and voice over Internet
- MIMO™ technology provides robust high-bandwidth wireless Tx/Rx capability at further range
- CCA™ improves wireless performance while automatically avoiding channel conflict

- supports multiple operation modes (Access Point, Multi-SSID, Client, Universal/WDS Repeater, Bridge with AP)
- easily setup a WPA encrypted secure connection at a push of the WPS button
- supports Wi-Fi Multimedia (WMM) assures the quality of VoIP and multimedia streaming
- up to 30 meters (100 feet) of flexible deployment with included Passive Power over Ethernet Injector
- up to 4 SSIDs and VLAN support, it allows networks administrator to segregate different services or applications to different designated users
- WPA/WPA2 encryptions provide your network with active defence against security threats
- backward compatible with 802.11b/g products
- external detachable antennas allow for better alignment and stronger antenna upgrades
- wall mounted available, also can be placed horizontally on a table or desk

Naziv opreme / Equipment name

Uređaj za forenzičku analizu bežičnog komunikacijskog prometa D-Link DAP-1160
Device for forensic analysis of wireless communication traffic D-Link DAP-1160

Proizvođač / Manufacturer

D-Link, Taipei, Taiwan

Namjena i opis / Purpose and description

Koristi se za ispitivanje sigurnosti i forenzičku analizu bežičnog komunikacijskog prometa. Baziran je na Realtek RTL8186 hardveru. Sadrži 4 MB Flash memorije i 16 MB SDRAM memorije. DAP-1160 omogućava 64/128-bit WEP i WPA/WPA2 filtriranje prema MAC adresama.

This device is used for security testing and forensic analysis of communications traffic. Based on the Realtek RTL8186 chipset, the DAP-1160 can be upgraded with any bespoke firmware based on the provided Software Development Kit (SDK). This allows programmers to make full use of the 4MB Flash memory and 16MB SDRAM to include advanced features of their choice. The DAP-1160 provides 64/128-bit WEP encryption and WPA/WPA2 security to protect your network and wireless data. In addition, it also provides MAC address filtering and the "Disable SSID Broadcast" function to prevent outsiders' access to your home or office network.

ODSJEK PROMET

ZAVOD ZA ZRAČNI PROMET

Laboratorij za modeliranje i simulacije u zračnom prometu / upravljanje zračnim prometom

Voditelj
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DIVISION OF TRANSPORT

DEPARTMENT OF AIR TRANSPORT

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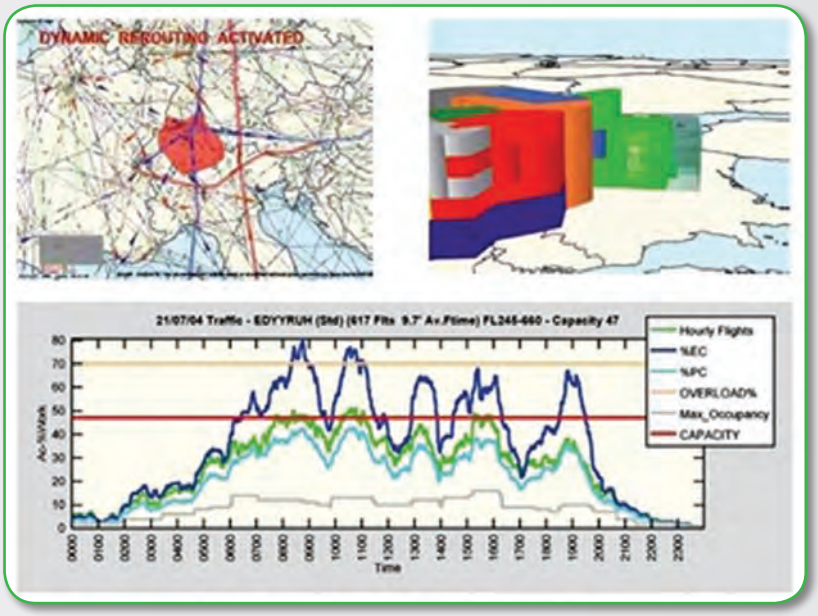
Naziv opreme / Equipment name

Program za modeliranje i simulaciju zračnog prostora
System for traffic Assignment and Analysis at a Macroscopic level (SAAM)

Proizvođač / Manufacturer

EUROCONTROL, Brussels, Belgium



Namjena i opis / Purpose and description

U svrhu modeliranja i simulacija zračnog prostora koristi se simulacijski program System for traffic Assignment and Analysis at a Macroscopic level (SAAM). Program SAAM koristi se za preliminarna istraživanja, testiranja i analizu različitih mogućnosti te za razvoj scenarija koji se mogu prenijeti u simulacije u brzom vremenu (Fast Time Simulation) te u simulacije u stvarnom vremenu (Real Time Simulation) Programom SAAM između ostalog vrši se kreacija/promjena/dizajn rutne mreže i volumena zračnog prostora (3D), generiranje prometne potražnje (4D trajektorije leta zrakoplova) i apliciranje iste na strukture zračnog prostora, optimizacija prometne potražnje ovisno o funkciji cilja (pronalazak najkraćeg puta i/ili najjeftinijeg puta između parova gradova), analiza trajektorija leta prema zadanim parametrima, npr. prema točci odlaska, točci dolaska, segmentu, sektorima, tipu zrakoplova, itd.

System for traffic Assignment and Analysis at a Macroscopic level (SAAM) is used for the purpose of simulations and airspace modelling. SAAM software is used for preliminary testing, analysis of different solutions and development of scenarios that can be exported into the Fast Time and Real Time Simulation tools. With SAAM tool among others following actions are performed creation/change/design of route network and 3D volume of airspace, generation of traffic demand (4D flight trajectory) and assigning of traffic demand on airspace structures, optimization of traffic demand, analysis of flight trajectories, etc.

Naziv opreme / Equipment name

Program za procjenu i vizualizaciju kapaciteta kontrole zračnog prometa
Network Estimation Visualization of ACC Capacity (NEVAC)

Proizvođač / Manufacturer

EUROCONTROL, Brussels, Belgium

Namjena i opis / Purpose and description

Program Network Estimation Visualization of ACC Capacity (NEVAC) služi za: izračun osnovnog kapaciteta ACC-a, generiranje buduće prometne potražnje, optimizaciju sektorskih konfiguracija i shema otvaranja sektora balansirajući radne sate kontrolora zračnog prometa sa prekoračenjem kapaciteta i povezanim kašnjenjem, analizu reorganizacije zračnog prostora upotrebom virtualnog ACC-a, vizualizaciju prometne potražnje, zagušenja i analize kompleksnosti zračnog prometa, itd.
U sklopu aktivnosti laboratorija softverski paket Network Estimation Visualization of ACC Capacity (NEVAC) koristiti se za analizu povijesnog kapaciteta ACC-a u svrhu determiniranja dogovorene granice za sljedeću godinu, te evaluaciju dostizanja kapaciteta od strane pružatelja usluga u zračnoj plovidbi.

Network Estimation Visualization of ACC Capacity (NEVAC) software is used for calculation of baseline ACC capacity, generation of future air traffic demand, optimization of sector configurations and sector opening schemes, analysis of the airspace reorganization, visualization of the air traffic demand and airspace capacity, etc. Within the laboratory Network Estimation Visualization of ACC Capacity (NEVAC) is used for the analysis of the historic ACC capacity and future air traffic demand, evaluation of opening schemes, sector configurations, capacity enhancements, and other activities.

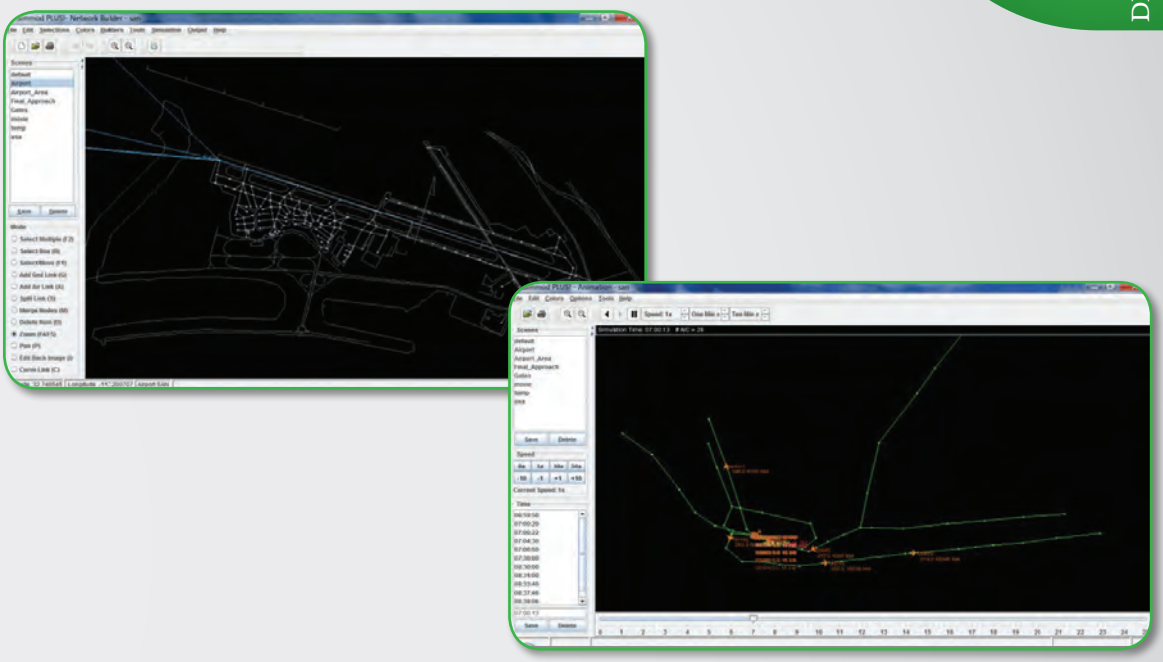
1 ODSJEK PROMET
DIVISION OF TRANSPORT

Naziv opreme / Equipment name

Program za planiranje aerodromskog sustava
SIMMOD PLUS
Airport and Airspace Simulation Model
SIMMOD PLUS

Proizvođač / Manufacturer

ATAC Corporation, Santa Clara, California, USA



Namjena i opis / Purpose and description

Simulacijski programski paket SIMMOD PLUS koristi se za provođenje složene simulacijske analize na temelju definiranih korisničkih parametara. SIMMOD omogućuje fleksibilnost kod planiranja aerodromskog sustava te razvoj različitih scenarija koji se vjerno mogu prikazati u simulacijskom programskom paketu. Simulacijski programski paket SIMMOD_PLUS u sklopu aktivnosti laboratorija koristiti se za istraživanje i analizu aerodromskog sustava.

SIMMOD PLUS simulation software package is used for complex simulation analysis based on user-defined parameters. SIMMOD provides the flexibility in airport system planning and development of different scenarios that can be realistically displayed in simulation software package. Simulation software package SIMMOD_PLUS within the activities of laboratory is used for research and analysis of the airport system.

ODSJEK PROMET

ZAVOD ZA ŽELJEZNIČKI PROMET

Laboratorij za modeliranje i simulacije željezničkih sustava

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DIVISION OF TRANSPORT

DEPARTMENT OF RAILWAY TRANSPORT

Laboratory for Modelling and Simulation of Railway Systems

Head
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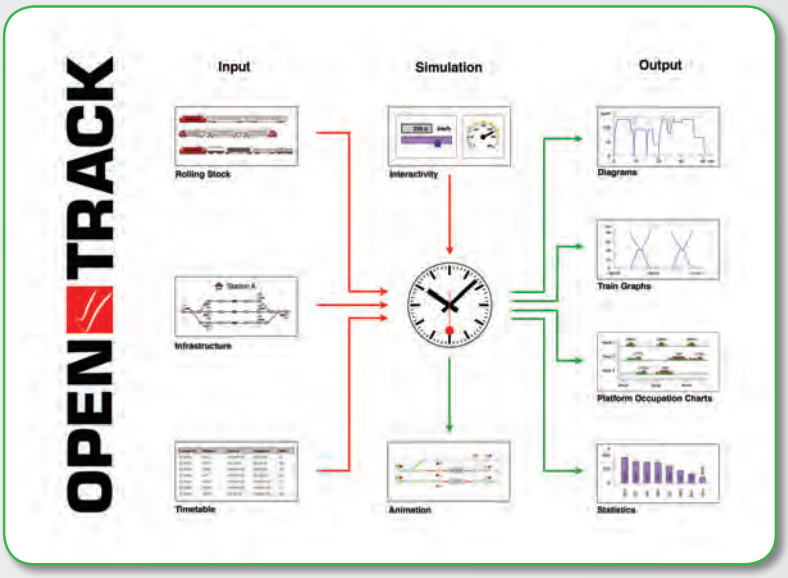
Naziv opreme / Equipment name

Program za modeliranje i simulacije u željezničkom prometu OpenTrack
Software for modelling and simulation of railway system OpenTrack

Proizvođač / Manufacturer

Swiss Federal Institute of Technology, Zürich, Switzerland



Namjena i opis / Purpose and description

Program služi za izradu računalnih modela i simulacije u željezničkom prometu. OpenTrack podržava izvođenje sljedećih zadataka:

- određivanje zahtjeva za željezničku infrastrukturu
- analiza tehničkog kapaciteta pruga i kolodvora
- analiza voznog parka
- planiranje i izrada voznog reda te analiza njegove stabilnosti
- analiza učinkovitosti različitih sustava za vođenje vlakova
- proračun potrošnje pogonske energije vlakova
- analiza utjecaja kvarova na infrastrukturnim i mobilnim kapacitetima željeznice i kašnjenja vlakova na učinkovitost željezničkog prometa
- simulacija tramvajskog prometa
- simulacija djelovanja sustava metroa
- simulacija djelovanja Maglev sustava

The program is used for modelling and simulation of railway operations. OpenTrack supports the following tasks:

- determining the requirements for a railway network infrastructure
- analyzing the capacity of lines and stations

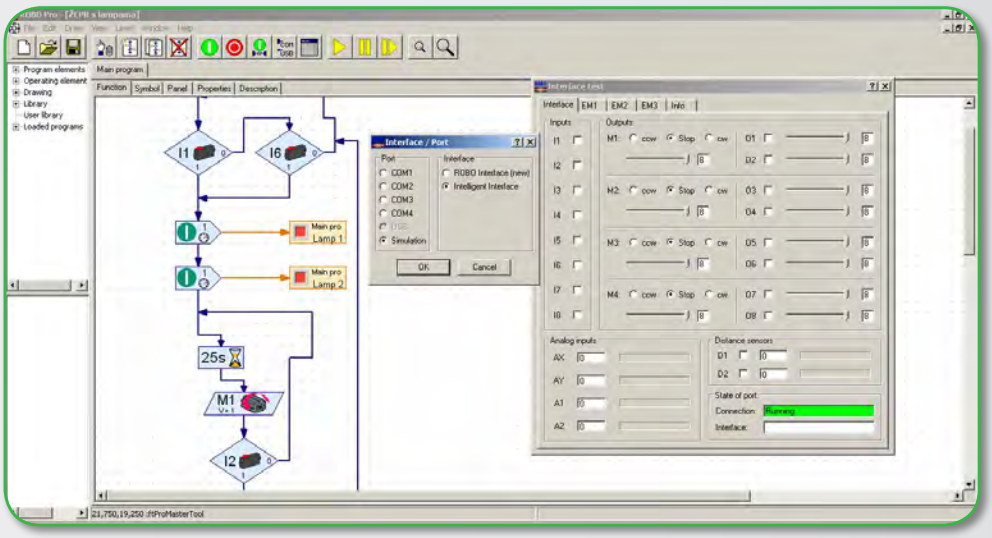
- rolling stock studies (for example, future requirements)
- timetable construction; analyzing the robustness of timetables
- analyzing efficiency of various signalling systems, Analyzing the effects of system failures (such as infrastructure or train failures) and delays
- calculation of power and energy consumption of train services
- simulation of Tram/Streetcar and Light Rail systems
- simulation of Metro/Subway/Underground systems
- simulation of Maglev systems (such as Transrapid)

Naziv opreme / Equipment name

Program za izradu aplikacija upravljanja željezničkim uređajima RoboPro
Software for programming of railway control units RoboPro

Proizvođač / Manufacturer

Fischertechnik GmbH, Waldachtal, Germany



Namjena i opis / Purpose and description

Program je namijenjen za programiranje rada programabilnog logičkog kontrolera. Ovaj kontroler primjenjuje se za upravljanje procesom rada fizičkih modela različitih željezničkih signalno-sigurnosnih uređaja kao što su uređaji željezničko-cestovih prijelaza u razini, uređaj automatskog pružnog bloka i dr.

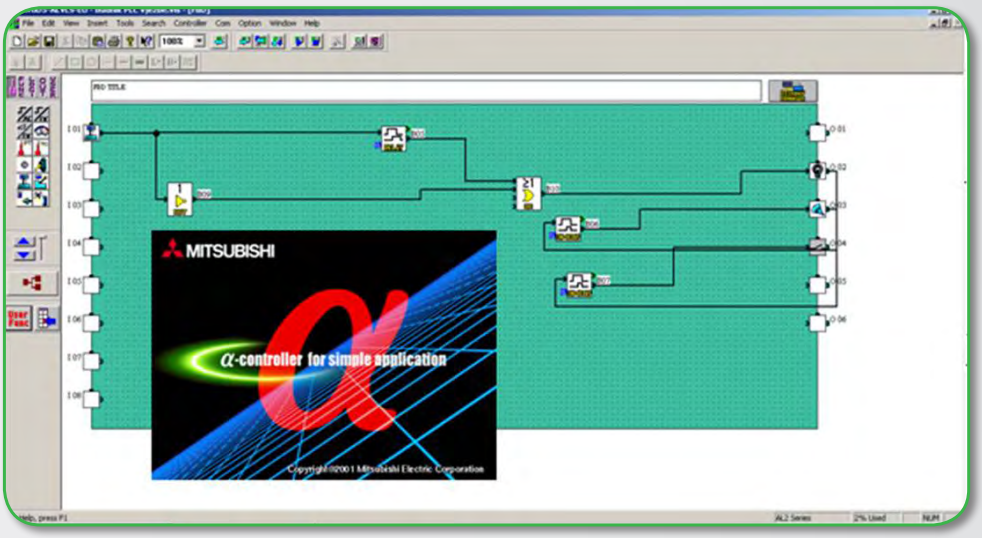
The program is used for programming of programmable logic controller RoboPro. This controller controls various physical models of train control systems such as railway level crossings, automatic block system etc.

Naziv opreme / Equipment name

Aplikacija za programiranje mikrokontrolera
ALPHA 2 - Software
Micro controller programming software
ALPHA 2 - Software

Proizvođač / Manufacturer

Mitsubishi Electric, Tokyo, Japan



Namjena i opis / Purpose and description

Program je namijenjen za programiranje rada programabilnog logičkog kontrolera. Ovaj kontroler primjenjuje se za upravljanje procesom rada željezničkih signalno-sigurnosnih uređaja kao što su uređaji željezničko-cestovih prijelaza u razini, uređaj budnosti strojovođe (budnik) i dr.

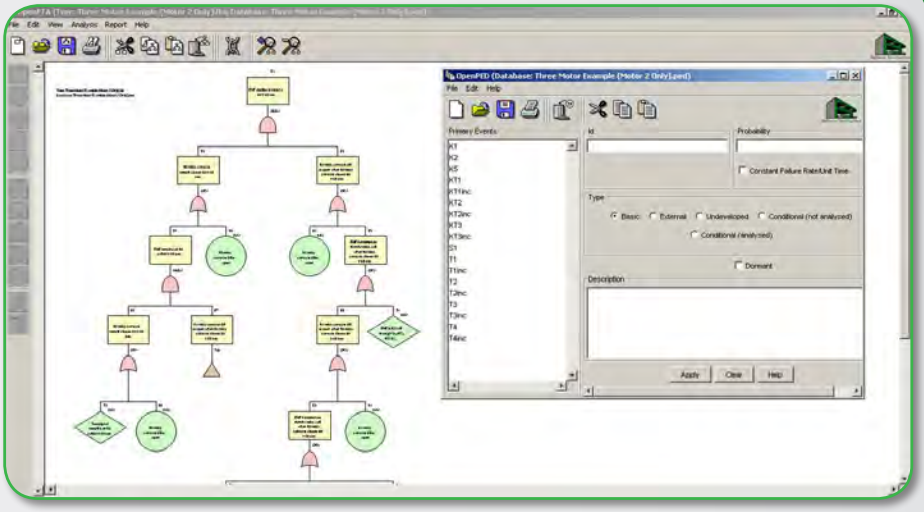
The program is used for programming of programmable logic controller ALPHA 2. This controller is used for control of various train control systems such as railway level crossings, dead man's control system etc.

Naziv opreme / Equipment name

Program za analizu pouzdanosti sustava Open FTA
Sofware for conduction of Fault Tree AnalysisOpen FTA

Proizvođač / Manufacturer

Formal Software Construction Ltd., Cardiff, UK



Namjena i opis / Purpose and description

Program je namijenjen za izvođenje analize stabla pogrešaka. Analiza stabla pogrešaka predstavlja deduktivnu metodu koja služi za analizu utjecaja inicijalnih smetnji i kvarova u radu složenih sustava.

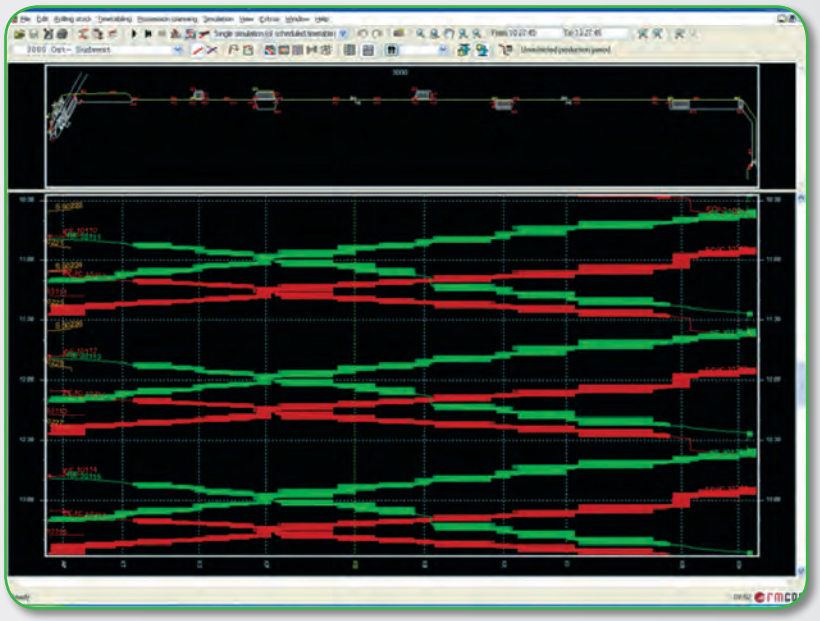
The program is used for conduction of fault tree analysis. FTA is a deductive, top-down method aimed at analyzing the effects of initiating faults and events on a complex system. This program is used for reliability analysis of train control systems.

Naziv opreme / Equipment name

Program za modeliranje i simulacije u željezničkom prometu RailSys
Software for modelling and simulation of railway system RailSys

Proizvođač / Manufacturer

Rail Management Consultants GmbH (RMCon), Hannover, Deutschland



Namjena i opis / Purpose and description

Program služi za izradu računalnih modela i simulacije u željezničkom prometu.
RailSys podržava izvođenje sljedećih zadataka:

- određivanje zahtjeva za željezničku infrastrukturu
- analiza tehničkog kapaciteta pruga i kolodvora
- planiranje i izrada voznog reda te analiza njegove stabilnosti
- analiza utjecaja kvarova na infrastrukturnim i mobilnim kapacitetima željeznice i kašnjenja vlakova na učinkovitost željezničkog prometa

The program is used for modelling and simulation of railway operations.
RailSys supports the following tasks:

- determining the requirements for a railway network infrastructure
- analyzing the capacity of lines and stations
- timetable construction; analyzing the robustness of timetables
- analyzing the effects of system failures (such as infrastructure or train failures) and delays

ODSJEK PROMET

ZAVOD ZA ŽELJEZNIČKI PROMET

Laboratorij za sigurnost željezničkog prometa

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Naziv opreme / Equipment name

Komplet za simulaciju rada uređaja za detekciju zauzeća kolosijeka
Railway track occupation detection simulation set

Proizvođač / Manufacturer

Altpro d.o.o., Zagreb, Hrvatska

Namjena i opis / Purpose and description

Komplet je namijenjen za simulaciju rada uređaja brojača osovina BO23 koji služi za kontrolu zauzetosti kolodvorskih odsjeka brojanjem osovina (npr. zauzetost skretnica i kolosijeka unutar kolodvora), te kontrolu odsjeka otvorene pruge (npr. prostornih odsjeka APB-a).
Komplet se sastoji od jednog unutarnjeg uređaja BO23-UNUR i vanjske opreme BO23-VUR te senzora ZK24-2.

Railway track clear detection simulation set is used for simulation of axle counter device BO23 that detects the occupation and clearance of a track sections in railway stations (e.g. occupation of switches, station tracks) and on the open track (e.g. Automatic Block sections).
The set includes one interior device BO23-UNUR, and outdoor equipment BO23-VUR and wheel senzor ZK24-2.

Naziv opreme / Equipment name

Komplet za testiranje uređaja za detekciju prolaza kotača vlaka u svrhu uključenja/isključenja željezničko-cestovnog prijelaza
Set for simulation of railway level crossing activation and deactivation by wheel sensors

Proizvođač / Manufacturer

Altpro d.o.o., Zagreb, Hrvatska

Namjena i opis / Purpose and description

Uređaj za detekciju prolaza kotača vlaka u svrhu uključenja/isključenja predstavlja dio uređaja za osiguranje željezničko-cestovnog prijelaza u razini (ŽCPR).
Povlačenjem magneta iznad senzora željezničkog kotača ZK24-2 simulira se prolazak vlaka preko uključnog i isključnog kontakta za uključenje odnosno isključenje uređaja željezničko cestovnog prijelaza u razini.

Set for simulation of railway level crossing activation and deactivation by wheel sensors is part of a device for railway level crossing safety system.
Simulation of the process is made by pulling of special magnetic block over the rail wheel sensors ZK24-2 which are responsible for activation and deactivation of railway level crossing device.

Naziv opreme / Equipment name

Laboratorijski komplet za ispitivanje i simulaciju rada Autostop uređaja RAS 8385
Set for simulation and testing of automatic train protection device RAS 8385

Proizvođač / Manufacturer

Altpro d.o.o., Zagreb, Hrvatska

Namjena i opis / Purpose and description

Autostop uređaj RAS 8385 služi za automatsku zaštitu vlaka. Uz autostop uređaj nalaze se i dvije pružne balize; kombinirana baliza (1000/2000 Hz) i pružna baliza (500 Hz) koje služe za simulaciju rada autostop uređaja.
U kompletu se nalaze i ispitni uređaj za RAS 8385 te ispitni uređaj PMI2 za indusi pružne balize.

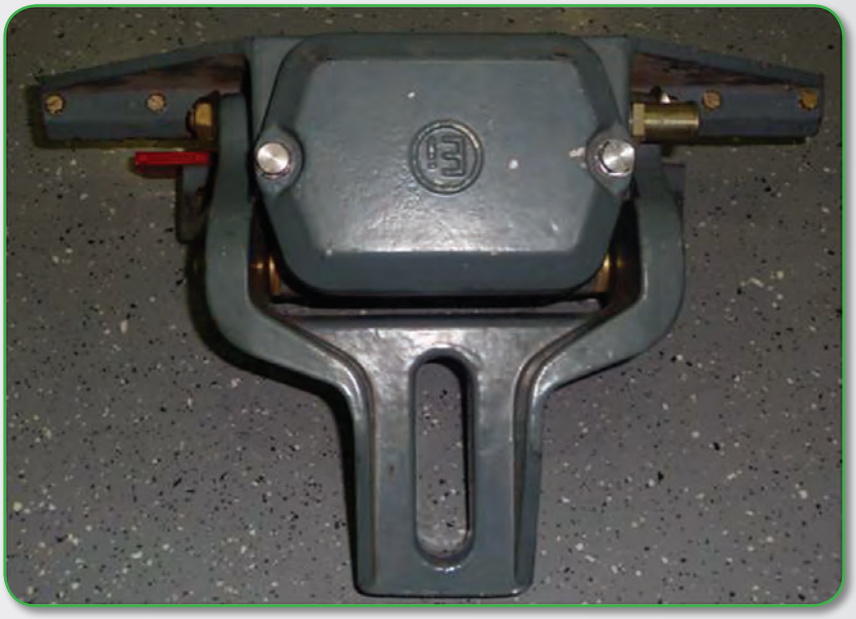
Automatic train protection device RAS 8385 is used for automatic control of train driver behaviour during a process of train operation. Beside automatic train protection device RAS 8385 this set also includes two track balises, combined balise (1000/2000 Hz) and control balise (500 Hz) which are used for simulation of automatic train protection device functions.
This set also includes testing device for automatic train protection device RAS 8385 track balise testing device PMI2.

Naziv opreme / Equipment name

Magnetski tračnički kontakt
Magnetic wheel sensor

Proizvođač / Manufacturer

Elektronska Industrija, Niš, Srbija



Namjena i opis / Purpose and description

Služi za detekciju prolaska kotača željezničkog vozila. Magnetski tračnički kontakti rade uz pomoć ugrađenih stalnih magneta, bez posebnog napajanja. Najčešće se rabe na uređajima za automatsko osiguranje cestovnih prijelaza za uključenje i isključenje cestovne signalizacije.

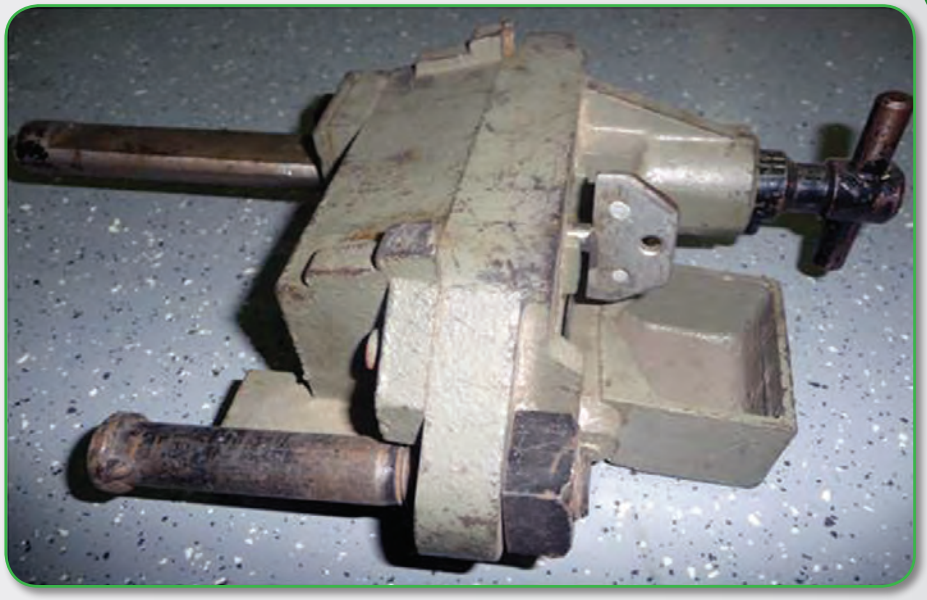
Magnetic wheel sensor is used for detection of railway vehicle wheels which are passing over this sensor. This type of wheel sensors is using the permanent magnet without need for special electrification along the track. They are usually used as sensors for activation and deactivation of automatic level crossing device.

Naziv opreme / Equipment name

Skretnička brava (Robel)
Point lock (Robel)

Proizvođač / Manufacturer

Posit d.o.o., Zagreb, Hrvatska



Namjena i opis / Purpose and description

Namjena ovog uređaja jest zadržavanje skretnice u njezinom pravilnom i ispravnom položaju. Brava se pričvršćuje vijcima s vanjske strane vrata tračnice, a u sebi ima odgovarajuću polugu koja se gurne prema otvorenom jezičku i u tome se položaju zaključa pomoću pripadajućeg ključa. Ključ se može izvaditi iz brave jedino u slučaju kada je brava zaključana. Na taj način nedvojbeno se može utvrditi u kojem se položaju nalazi skretnica.

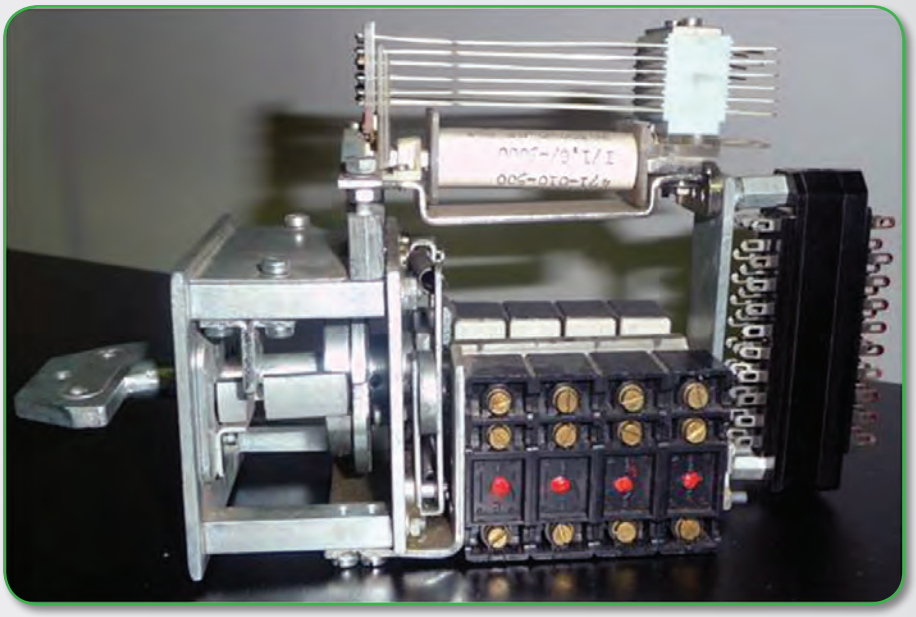
This point lock is used for locking a set of points in the correct position for safe train operation. This lock is mounted on the outer side of the rail and it has a special lever which can be pushed and locked in this position by a special key. The key can be removed from the lock only when it is locked. In this way it is possible to determine a position of the points.

Naziv opreme / Equipment name

Elektromagnetska brava
Electromagnetic lock

Proizvođač / Manufacturer

Iskra, Kranj, Slovenija



Namjena i opis / Purpose and description

Ovaj uređaj je namijenjen za ostvarivanje veće sigurnosti željezničkog prometa. U sklopu ovog uređaja primijenjena je relejna tehnika kako bi se ostvarila sigurnosna logika u okviru tehnološkog procesa rada na željeznici. Elektromagnetska brava sprečava da prometnik vlakova dopusti vožnju vlaka na otvorenoj pruzi ako postoji mogućnost da skretnica nije postavljena u pravilan položaj za tu vožnju.

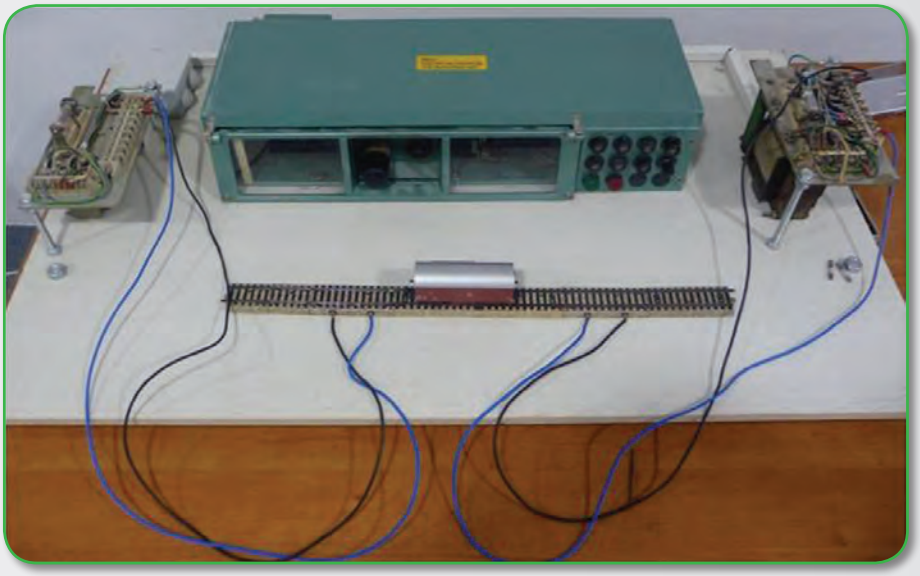
Electromagnetic lock is used to improve safety of railway traffic. This device uses a relay to achieve safety logic of railway processes. Electromagnetic lock prevents train director to allow a train to run on the open line if there is a possibility for a switch to be in the wrong position for its run.

Naziv opreme / Equipment name

Model izoliranog odsjeka
Track circuit model

Proizvođač / Manufacturer

Alcatel, Paris, France



Namjena i opis / Purpose and description

Namjena ovog modela je demonstracija rada izoliranog odsjeka. Pomoću ovog modela studentima je moguće pokazati na koji se način obavlja kontrola slobodnosti kolosijeka od strane željezničkih vozila te puknuća tračnica u stvarnom okruženju. Model se sastoji o relejne grupe izoliranog odsjeka, dva transformatora te modela željezničkog vozila i kolosijeka.

Track circuit model is used to present students how a real track circuit is operating. By application of this model students are able to understand the logic of this kind of track clear detection. The model also enables detection of rail rupture. The model includes track circuit relay group, two transformers and model of railway vehicle and track.

Naziv opreme / Equipment name

Programabilan logički kontroler (PLC)
Programmable logic controller (PLC)

Proizvođač / Manufacturer

Mitsubishi Electric, Tokyo, Japan

Namjena i opis / Purpose and description

Programibilni logički kontroler (PLC) koristi se za obuku studenata za programiranje logičkih procesa u željezničkom prometu (npr. logika rada uređaja za osiguranje željezničko-cestovnog prijelaza, logika rada uređaja budnika i dr.).
Osnovne tehničke značajke uređaja:

- broj integriranih ulaza/izlaza: 14
- digitalnih ulaza: 8
- broj integriranih izlaza: 6
- maksimalna potrošnja energije W: 5,5
- težina kg: 0,3
- dimenzije mm: 124,6 x 90 x 52

Programmable logic controller (PLC) is used for teaching students to programme railway logic processes (e.g. safety logic of level crossing device, logic of electronic dead-man's control unit etc.).
Basic technical specification:

- integrated inputs/outputs: 14
- digital inputs: 8
- integrated outputs: 6
- max. power consumption W: 5.5
- weight kg: 0.3
- dimensions (W x H x D) mm: 124.6 x 90 x 52

2

ODSJEK ITS I LOGISTIKA

ZAVOD ZA INTELIGENTNE TRANSPORTNE SUSTAVE

Laboratorij za inteligentne transportne sustave

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DIVISION OF ITS AND LOGISTICS

DEPARTMENT OF INTELLIGENT TRANSPORT SYSTEMS

Intelligent Transportation Systems Laboratory

Head
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Naziv opreme / Equipment name

Komplet za robotiku Mindstorms
Robotic system kit Mindstorms

Proizvođač / Manufacturer

LEGO Group, Billund, Denmark

Namjena i opis / Purpose and description

Komplet za robotiku služi za izgradnju fizičkih modela inteligentnih transportnih sustava kao što su samovozeći prometni sustavi za potporu vozaču i mobilni roboti. Sastoji se od sklopovskih i programskih komponenata za izgradnju, vođenje i upravljanje sustavima.
Tehničke specifikacije:

- 32-bitni ARM7 mikrokontroler
- osjetila dodira, svjetla, zvuka i udaljenosti
- servo motori
- konstruktivni elementi

The robotics kit is used for construction of physical models of intelligent transport systems such as self-propelled transport systems for driver support and mobile robots. It consists of hardware and software components for the construction, operation and management of systems.
Technical specifications:

- 32-bit ARM7 microcontroller
- sensors: touch, light, sound and distance
- servo motors
- constructive elements

Naziv opreme / Equipment name

GPS prijamnik GPS 10
GPS receiver GPS 10

Proizvođač / Manufacturer

GARMIN, Olathe, Kansas, USA

Namjena i opis / Purpose and description

Bluetooth GPS prijamnik tvrtke Garmin koristi se za praćenje i bilježenje GPS tragova prilikom modeliranja prometnih tokova i izrade simulacijskih modela. Omogućena je pohrana GPS podataka u internu memoriju, a visoka razlučivost podataka omogućuje točne i ažurne podatke o kretanju.
Tehničke specifikacije:

- dimenzije: 45 x 88 x 19 mm
- masa: 80 g
- napajanje: 900 mAH
- osjetljivost GPS senzora: -165 dBW
- protokol: NMEA 0183 V2.0

Bluetooth receiver made by Garmin is used for GPS data tracking and recording in trafic flow modelling and creation of simulation models. Storage of GPS data into internal memory is enabled and high resolution data enables accurate and precise traffic data.
Technical specifications:

- dimensions: 45 x 88 x 19 mm
- weight: 80 g
- battery: 900 mAH
- GPS sensor sensitivity: -165 dBW
- protocol: NMEA 0183 v2.0

Naziv opreme / Equipment name

Dlanovnik iPAQ hx2750
Pocket PC iPAQ hx2750

Proizvođač / Manufacturer

Hawlett-Packard, Palo Alto, California, USA

Namjena i opis / Purpose and description

Dlanovnik HP iPAQ hx2750 koristi se za uparivanje perifernih jedinica (GPS, Bluetooth senzori, itd.) potrebnih za prikupljanje prometnih podataka (vanjska SD/MMC memorija). Uređaj je autonoman, te je baziran na Windows Mobile operacijskom sustavu što omogućuje lakšu povezivost sa perifernim jedinicama.
Tehničke specifikacije:

- procesor: Intel PXA270, 624 MHz
- memorija: 128 MB interne memorije
- proširenje memorije: SD/MMC utor, do 1 GB
- ekran: 3.5 inčni u boji

HP iPAQ hx2750 pocket PC is used for pairing peripheral devices (ie. GPS receiver, Bluetooth sensors, etc.), needed for traffic data storage (external SD/MMC storage card). Device is autonomous and is based on Windows Mobile operating system which enables easy connectivity with peripheral units.
Technical specifications:

- processor: Intel PXA270, 624 MHz
- memory: 128 MB internal memory
- memory expansion: SD/MMC slot, up to 1 GB
- display: 3.5 inch color display

Naziv opreme / Equipment name

Uređaj za praćenje pokreta Kinect
Motion sensing device Kinect

Proizvođač / Manufacturer

Microsoft, Redmond, Washington, USA

Namjena i opis / Purpose and description

Kinect je uređaj za beskontaktno praćenje objekata, pokreta i zvuka iz više izvora.
Tehničke specifikacije:

- kolor kamera
- infracrveni izvor
- infracrveno osjetilo dubine
- sustav za okretanje uređaja
- polje mikrofona

A Kinect is a device for remote sensing and tracking of objects, movements and sound from several sources.
Technical specifications:

- color camera
- IR Emitter
- IR Depth Sensor
- tilt motor
- microphone array

Naziv opreme / Equipment name

Sučelje za komunikaciju čovjeka s računalom korištenjem električnih aktivnosti mozga EPOC
Neuroheadset EPOC

Proizvođač / Manufacturer

Emotiv Systems, San Francisco, California, USA

Namjena i opis / Purpose and description

EPOC je uređaj za komunikaciju čovjeka s računalom. EPOC koristi senzore za pretvaranje električnog signala produciranog od strane mozga za detekciju ljudskih misli i osjećaja u stvarnom vremenu.
Sadržaj paketa:

- uređaj za detekciju moždanih signala sa ugrađenom punjivom baterijom
- punjač za bateriju
- USB primopredajnik
- komplet od 16 elektroda
- fizikalna otopina
- EPOC SDKLite programski paket

The Emotiv EPOC is the brain computer interface device. The EPOC uses sensors to translate electrical signals produced by the brain to detect user thoughts, feelings, and expressions in real time.
Package Contents:

- headset assembly with rechargeable lithium battery
- battery charger
- USB transceiver dongle
- sensor pack with 16 sensor units
- saline solution
- EPOC SDKLite software

Naziv opreme / Equipment name

Komplet mikrokontrolera s osjetilima
Arduino starter kit

Proizvođač / Manufacturer

Arduino, China

Namjena i opis / Purpose and description

Arduino je mikrokontroler za prikupljanje i obradu podataka te upravljanje vanjskim uređajima.
Osnovne karakteristike Arduino početnog kompleta Uno R3:

- mikrokontorler: ATmega328
- flash memorija: 32 KB
- radni takt: 16 MHz
- digitalni I/O: 14 (od toga 6 PWM)
- analogni I/O: 6

Senzori:

- Adafruit Ultimate GPS (66 kanala w/10 Hz)
- čitač MicroSD kartica
- AltIMU-10 žiroskop, akcelerometar, kompas, barometar (L3GD20, LSM303DLHC, LPS331AP

Arduino is a microcontroller for data acquisition, processing and control of peripheral devices.
Basis of Arduino starter kit is Arduino Uno R3 microcontroler.

Basic characteristics:

- microcontroller: ATmega328
- flash memory: 32 KB
- clock speed: 16 MHz
- digital I/O: 14 (of which 6 provide PWM output)
- analog I/O: 6

Sensors:

- Adafruit Ultimate GPS (66 channel w/10 Hz updates)
- MicroSD card breakout board
- AltIMU-10 gyro, accelerometer, compass, altimeter (L3GD20, LSM303DLHC, LPS331AP Carrier)

Naziv opreme / Equipment name

Komplet mikrokontrolera
Raspberry Pi, starter pack

Proizvođač / Manufacturer

Raspberry Pi Foundation (Element 14, Premier Farnell, RS Components), Caldecote, Cambridgeshire, UK

Namjena i opis / Purpose and description

Starter kit Raspberry Pi sastoji se od: mikro-kontrolera, SD memorijske kartice i LCD modula. Raspberry Pi je računalo opće namjene veličine kreditne kartice. Prvenstveno se koristi u obrazovanju i projektima samogradnje.

Osnovne karakteristike Raspberry Pi mikro-kontrolera:

- mikro-kontorler: Raspberry Pi Model B
- procesor: ARM1176JZF-S
- GPU: Broadcom VideoCore IV @ 250 MHz
- memorija: 512 KB
- radni takt: 700 MHz
- I/O: USB 2.0
- video izlaz: RCA (PAL / NTSC), HDMI (rev 1.3 & 1.4)
- video rezolucija: HDMI (640 x 350 - 1920 x 1200)

Kit:

- 4GB - Raspberry-Pi / PROG-4GB-SDCard
- blue & white 16X2 LCD + Keypad Kit

Starter kit Raspberry Pi has: micro-controller, SD memory card and LCD module. Raspberry Pi is general purpose credit-card-sized single-board computer. It is mainly use for education and DIY projects.
Main characteristic of Raspberry Pi micro-controller:

- micro-controller: Raspberry Pi Model B
- processor: ARM1176JZF-S
- GPU: Broadcom VideoCore IV @ 250 MHz
- memory: 512 KB
- clock: 700 MHz
- I/O: USB 2.0
- video output: RCA (PAL / NTSC), HDMI (rev 1.3 & 1.4)
- video resolution: HDMI (640 x 350 – 1920 x 1200)

Kit:

- 4GB - Raspberry-Pi / PROG-4GB-SDCard
- blue & white 16X2 LCD + Keypad Kit

Naziv opreme / Equipment name

Digitalni multimetar UT151
Digital multimeter UT151

Proizvođač / Manufacturer

UNI-T, Kwun Tong, Kowloon, Hong Kong

Namjena i opis / Purpose and description

Multimetar UT151 namijenjen je za mjerenje osnovnih električnih veličina kao što su napon (AC/DC), jakost električne struje (AC/DC), otpor kao i za provjeru dioda, mjerenje kapaciteta kondenzatora, frekvencije te strujnog pojačanja NPN i PNP tranzistora.

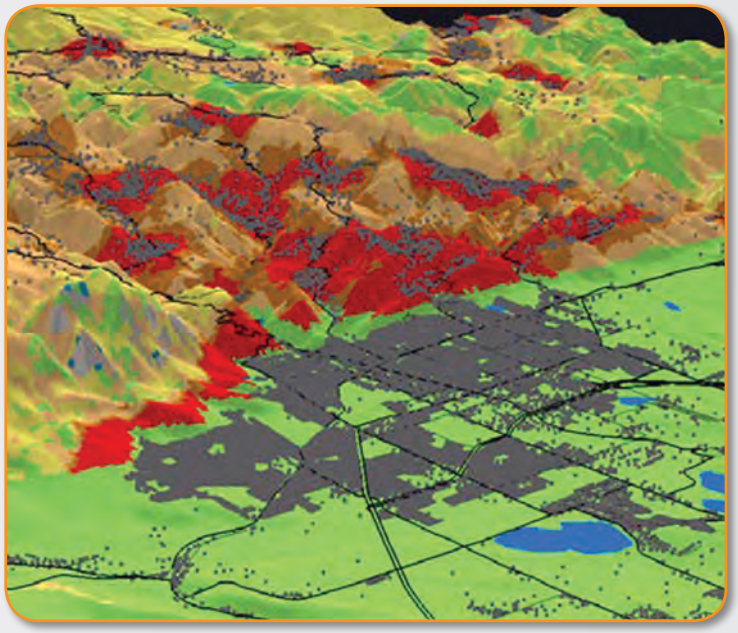
Multimeter UT151 is used for measuring basic electrical units such as voltage (AC/DC), current (AC/DC) and resistance, and for testing diodes, measuring condenser capacity, frequency and electrical amplification of NPN and PNP transistors.

Naziv opreme / Equipment name

Program za izradu geografskog informacijskog sustava ArcGIS
Gographic information system software ArcGIS

Proizvođač / Manufacturer

Environmental Systems Research Institute (ESRI), Redlands, California, USA



Namjena i opis / Purpose and description

Alat ArcGIS, tvrtke ESRI, je geografski informacijski sustav (GIS) namjenjen radu s digitalnim kartama i geografskim informacijama. Koristi se za izradu i praktičnu primjenu digitalnih karata, združivanje geografskih podataka, analizu mapiranih podataka, dijeljenje i pronalaženje geografski referenciranih podataka, primjenu digitalnih karata i geografskih informacija za široki raspon aplikacija i upravljanje geografskim podatcima u sklopu baze podataka. Sustav osigurava osnovu za izradu karte geografskih informacija dostupnih cijeloj organizaciji, okruženju ili putem weba.
Fakultet posjeduje dvije ekstenzije osnovnog alata, ArcGIS Network Analyst i ArcGIS Spatial Analyst.

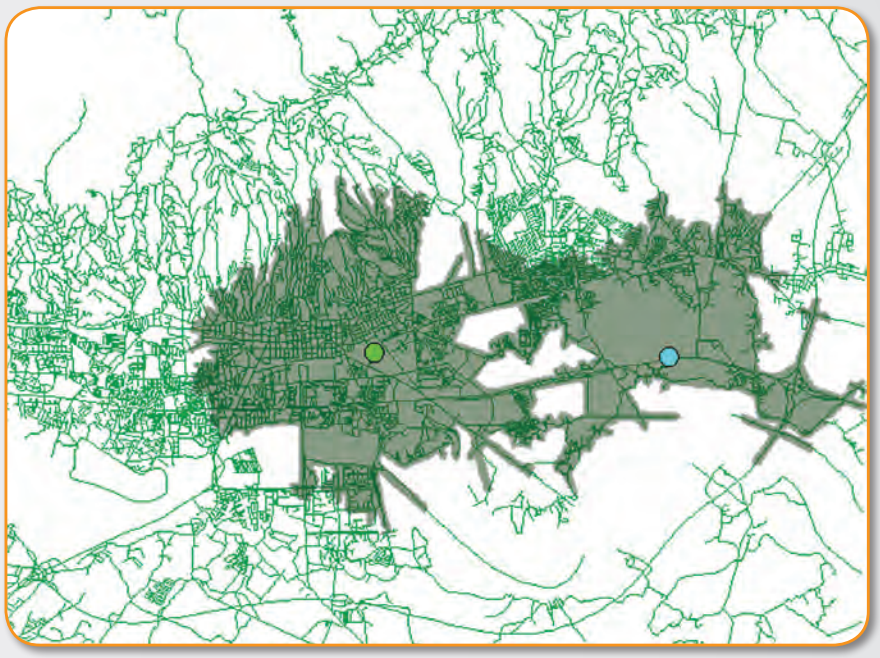
Esri's ArcGIS is a geographic information system (GIS) used for working with maps and geographic information. It is used for: creating and using maps, compiling geographic data, analyzing mapped information, sharing and discovering geographic information, using maps and geographic information in a range of applications, and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web.
Faculty owns two additional extensions of basic tool: ArcGIS Network Analyst and ArcGIS Spatial Analyst.

Naziv opreme / Equipment name

Programski alati za modeliranje i analizu prostornih podataka ArcGIS Spatial Analyst
Spatial modeling and analysis software tools ArcGIS Spatial Analyst

Proizvođač / Manufacturer

Environmental Systems Research Institute (ESRI), Redlands, California, USA



Namjena i opis / Purpose and description

ArcGIS Spatial Analyst pruža niz alata za prostorno modeliranje i analizu.
Korištenjem programa ArcGIS Spatial Analyst može se: kreirati, propitivati, mapirati i analizirati rasterske podatke, provoditi integrirana raster / vektor analiza, izlučiti nove informacije iz postojećih podataka, propitivati podatke u više slojeva podataka i potpuno integrirati rasterske podatke s vektorskim izvorima podataka.

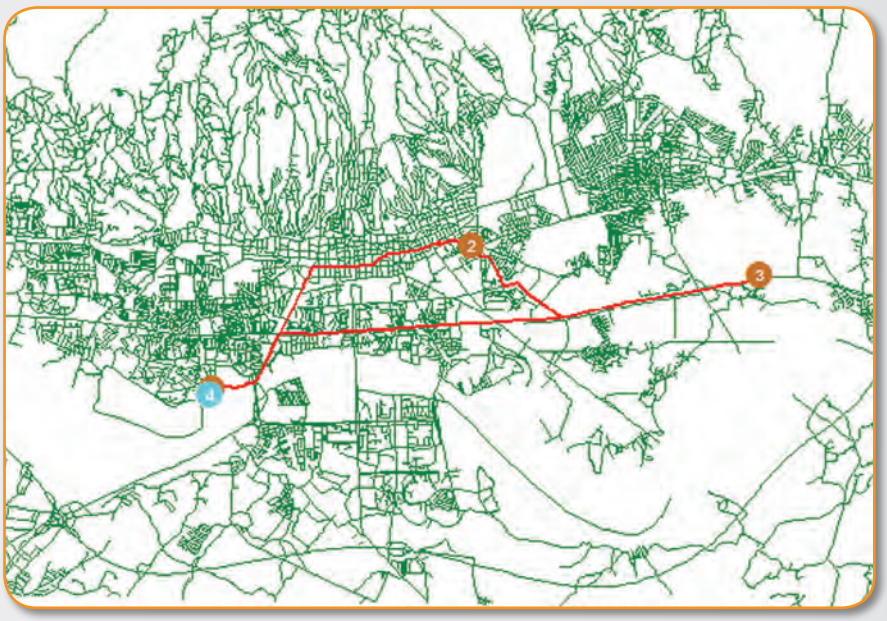
ArcGIS Spatial Analyst provides a range of spatial modeling and analysis tools.
Using ArcGIS Spatial Analyst, we can: create, query, map, and analyze raster data, perform integrated raster/vector analysis, derive new information from existing data, query information across multiple data layers and fully integrate raster data with vector data sources.

Naziv opreme / Equipment name

Program za prostornu analizu mrežnih podataka ArcGIS Network Analyst
Network based spatial analysis software ArcGIS Network Analyst

Proizvođač / Manufacturer

Environmental Systems Research Institute (ESRI), Redlands, California, USA



Namjena i opis / Purpose and description

ESRI ArcGIS Network Analyst je programski alat koji omogućuje prostornu analizu prometne mreže, kao što je usmjeravanje vozila ili flote, usmjeravanje putovanja, pronalaženje najbližih objekata, definiranje područja posluživanja i rješavanje problema lokacije i alokacije.
Korištenjem ArcGIS Network Analysta mogu se dinamički modelirati realni uvjeti na mreži, uključujući jednosmjerne ulice, ograničenja kretanja, ograničenja brzine i promjenjive brzine vožnje temeljem prometnog opterećenja.

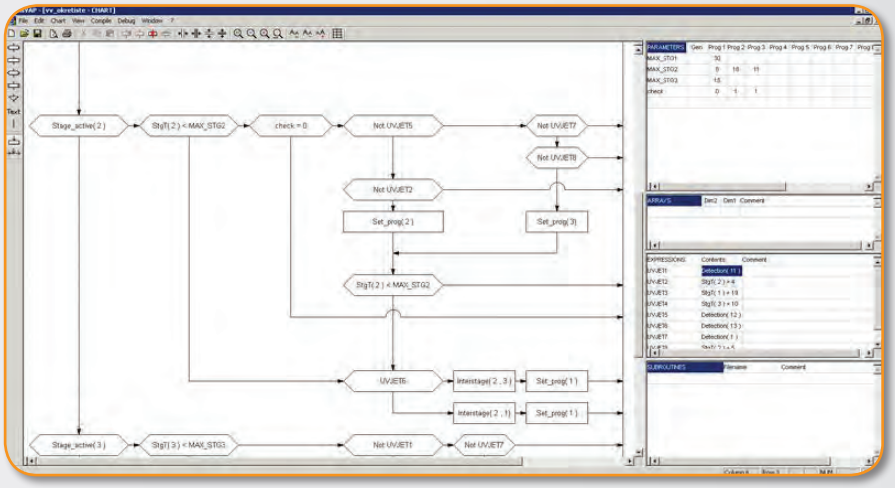
ArcGIS Network Analyst provides network-based spatial analysis, such as routing, fleet routing, travel directions, closest facility, service area, and location-allocation analysis.
ArcGIS Network Analyst makes it possible to dynamically model realistic network conditions, including one-way streets, turn and height restrictions, speed limits, and variable travel speeds based on traffic.

Naziv opreme / Equipment name

Program za modeliranje vozilom aktiviranog upravljanja semaforiziranim raskrižjem VisVAP
Vehicle Actuated Programming Software VisVAP

Proizvođač / Manufacturer

PTV Group, Karlsruhe, Germany



Namjena i opis / Purpose and description

PTV VisVAP je dodatni modul programskog alata za modeliranje i simulaciju u prometu PTV VISSIM, koji pruža mogućnost programiranja i izrade programske logike primjenom objektno orijentiranog pristupa. Koristi se za izradu algoritama adaptivnog upravljanja semaforiziranih raskrižja, shvaćanja logike rada semaforskih uređaja i adaptivnih mogućnosti upravljanja semaforiziranim rasrkižjima.

PTV VisVAP is an additional module for the PTV VISSIM micromodelling and simulation software which enables programming of signal logic via object oriented approach.
It is used for definition and development of adaptive signal control algorithms, as a tool for comprehending working logic of signal control devices and adaptive traffic control on intersections.

Naziv opreme / Equipment name

Program za optimizaciju ruta dostavnih vozila OPTiRUT
Software for delivery vehicle route optimisation OPTiRUT

Proizvođač / Manufacturer

Fakultet prometnih znanosti / autor mr. sc. Ante Galić
Faculty of Transport and Traffic Sciences / author Ante Galić, M.Sc.

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DIVISION OF ITS AND LOGISTICS

Namjena i opis / Purpose and description

OPTiRUT je programsko rješenje za optimizaciju ruta dostavnih vozila. Na temelju podataka o narudžbama i raspoloživim vozilima koji se preuzimaju iz baze poslovnih podataka, heuristički i metaheuristički optimizacijski algoritmi izračunavaju rute dostavnih vozila s ciljem smanjenja transportnih troškova. Izračunate rute se povratno pohranjuju u bazu poslovnih podataka što omogućuje ispis tovarnih listova za skladište i radnih naloga vozača. Stvarne prometne veličine (vrijeme putovanja, cestovna udaljenost) izračunavaju se pomoću GIS modula i zemljovida Republike Hrvatske ustupljenog od tvrtke Mireo d.d. za potrebe projekta. Aplikacija je izrađena u sklopu projekta za potrebe tvrtke Orbico d.o.o. iz Zagreba.

OPTiRUT is a software solution for delivery vehicle route optimisation. On the basis of order and available vehicle data found in business databases, heuristic and metaheuristic optimisation algorithms calculate delivery vehicle routes in order to reduce transport expenses. Calculated routes are stores in the business database which allows printing of storage waybills and drivers' work orders. Actual traffic measures (travel time, road distance) are calculated using GIS modules and maps of Croatia provided by Mireo Inc. for the project. The application was made as a part of the project for the company Orbico Ltd. from Zagreb.

Naziv opreme / Equipment name

Zaštitno kućište za kameru H-606
External case for camera H-606

Proizvođač / Manufacturer

VOOK, New York, USA

Namjena i opis / Purpose and description

Zaštitno kućište za kameru se koristi za zaštitu kamere od atmosferkih i drugih utjecaja prilikom terenskog snimanja sa stupa. Kućište podržava daljinsko upravljanje kuta i smjera snimanja kamere, te njezinog spajanja na računalo radi stvarnovremenog prikaza prometne scene.
Tehničke specifikacije:

- aluminijsko kućište
- dimenzije: 410 x 118 x 107 mm
- masa: 1,8 kg

External case is used for protection of surveillance cameras from atmospheric influences during recording of traffic from telescopic post. Remote control of case position and angle is supported. Several types of video cameras can be mounted for video imaging of traffic flow.
Technical specifications:

- aluminum casing
- dimensions: 410 x 118 x 107 mm
- weight: 1.8 kg

Naziv opreme / Equipment name

Stup za kameru
Telescopic post

Proizvođač / Manufacturer

Ručna izrada
Handmade

Namjena i opis / Purpose and description

Teleskopski stup prilagođen je za montažu na vozilo (kombi vozilo Fakulteta) na koje se montira nosač kamere i sama kamera radi snimanja prometnih tokova.
Tehničke specifikacije:

- aluminijsko kućište
- visina: do 7 m

Telescopic post is adjusted for mounting on vehicle (Faculty's minivan). External case with video camera can be mounted on top of it for video analysis of traffic flows.
Technical specifications:

- aluminum casing
- height: up to 7 m

Naziv opreme / Equipment name

Radar za mjerenje brzine s pokazivačem BT2258
Radar LED Display BT2258

Proizvođač / Manufacturer

Sierzega, Thening, Austria

Namjena i opis / Purpose and description

Radar/LED ploča omogućuje prikaz trenutne brzine nadolazećeg vozila. Moguća je montaža uz prometnicu prvenstveno radi prikupljanja podataka o brzini vozila na određenom segmentu prometnice.
Tehničke specifikacije:

- dimenzije: 960 x 630 mm
- visina brojki: 307 mm
- pohrana podataka: Bluetooth sučelje
- aluminijsko kućište

Radar LED display enables measurement and display of current vehicle speeds. It can be mounted alongside roads and current speeds can be displayed in real time.
Technical specifications:

- dimensions: 960 x 630 mm
- height of numbers: 307 mm
- data storage: Bluetooth interface
- aluminum casing

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ODSJEK AERONAUTIKA

ZAVOD ZA AERONAUTIKU

Laboratorij za aerodinamiku

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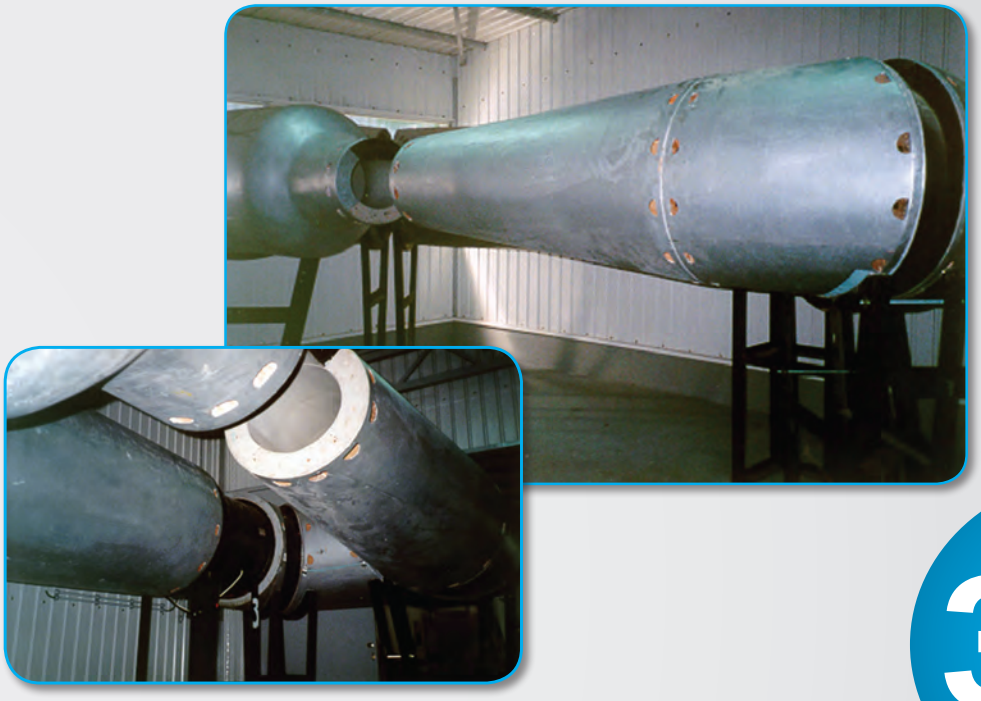
Naziv opreme / Equipment name

Podzvučni aerotunel
Subsonic windtunnel

Proizvođač / Manufacturer

Ručni rad
Handmade



Namjena i opis / Purpose and description

Podzvučni aerotunel namijenjen je za istraživanje temeljnih zakona strujanja podzvučnog (nestlačivog) fluida. Aerodinamički tunel Laboratorija za aerodinamiku je zatvoreni tip tunela izrađen od iverice s dvostrukim stjenkama između kojih su postavljena rebra.
Glavni dijelovi tunela su: test-sekcija, konvergentna mlaznica, umirivačka sekcija, difuzor, ventilator, motor, usmjerivači zraka te povratni vod.
Tunel je kružnog poprečnog presjeka, osim radne sekcije, izlaznog dijela mlaznice i ulaza u prvi difuzor koji su eliptični. Radna sekcija otvorena je sa bočnih strana.
Dimenzije radne sekcije su 0,352 x 0,310 m, duljine 0,450 m.
Ukupna snaga potrebna za pogon tunela, odnosno prirast tlaka izražava se kroz mjeru djelotvornosti tunela, ER i zavisi od brzine strujanja zraka. Pogonska sekcija (asinkroni motor i ventilator) nalazi se u metalnom kućištu postavljenom na zasebnom nosaču. Motor ima upravljanje frekvencijom tako da je frekvencija nezavisni parametar za koji se određuju ostale veličine. Maksimalna frekvencija motora je 50 Hz, snaga motora je 4 kW, a brzina vrtnje 2900 okr/min.

Subsonic wind tunnel is used for study of the fundamental laws of subsonic, incompressible fluid flow. Wind tunnel at the Aerodynamics Laboratory is a closed type tunnel made of plywood with a double-wall and ribs between them.

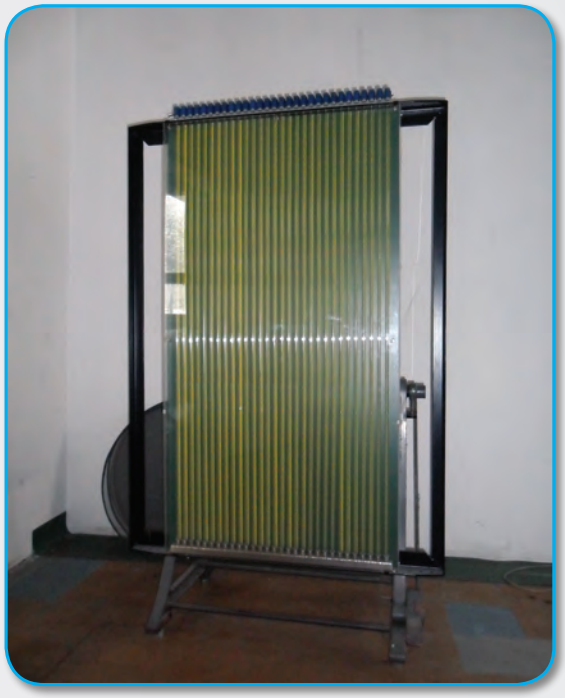
The main parts of the tunnel are: test-section, contraction secton, flow straighteners, diffuser, fan, drive motor, and turning vanes.
The tunnel has a circular cross-section, except for the test-section, nozzle output and entrance to the first diffuser that are elliptical. Test-section is open on the sides. Dimensions of the test-section are 0,352 x 0,310 m, 0,450 m length.
The total power required for the operation of the tunnel, or increase pressure expressed through measure the effectiveness of the tunnel, ER and depends on airspeed. Drive section (asynchronous motor and fan) is located in a metal casing mounted on a separate carrier. The engine is controled by frequency so that the frequency is independent variable that determines all other variables. Maximum motor frequency is 50 Hz, power is 4 kW, a speed 2900 RPM .

Naziv opreme / Equipment name

Piezometarska harfa
Multilevel piezometer

Proizvođač / Manufacturer

Ručni rad
Handmade



Namjena i opis / Purpose and description

Oprema je namijenjena za mjerenje relativnog tlaka. Harfa ima spremnik za tekućinu i 30 prozirnih cjevčica koje se pneumatskim cijevima spajaju na mjerna mjesta. Jedna cjevčica služi za mjerenje referentnog tlaka, a ostalih 29 za mjerenje lokalnih tlakova. Pored svake cjevčice nalazi se mjerilo na kojem se očitava visina nivoa tekućine. Razlika lokalnog i referentnog tlaka (izražena razlikom nivoa tekućine) predstavlja relativni (diferencijalni) tlak. Harfa ima mogućnost naginjanja čime se može povećati razlučivost očitanja. Mjerni opseg: cca ± 5000 Pa.

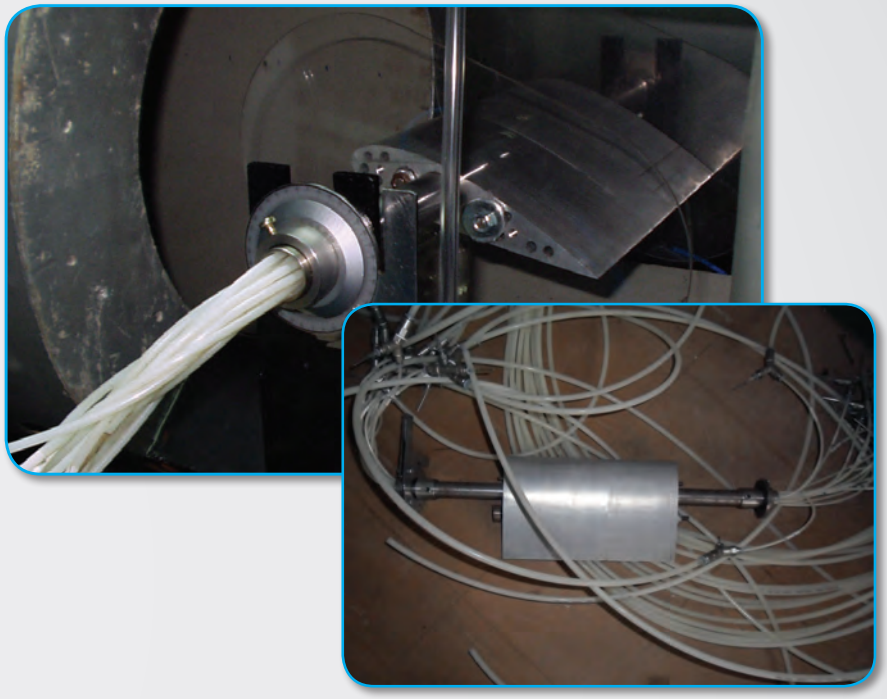
Multilevel piezometer is used for relative pressure measurements. It has a fluid reservoir and 30 transparent tubes are connecting pressure measurement points. One tube is used to measure the reference pressure, and the remaining 29 for the measurement of local pressures. In each tube there is a scale on which the height of the liquid level is read. Difference between local and reference pressure (expressed in different fluid levels) is a relative (differential) pressure. Multilevel piezometer can be tilted to increase the reading resolution. Measuring range: approximately ± 5000 Pa.

Naziv opreme / Equipment name

Model aeroprofila NACA 2421 s otvorima za mjerenje tlaka
NACA 2421 airfoil model with pressure taps

Proizvođač / Manufacturer

Ručni rad
Handmade



Namjena i opis / Purpose and description

Model aeroprofila NACA 2421 duljine tetive: c = 0,15 m, metal. Aeroprofil ima otvor na prednjem bridu te po 14 otvora na gornjaci i donjaci koji služe za osjećanje tlaka. Otvori se pneumatskim cijevima povezuju s piezometarskom harfom.

- određivanje raspodjele tlaka oko aeroprofila pri različitim napadnim kutovima i brzinama slobodne struje zraka;
- prikaz raspodjele tlaka oko aeroprofila iznad kritičnog napadnog kuta (uvjeti sloma uzgona, *stall*)

NACA 2421 airfoil model chord length: c = 0.15 m, metalic. Airfoil has an opening at the front edge and 14 pressure taps at upper surface and lower surface. Pressure taps are connected with pneumatic tubes to the multilevel piezometer.

- determination of pressure distribution around the airfoil at various angles of attack and available air-flow speeds;
- display of pressure distribution around the airfoil above the critical angle of attack (stall conditions).

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ODSJEK AERONAUTIKA

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Asst.Prof. Biljana Juričić, Ph.D.
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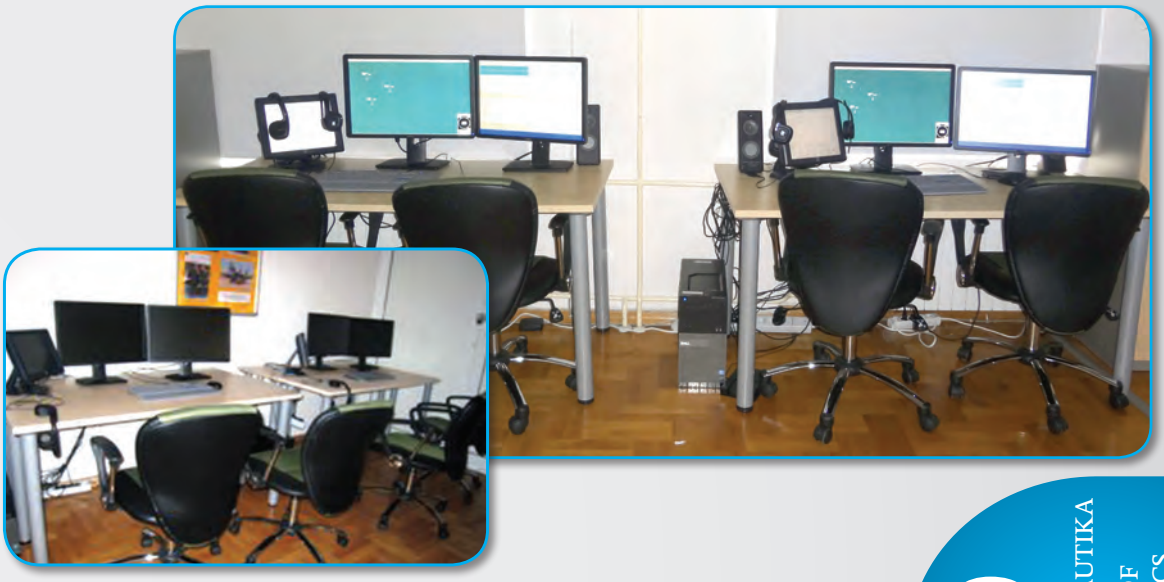
Naziv opreme / Equipment name

Simulator za radarsku kontrolu zračnog prometa
Air traffic control radar simulator
(MICRONAV BEST RADAR SIMULATOR)

Proizvođač / Manufacturer

Micro Nav Ltd., Bournemouth, UK



Namjena i opis / Purpose and description

Simulator za radarsku kontrolu zračnog prometa je simulator utemeljen na osobnom računalu. Koristi se za simulaciju kontrole zračnog prometa. Sastoji se od hardverske opreme i aplikacije. Hardver čine 2 radne pozicije za kontrolora zračnog prometa (2 PC-a s ostalom pripadajućom opremom), 2 radne pozicije za pseudo-pilote od kojih jedna služi i kao pozicija upravitelja sustava (2 PC-a s ostalom pripadajućom opremom) i 1 rezervna radna stanica (1 PC s ostalom pripadajućom opremom). BEST simulator ima nastavnu i znanstveno-istraživačku namjenu. Koristi se u nastavi na preddiplomskom studiju aeronautike te prilikom organiziranja osposobljavanja kroz cjeloživotno učenje. Simulator omogućava kreiranje zračnog prostora, vježbi oblasne i prilazne radarske kontrole zračnog prometa te meteoroloških podataka. Studenti kontrolori imaju nadležnost nad definiranim prostorom, a na elektroničkom obrascu za praćenje napredovanja leta zrakoplova upisuju sve promjene i odobrenja koja su izdali pilotima. Pseudo-piloti simuliraju kretanje zrakoplova u prostoru svojim naredbama. Komunikacija između kontrolora i pilota je govorna radio-telefonska komunikacija. Vježbe se izvode uz nadzor ovlaštenih instruktora kontrole zračnog prometa. Znanstvena istraživanja koja se provode na simulatoru vezana su uz proces osposobljavanja kontrolora zračnog prometa (izračun i analiza radnih zadaća i ukupnog radnog opterećenja kontrolora, primjena u provođenju radio-telefonske komunikacije i istraživanju pojavnosti pogrešaka, analiza nepredviđenih situacija u zračnom prometu i dr.) te analizu i uvođenje tehnoloških rješenja u sustavu kontrole zračnog prometa i upravljanju zračnim prometom (izrada i implementacija novih ruta za planiranje prometa, reorganizacija zračnog prostora, sektorizacija, studije sigurnosti i dr.).
Fakultet prometnih znanosti posjeduje trajnu licencu za korištenje simulatora.

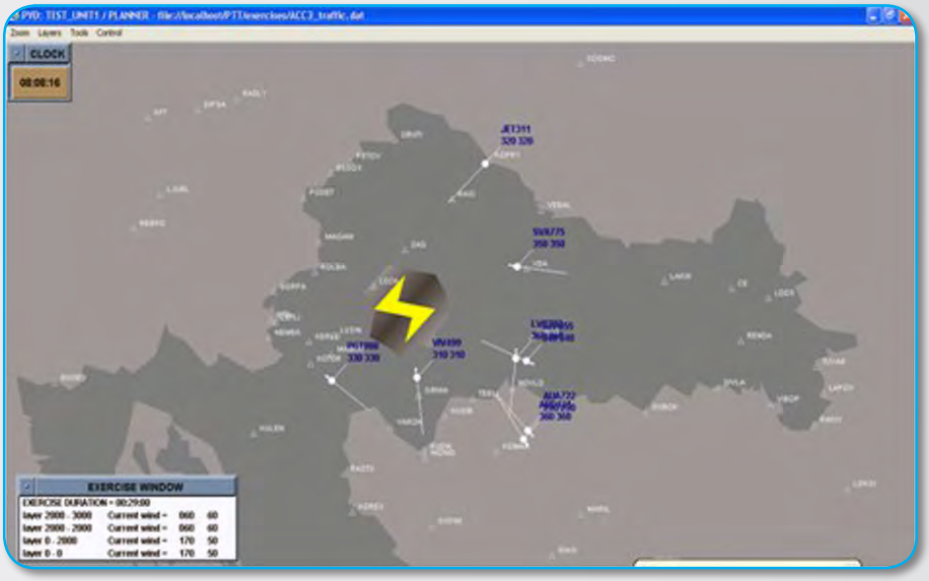
BEST radar simulator is a PC-based simulator. It is used for simulation of air traffic control service. It contains: 2 air traffic controller (ATCO) working positions (2 PCs with ancillary equipment), 2 pseudo-pilot working positions (2 PCs with ancillary equipment) and licensed application. One of these positions is used as system manager working position. Best simulator also gains 1 spare working position (1 PCs with ancillary equipment). BEST simulator is used for air traffic controller training and for scientific research. Simulator is used within the program of undergraduate study of aeronautics, module air traffic control (ATC) and within the modular basic ATC training courses. It enables creation of airspace, exercises of area and approach control services and meteorological data. ATC students are authorized to provide air traffic services (ATS) within the airspace of its jurisdiction. They use specially designed electronic flight strips to note all clearances and instructions given to aircraft. Pseudo-pilots simulate movement of aircraft in the air. Air traffic controllers and pseudo-pilots communicate via radiotelephony communication. Communication system is a part of the simulator. Exercises are conducted under the supervision of certified air traffic control instructors. Scientific research is provided within the field of air traffic controller training (determination and analysis of air traffic controller tasks and workload, analysis of errors occurrence in radio-telephony communication, contingency analysis etc.). Simulator is also used for analysis and implementation of new technological solution within the fields of air traffic management (ATM) and air traffic control (ATS route design and implementation, airspace reorganization, sectorization analysis, safety studies etc.).
Software is licensed according to the agreement with Micronav ltd.
Faculty of Transport and Traffic Sciences owns permanent license for BEST simulator.

Naziv opreme / Equipment name

Radarski trenažer
Radar Skills Trainer (RST)

Proizvođač / Manufacturer

EUROCONTROL, IANS, Luxembourg



Namjena i opis / Purpose and description

RST radarski trenažer je simulator utemeljen na osobnom računalu. Korištenje u nastavi na preddiplomskom studiju aeronautike te prilikom organiziranja osposobljavanja kroz cjeloživotno učenje. Program omogućuje samostalno kreiranje vježbi za uvježbavanje osnovnih funkcija radarskog vektoriranja te ostalih radarskih funkcija oblasne i prilazne kontrole zračnog prometa. Ne omogućava potpunu simulaciju kontrole zračnog prometa jer ne uključuje simulaciju direktne radio-telefonske komunikacije između pseudo-pilota i kontrololora. Provodi se uz nadzor ovlaštenih nastavnika.
Napomena: zahtijeva LAN mrežu i server, u slučaju korištenja zahtjevnijih modova rada programa (Distributed stand-alone i Full CMS).

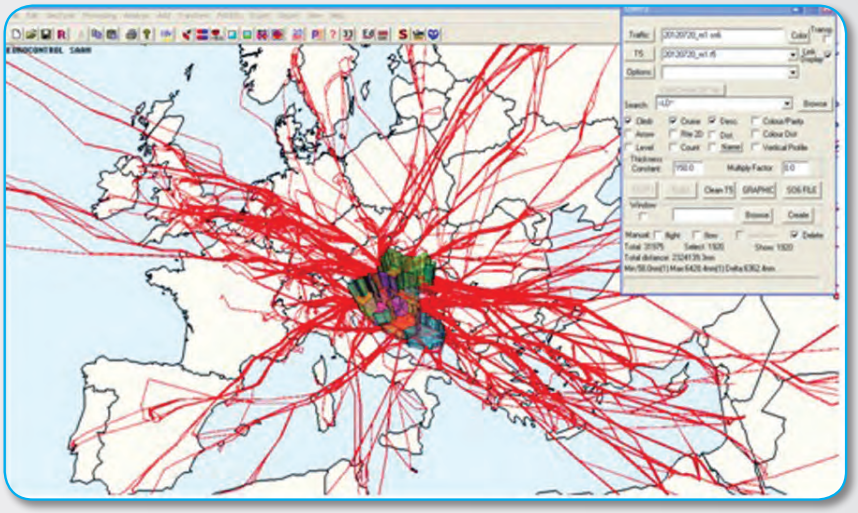
RST is a PC-based simulator. Simulator is used within the program of undergraduate study of aeronautics, module ATC and within the modular basic ATCO training courses. It enables creation of airspace, exercises of area and approach control services. It is used for practicing basic radar vectoring and basic radar functions for both area and approach control. It cannot simulate complete air traffic control service since it doesn't involve simulation of radiotelephony communication between pseudo-pilots and controllers. Students perform exercises under the supervision of certified tutors.
Note: requires a LAN network and server when using more demanding modes (Distributed stand-alone and Full CMS).

Naziv opreme / Equipment name

Program za modeliranje i simulaciju zračnog prostora
System for traffic Assignment and Analysis at a Macroscopic level (SAAM)

Proizvođač / Manufacturer

EUROCONTROL, Brussels, Belgium



Namjena i opis / Purpose and description

Program se koristi u nastavi na preddiplomskom i diplomskom studiju aeronautike te prilikom organiziranja osposobljavanja kroz cjeloživotno učenje. Omogućuje analizu i istraživanje prometnog opterećenja na rutama, segmentima ruta, na aerodromima te na strukturi zračnog prostora s mogućnošću izrade različitih scenarija. Omogućava vizualizaciju i animaciju 3D prometa kroz neki prostor. Omogućava filtriranje prometa za zadane uvjete putem funkcije Query. Koristi se za usporedbu duljine ruta te izračun prijeđenih NM, ušteda na gorivu i onečišćenju okoliša. Funkcija Traffic Assignement omogućava izrade scenarija s izmjenjenim karakteristikama prostora ili mreže ruta. Nadogradnja programa i ulazni podaci uzimaju se sa servera EUROCONTROL-a (DDR). Program se koristi u suradnji sa Hrvatskom kontrolom zračne plovidbe d.o.o.
Napomena: zahtijeva LAN mrežu i server.

Program is used within the program of undergraduate study of aeronautics, module ATC and within the modular basic air traffic controller (ATCO) training courses. It enables research and analysis of traffic load on ATS routes, route segments, significant points, aerodromes and airspace structure with different scenarios. Visual presentation and animations of 3D traffic through certain airspace can be provided.
It allows filtering of traffic according to the conditions set by the query function. It is used to compare ATS route distances, shortest route calculation in nautical miles, savings on fuel and environmental pollution. Function Traffic Assignment enables different scenario analysis with different airspace and network settings. Upgrading the program and input data are taken from the EUROCONTROL server (DDR). The program is used in cooperation with the Croatia Control Ltd.
Note: Requires LAN and server.

3

ODSJEK AERONAUTIKA

ZAVOD ZA AERONAUTIKU

Laboratorij za simulaciju letenja

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DIVISION OF AERONAUTICS

DEPARTMENT OF AERONAUTICS

Flight Simulation Laboratory

Head
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Naziv opreme / Equipment name

Simulator leta BT-220
Flight Synthetic Training Device BT-220

Proizvođač / Manufacturer

BT Simulation, Graz, Austria

Namjena i opis / Purpose and description

Istraživanje ponašanja zrakoplova i opreme aviona Piper Seneca III u letu.
Flight Synthetic Training Device – simulator leta BT-220 je kategoriziran i certificiran kao FNPT II (Flight Navigation Procedure Trainer, nivo II) od strane Hrvatske agencije za civilno zrakoplovstvo (CCAA). Koristi se za simuliranje letenja i ponašanja generičkog dvomotornog klipnog zrakoplova, a temeljen je na performansama stvarnog aviona Piper Seneca III. Pored navedenog, moguće je simulirati i sve operativne procedure i navigacijske postupke u letenju.
Simulator se sastoji od makete pilotske kabine zrakoplova Piper Seneca III sa svim uređajima i komandama za dva pilota, instruktorske stanice za kontrolu leta sa mogućnošću simulacija otkaza i kvarova zrakoplova i opreme, promjene meteoroloških uvjeta itd. te vizualnog ekrana postavljenog ispred makete pilotske kabine.

Research of airframe and equipment flight handling of Piper Seneca III aircraft.
Flight Synthetic Training Device – BT-220 is categorised and certificated as FNPT II (Flight Navigation Procedure Trainer, level II) by the Croatian Civil Aviation Agency (Hrvatske agencije za civilno zrakoplovstvo (CCAA)). It is used to simulate the flight caracteristics and handling of a generic twin-engined piston airplane and is based on the performance of Piper Seneca III. Also, all types of operational and navigational procedures can be simulated.
Simulator is made of cockpit mock-up of a Piper Seneca III aircraft including all flight controls and instruments for two pilots, instructor station with options to simulate failures of systems and equipment, changing weather conditions etc. A visual display is located in front of the cockpit mock-up.

Naziv opreme / Equipment name

Simulator leta BT-222
Flight Synthetic Training Device BT-222

Proizvođač / Manufacturer

BT Simulation, Graz, Austria

Namjena i opis / Purpose and description

Istraživanje ponašanja zrakoplova i opreme aviona Piper Cheyenne II u letu.
Flight Synthetic Training Device – simulator leta BT-222 je kategoriziran i certficiran kao FNPT II MCC (Flight Navigation Procedure Trainer, nivo II Multi Crew Cooperation) od strane Hrvatske agencije za civilno zrakoplovstvo (CCAA). Koristi se za simuliranje letenja i ponašanja generičkog dvomotornog turboprop zrakoplova, a temeljen je na performansama stvarnog aviona Piper Cheyenne II. Pored navedenog, moguće je simulirati i sve operativne procedure i navigacijske postupke u letenju te procedure suradnje višečlane posade (MCC).
Simulator se sastoji od makete pilotske kabine zrakoplova Piper Cheyenne II sa svim uređajima i komandama za dva pilota, instruktorske stanice za kontrolu leta sa mogućnošću simulacija otkaza i kvarova zrakoplova i opreme, promjene meteoroloških uvjeta itd. te vizualnog ekrana postavljenog ispred makete pilotske kabine.

Research of airframe and equipment flight handling of Piper Cheyenne II aircraft.
Flight Synthetic Training Device – BT-222 is categorised and certficated as FNPT II MCC (Flight Navigation Procedure Trainer, level II Multi Crew Cooperation) by the Croatian Civil Aviation Agency (Hrvatske agencije za civilno zrakoplovstvo (CCAA)). It is used to simulate the flight caracteristics and handling of a generic twin-engined turboprop airplane and is based on the performance of Piper Cheyenne II. Also, all types of operational and navigational procedures can be simulated including Multi Crew Cooperation procedures.
Simulator is made of cockpit mock-up of a Piper Cheyenne II aircraft including all flight controls and

instruments for two pilots, instructor station with options to simulate failures of systems and equipment, changing weather conditions etc. A visual display is located in front of the cockpit mock-up.

3

ODSJEK AERONAUTIKA

ZAVOD ZA AERONAUTIKU

Laboratorij za zrakoplovne emisije

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DIVISION OF AERONAUTICS

DEPARTMENT OF AERONAUTICS

Laboratory for Aircraft Emissions

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Naziv opreme / Equipment name

Zvukomjer PCE-322A
Sound Level Meter PCE-322A

Proizvođač / Manufacturer

PCE Instruments, Southampton, United Kingdom

Namjena i opis / Purpose and description

Oprema se koristi za mjerenje razine zvučnog tlaka/intenziteta uz A ili C frekvencijsko ponderiranje te dvije vremenske konstante: brzu (125 ms) i sporu (1s). Moguće je također diskretno snimanje buke frekvencijom uzorkovanja 1-59 Hz i pohranjivanje snimljenih uzoraka u internu memoriju te praćenje i kasnija obrada na računalu.
Oprema uz zvukomjer uključuje:

- DC 9V izvor napajanja
- bateriju
- teleskopski tronožac
- instalacijski CD
- USB kabel
- odvijač
- zaštitnik od vjetra
- uputstva za uporabu
- prijenosnu kutiju

Equipment is used for Sound Pressure Level (SPL) measurement with A or C frequency weighting and two different time constants: fast (125 ms) and slow (1s). Discreet sound recording with sampling frequency of 1-59 Hz, storing recorded samples in the internal memory, monitoring and PC-post processing is also possible.

Equipment also includes:

- DC 9V power supply
- battery
- telescopic tripod
- installation CD
- USB interface cable
- screwdriver
- wind protector
- instruction manual
- carrying case

Naziv opreme / Equipment name

Audiometar Bell Plus HDA280
Audiometer Bell Plus HDA280

Proizvođač / Manufacturer

Inventis Srl, Padova, Italy

Namjena i opis / Purpose and description

Oprema se koristi za određivanje karakteristike zračne i koštane provodljivosti ispitanika u dekadnom području frekvencija i utvrđivanje stupnja traumatskog oštećenja sluha. U internu memoriju moguće je pohraniti do 100 zapisa.
Oprema uz audiometar uključuje:

- slušalice HDA-280
- B71 koštani vibrator
- signalni prekidač pacijenta
- USB kabel
- zaštitne futrole
- DC 6V izvor napajanja
- upute za korištenje (hrv. i engl.)
- instalacijski CD

The equipment is used to determine the characteristics of air and bone conduction of respondents in decade frequency band and determining the degree of traumatic hearing loss. The internal memory can store up to 100 entries.
Equipment also includes:

- Earphones HDA-280
- B71 bone vibrator
- patient signal switch

- USB interface cable
- protective holster
- DC 6V power supply
- instructions for use (Croatian and English)
- installation CD

Naziv opreme / Equipment name

Zvukomjer Nor140
Sound Analyser Nor140

Proizvođač / Manufacturer

Norsonic, Lierskogen, Norway

Namjena i opis / Purpose and description

Oprema se koristi za globalno i profilno mjerenje razine zvučnog tlaka/intenziteta. Moguće je mjeriti, pohranjivati i kasnije analizirati čitav niz akustičkih parametara. Zvukomjer koristi tercne i oktavne filtre te paralelno može mjeriti i računati velik broj parametara s 3 vremenske konstante.
Oprema uz zvukomjer uključuje:

- DC 12V izvor napajanja
- 4 baterije AA
- avionski priključak
- GRAS niskofrekventni mikrofon
- nor1251 akustički kalibrator
- instalacijski CD
- USB kabel
- zaštitnik od vjetra
- uputstva za uporabu
- prijenosnu torbu

The equipment is used for global and profile measurement of sound pressure/intensity level (SPL). It is possible to measure, store and analyze a range of acoustic parameters. Analyser uses octave and one-third octave filters and can parallel measure and count a large number of acoustics parameters with 3 different

time constants.
Equipment also includes:

- DC 12V power supply
- 4 AA batteries
- airplane connector
- low frequency GRAS microphone - nor1251
- acoustic calibrator
- installation CD
- USB interface cable
- wind protector
- instruction manual
- carrying case.

Naziv opreme / Equipment name

Mjerni mikrofon ECM800
Microphone ECM800

Proizvođač / Manufacturer

Behringer, Germany

Namjena i opis / Purpose and description

Oprema se koristi za mjerenje promjene zvučnog tlaka. Moguće je i snimanje u kombinaciji s drugim uređajima.
Oprema uz mikrofon uključuje:

- Klotz priključne kabele (duljine 3 m i 10 m)
- nosač
- zaštitnik od vjetra
- prijenosnu kutiju

Equipment is used to measure the changes in sound pressure. Recording is possible also in combination with other devices.
Equipment with microphone includes:

- Klotz connection cables (3 m and 10 m long)
- swivel stand mount
- wind protector
- carrying case

Naziv opreme / Equipment name

Slušalice SHURE SRH440
Headphones SHURE SRH440

Proizvođač / Manufacturer

Shure Europe, Helibronn, Germany

Namjena i opis / Purpose and description

Visokokvalitetne slušalice koriste se za nadzor i preslušavanje zvučnih zapisa, a mogu se koristiti i kao zaštita od buke.
Oprema uz slušalice uključuje:

- priključni kabel
- 6,3 mm nastavak priključka
- prijenosnu torbu

High-quality headphones are used for sound monitoring and can be used as a noise protection device.
Equipment also includes:

- detachable cable
- threaded 6.3 mm gold-plated adapter
- carrying bag

Naziv opreme / Equipment name

Vanjska zvučna kartica C400
Exterior Sound Card C400

Proizvođač / Manufacturer

M-AUDIO, Cumberland, USA

Namjena i opis / Purpose and description

Oprema se koristi za snimanje i reproduciranje zvuka različitih izvora.
Oprema uz karticu uključuje:

- Pro Tools SE softver DVD
- CD s upravljačkim programima i dokumentacijom
- USB kabel

Equipment is used for sound processing.
Equipment also includes:

- Pro Tools SE software DVD
- drivers and documentation CD
- USB interface cable

Naziv opreme / Equipment name

Digitalno analogni konverter – DAQPad – 6070E
Digital Analog Converter – DAQPad – 6070E

Proizvođač / Manufacturer

National Instruments, Austin, Texas, USA

Namjena i opis / Purpose and description

Oprema se koristi za mjerenja električnih/fizikalnih veličina te za računalno bazirano prikupljanje podataka.
Oprema uz karticu uključuje:

- punjač
- baterija i punjač za bateriju
- upute za uporabu
- software i instalacijski CD-i
- firewire kabeli
- senzor za temperaturu
- LabView upute za uporabu i training seminari na CD-u
- LabView softver (instalacijski CD-i)

Equipment is used for the measurement of electrical/physical phenomena and computer-based data acquisition.
Equipment also includes:

- charger
- battery and battery charger
- Instruction manual
- software and installation CDs
- firewire cables
- temperature sensor
- LabView user manuals and training seminars on CD
- LabView software (installation CDs)

3 ODSJEK AERONAUTIKA
DIVISION OF AERONAUTICS

Laboratorij za sustav georeferenciranog videa

Voditelj
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4

SAMOSTALNI ZAVODI

ZAVOD ZA PROMETNO PLANIRANJE

Laboratory for Georeferential Video System

Head
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INDEPENDENT DEPARTMENTS

DEPARTMENT OF TRANSPORT PLANNING

Naziv opreme / Equipment name

Digitalna kamera visoke rezolucije HD HERO2
High-resolution digital camera HD HERO2

Proizvođač / Manufacturer

GoPro, San Mateo, California, USA

Namjena i opis / Purpose and description

Kamera se primjenjuje za snimanje prometne infrastrukture u postupku izrade georeferenciranog videozapisa pojedinih elemenata cestovne mreže. Također se primjenjuje i prilikom snimanja kretanja pojedinačnih vozila u prometnom toku radi prikupljanja relevantnih parametrara potrebnih za provođenje prometno-tehnoloških analiza. GoPro kamera je kompatibilna s Microsoft ME/2000/XP Vista ili Mac OS 9.1/10.1/10.2 + operativnim sustavom.
Opće značajke:

- rezolucija senzora kamere: 11 megapiksela
- veličina optičkog senzora: 1/2.5 “
- tip optičkog senzora: CMOS
- digitalni HD video format: H.264
- format fotografije: JPEG
- audio format: AAC AV
- sučelja : HDMI, kompozitni video / audio
- kompatibilna je sa SD i SDHC memorijskim karticama kapaciteta 2 GB, 4 GB, 8 GB, 16 GB i 32 GB.

The camera is used for recording the transport infrastructure in the process of making georeferenced video of individual elements on the road network. It is also used for recording motion of individual ve-

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

hicles in the traffic stream to collect relevant parameters which are necessary to implement traffic analysis. The GoPro 2 camera is compatible with Microsoft ME/2000/XP VISTA or Mac OS 9.1/10.1/10.2+ operating system.

General features:

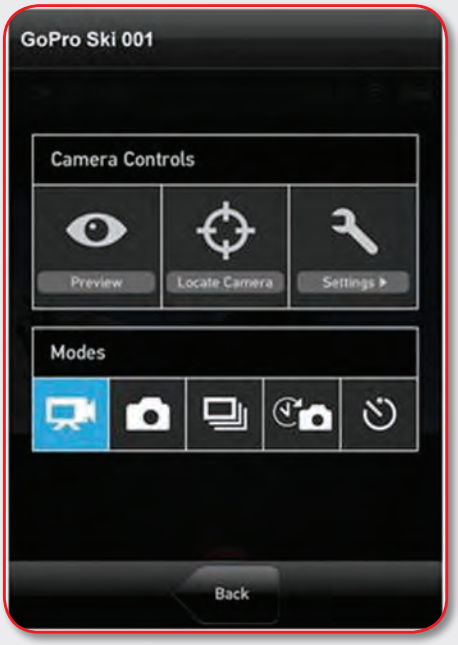
- camcorder sensor resolution: 11 Megapixel
- optical sensor size: 1/2.5”
- optical sensor type: CMOS
- digital HD video format: H.264
- image recording format: JPEG
- audio signal format: AAC AV
- interfaces : HDMI, composite video / audio
- compatible with 2 GB, 4 GB, 8 GB, 16 GB and 32 GB capacity SD and SDHC memory cards.

Naziv opreme / Equipment name

Aplikacija za upravljanje kamerom HD Hero2
HD Hero2 camera control application

Proizvođač / Manufacturer

GoPro, San Mateo, California, USA



Namjena i opis / Purpose and description

Nova iOS i Android aplikacija za mobilne uređaje omogućuje upravljanje sa HD Hero2 kamerom preko iPhone, iPad i Android uređaja. Aplikacija povezuje HD Hero2 kameru sa mobilnim uređajem na temelju WiFi tehnologije. Aplikacija GoPro App omogućuje potpunu kontrolu kamere sa pregledom videozapisa na smartphone uređajima i tablet računalima. Aplikacija također pruža mogućnost pregleda slike u realnom vremenu prije i tijekom izrade fotografije i videozapisa. Osim navedenog, program uključuje i mogućnost praćenja svih relevantnih karakteristika kamere u realnom vremenu poput trenutnog stanja baterije i kapaciteta SD kartice kao i mogućnost sinkronizacije datuma i vremena kamere sa smartphone uređaja i tablet računala.

New iOS and Android app enables control of HD Hero2 camera from iPhone, iPad or Android devices. Application connects with HD Hero2 camera via WiFi. The GoPro App enables full camera control and live scene preview for easy shot framing on smartphones or tablets. Additionally, it is possible to get live scene-preview prior to and during video and photo capture. Additional features also include real time monitoring of the camera vitals including battery life and SD card capacity, as well as the ability to sync GoPro camera date and time to your smartphone or tablet.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Daljinski upravljač Wi-Fi BacPac
Remote controller Wi-Fi BacPac

Proizvođač / Manufacturer

GoPro, San Mateo, California, USA

Namjena i opis / Purpose and description

Wi-Fi BacPac uređaj je kompatibilan s originalnom HD Hero i HD HERO2 kamerom. Wi-Fi BacPac montira se na GoPro kamere omogućujući daljinsko upravljanje (600'/180 m u optimalnim uvjetima) na temelju Wi-Fi daljinskog upravljača. Jednim Wi-Fi daljinskim upravljačem moguće je kontrolirati do 50 GoPro kamera sa BacPac opremom.

The Wi-Fi BacPac is compatible with the Original HD HERO and HD HERO2 cameras. The Wi-Fi BacPac attaches to GoPro camera enabling long range (600'/180 m in optimal conditions) remote control when used with the Wi-Fi Remote. A single Wi-Fi Remote can control up to 50 Wi-Fi BacPac enabled GoPro cameras at a time.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Brojač / klasifikator prometa - model NC200
Traffic Counter - Model NC200

Proizvođač / Manufacturer

Vaisala (NU-Metric), Vantaa, Finland

Namjena i opis / Purpose and description

Visoko specijalizirani profesionalni uređaj namijenjen za prikupljanje podataka o intenzitetu i strukturi prometnih tokova potrebnih prilikom provođenja analiza prometnog sustava. U zadanom vremenskom intervalu kontinuirano prati prometni tok i uvjete u prometu te kao rezultat daje potrebne podatke za provođenje precizne prometne analize. Koristeći tehnologiju magnetnog osjeta vozila, bilježi sve relevantne podatke i "izvozi" ih u napredan softver koji brzo generira tablice, izvještaje, histograme i grafove na temelju kojih je omogućen kvalitetan pregled osnovnih parametara prometnih tokova. Prikupljeni podaci o intenzitetu i strukturi prometnih tokova koriste se za detaljan uvid u trenutno stanje u prometu na odabranoj lokaciji te se na temelju njih određuju eventualne mjere poboljšanja toka prometa.

Highly specialized professional device designed to collect data on the intensity and structure of traffic flow which is required for the analysis of the transport system. Device continuously monitors traffic flow and traffic conditions in a given time interval and provides data for accurate traffic analysis. Using superior technology of magnetic vehicle detection, device records all relevant data which is exported into modern software that quickly generates tables, reports, histograms and graphs which provide a quality review of the basic traffic flow parameters. The collected data about the intensity and structure of traffic flow is used for detailed insight into the current traffic conditions at the selected location. Based on this data the possible measures for traffic flow improvement can be determined.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Brojač / klasifikator prometa – model TQ (TCR100)
Traffic Counter – Model TQ (TCR100)

Proizvođač / Manufacturer

Vaisala (NU-Metric), Vantaa, Finland

Namjena i opis / Purpose and description

Visoko specijalizirani profesionalni uređaj namijenjen prikupljanju podataka o intenzitetu i strukturi prometnih tokova potrebnih prilikom provođenja analiza prometnog sustava. U zadanom vremenskom intervalu kontinuirano prati prometni tok i uvjete u prometu i kao rezultat daje podatke za precizne prometne analize. Brojač prometa TCR100 može se jednostavno postaviti uz cestu, a kontrola nad radom uređaja omogućena je preko dlanovnika. Radarski senzor detektira sva vozila u prolazu pri čemu se bilježe podaci o duljini, brzini i klasi vozila. Koristeći tehnologiju radarskog osjeta vozila, bilježi sve relevantne podatke i "izvozi" ih u napredan softver koji brzo generira tablice, izvještaje, histograme i grafove na temelju kojih je omogućen kvalitetan pregled osnovnih parametara prometnih tokova. Prikupljeni podaci o intenzitetu i strukturi prometnih tokova koriste se za detaljan uvid u trenutno stanje u prometu na odabranoj lokaciji te se na temelju njih određuju eventualne mjere poboljšanja toka prometa. Montaža uređaja je predviđena za stupove uz cestu ili iznad ceste (konzolni stupovi, nadvožnjaci i sl.). Uređaji su dodatno zaštićeni otpornim kućištem na koje se postavljaju lokoti s ključevima.

Highly specialized professional device designed to collect data on the intensity and structure of traffic flow which is required for analysis of the transport system. Device continuously monitors traffic flow and traffic conditions in a given time interval and provides data for accurate traffic analysis. The TCR100

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

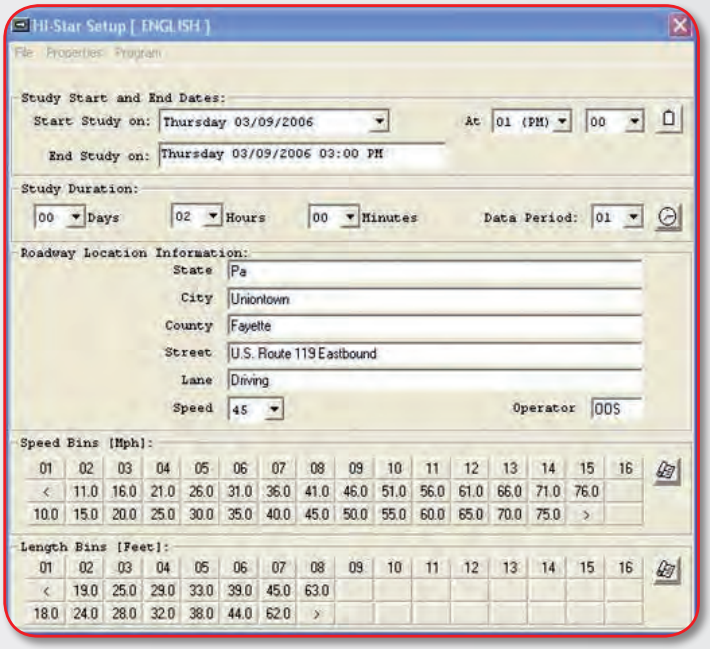
is easy to set-up on the roadside with a PDA (Palm) and does not disturb traffic flow. The sensor detects all passing vehicles in two directions, obtaining their length, speed and classification. Using superior technology of radar vehicle detection, device records all relevant data which is exported into modern software that quickly generates tables, reports, histograms and graphs which provide a quality review of the basic traffic flow parameters. The collected data about the intensity and structure of traffic flow is used for detailed insight into the current traffic conditions at the selected location. Based on this data the possible measures for traffic flow improvement can be determined. Devices are placed on poles along the road or over the road (cantilever beam, overpasses, etc.). The devices are also protected by strong housing and padlocks with keys.

Naziv opreme / Equipment name

Program za obradu i upravljanje podatcima o prometu HDM
Highway data management software HDM

Proizvođač / Manufacturer

Quixote Transportation Technologies, Chicago, USA



Namjena i opis / Purpose and description

HDM aplikacija pruža praktičan način za programiranje QTT uređaja za prikupljanje podataka o prometu, učitavanje podataka sa uređaja za brojanje prometa, organiziranje i manipulaciju sa prikupljenim podatcima pri čemu se podaci prikazuju na jednostavan i razumljiv način pomoću grafova. Ovaj softver je kompatibilan sa nizom uređaja za brojenje prometa tipa QTT, poput uređaja: QTT NC-90, QTT NC-90a, QTT NC-47, QTT NC-97, QTT NC-100 i QTT NC-200.

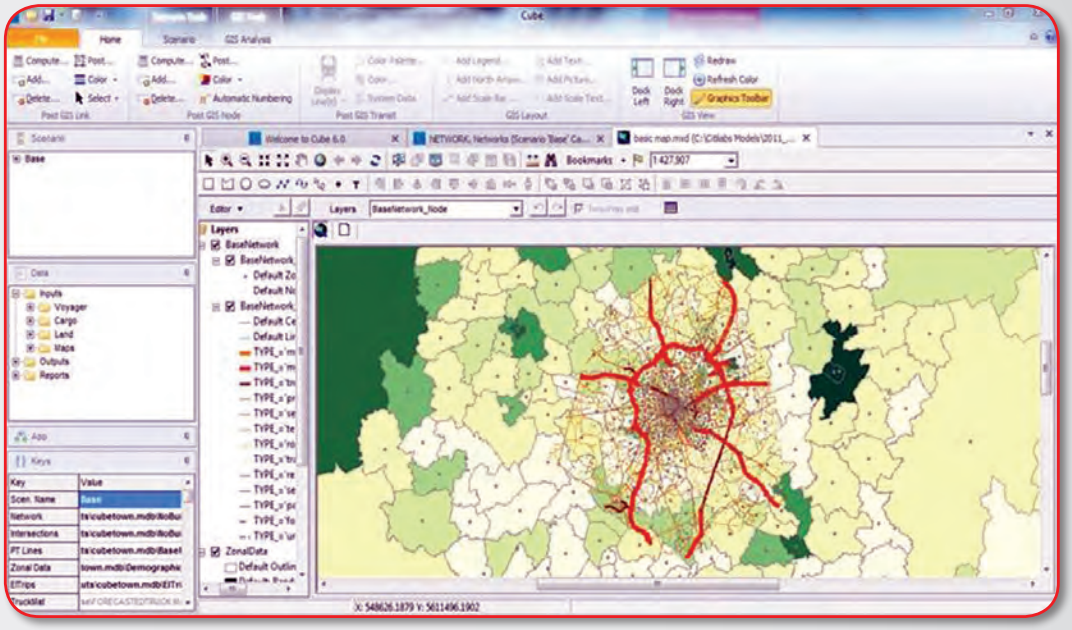
HDM application provides a convenient way to: Program QTT Traffic Analyzers to collect traffic data, read data gathered by the QTT Traffic Analyzers, organize and manipulate data gathered by traffic QTT Traffic Analyzers and to display information in easy to understand reports and graphs. This software is designed to be used with the entire QTT Traffic Analyzer family. This includes: QTT NC-90, QTT NC-90a, QTT NC-47, QTT NC-97, QTT NC-100 and QTT NC-200.

Naziv opreme / Equipment name

Sučelje geoprostornih podataka prometnog modela Cube Base
Traffic model geospatial data interface Cube Base

Proizvođač / Manufacturer

Citilabs, Lafayette, California, USA



Namjena i opis / Purpose and description

Cube Base predstavlja snažno i opsežno sučelje za sve vrste modela i ekstenzija u Cube aplikaciji. Cube Base aplikacija primjenjuje se za dizajniranje i primjenu prometnih modela pri čemu je omogućeno uređivanje i upravljanje svim ulaznim i izlaznim podatcima te provođenje analiza različitih scenarija. Aplikacija omogućuje uređivanje geoprostornih baza podataka, kreiranje karata, provođenje različitih prostornih analiza podataka i postavljanje složenih prostornih upita. GIS sučelje može se primjeniti za prikazivanje i uređivanje geoprostornih podataka u modelima prometne potražnje na prometnoj mreži ili na području pojedinih definiranih zona. Program Cube Base također omogućuje grafički pregled prometnih modela izrađenih u bilo kojem modulu Cube aplikacije kao i u modulima ostalih srodnih programa. Aplikacija pruža i alate za razvoj i prilagodbu sučelja model kao i alate za kreiranje, pokretanje i upravljanje različitim scenarijima. Cube Base također uključuje funkcije koje pomažu analitičaru prilikom izrade visoko kvalitetnih grafikona i tablica za jedan ili veći broj scenarija.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Cube Base is the powerful and comprehensive user interface for all Cube modeling modules and extensions. Cube Base is used to design and apply the models, to edit and manage all input and output data and to run and analyze scenarios. Application allows the editing of geodatabase data, create maps, analyze data, and submit map-based queries. GIS window can be used to display and edit the geographic data in travel demand models, such as transportation networks and transportation analysis zones. Cube Base

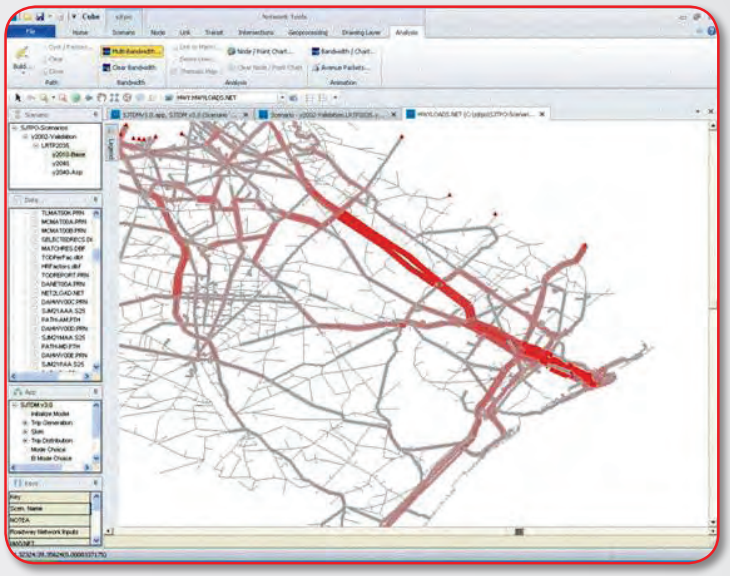
also provides a graphical view of a transportation model built with any of the Cube modules or legacy programs. Scenario Manager provides tools for developing a customized user interface for the model and to create, run and manage the scenarios. Cube Base also includes functions that help the analyst to create high quality charts and tables of single or multiple scenarios.

Naziv opreme / Equipment name

Program za modeliranje i planiranje prometnog sustava Cube Voyager
Transport system modeling and planning software Cube Voyager

Proizvođač / Manufacturer

Citilabs, Lafayette, California, USA



Namjena i opis / Purpose and description

Cube Voyager je dizajniran za modeliranje i planiranje prometnog sustava. U "srcu" Cube Voyagera je fleksibilan kontrolni skriptni jezik koji omogućuje fleksibilnu i potpunu kontrolu nad svim aspektima procesa modeliranja. Cube Voyager se sastoji od četiri glavna programa: mreže, matrice, cestovnog i javnog prometa. Sustav također sadrži modele koji omogućuju planiranje i distribuciju putovanja te je izvrstan izbor za izradu modela koji zahtijevaju povratnu informaciju o preopterećenosti mreže, što je za prometne modele izrazito važno. Simulacijski model je vrlo važan alat u donošenju odluka o novim investicijskim zahvatima po pitanju trasa javnog gradskog prometa kao i drugih održivih oblika prometa budući da daje informacije o stanju i zasićenju prometne mreže.

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INDEPENDENT DEPARTMENTS

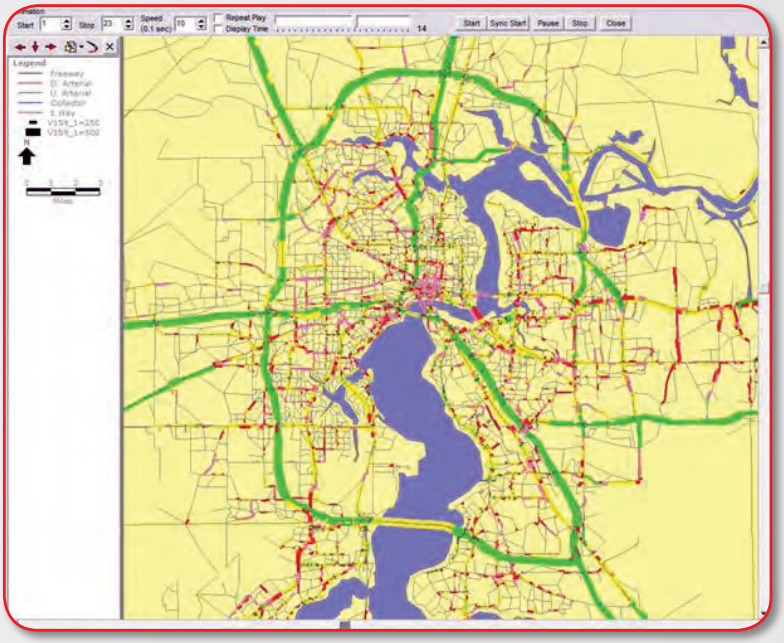
Cube Voyager is designed for modelling and planning of the transport system. The "heart" of Cube Voyager's is flexible control language called scripting language that provides a flexible and complete control over all aspects of the modeling process. Cube Voyager consists of four major programs: network, matrix, road and public transport. The system also includes models that allow the planning and distribution of travel and is an excellent choice for the development of models that require feedback on overloaded networks, which is extremely important for traffic models. The simulation model is a very important tool in making decisions on new investment projects which include selection of routes for public transport and other sustainable forms of transport as it provides information about the state and the saturation of the transport network.

Naziv opreme / Equipment name

Program za dinamičku dodjelu prometa na mrežu Cube Avenue
Dynamic traffic assignment software Cube Avenue

Proizvođač / Manufacturer

Citilabs, Lafayette, California, USA



Namjena i opis / Purpose and description

Aplikacija Cube Avenue predstavlja ekstenziju programa Cube Voyager, a namijenjena je za dinamičku dodjelu prometa na mrežu. Omogućuje modeliranje prometnog sustava uz povećanu razinu detalja u odnosu na makroskopske prometne modele koji se primjenjuju u programima poput Cube Voyager Highway aplikacije te manju razinu detalja u odnosu na mikroskopske prometne modele koji se primjenjuju u programima poput Cube Dynasim aplikacije. Program Cube Avenue pruža idealno okruženje za provođenje složenih prometnih studija, poput provođenja komparacije između varijantnih rješenja za ublažavanje zagušenja tijekom vršnog sata ili prilikom ispitivanja učinkovitosti planova evakuacije. Prometni stručnjaci mogu koristiti Cube Avenue aplikaciju u svrhu povezivanja prometnog planiranja sa aktivnostima u realnom vremenu, pri čemu je moguće istražiti utjecaje planiranih aktivnosti prije njihove implementacije.

Cube Avenue is a dynamic traffic assignment extension for Cube Voyager. It models traffic at greater levels of detail than macroscopic models, like Cube Voyager's Highway program, and at lesser levels of detail than microscopic models, like Cube Dynasim. Cube Avenue offers the ideal environment for many studies, such as comparing policies for alleviating peak period congestion or examining the effectiveness of emergency evacuation plans. Transportation professionals can use Cube Avenue to meld planning with real-time operations, examining likely impacts of operational responses before implementation.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Laboratorij za prometno-tehnička vještačenja

Voditelj
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4

SAMOSTALNI ZAVODI

ZAVOD ZA PROMETNO-TEHNIČKA VJEŠTAČENJA

Laboratory for Traffic Accidents Expertise

Head

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INDEPENDENT DEPARTMENTS

DEPARTMENT OF TRAFFIC ACCIDENT EXPERTISE

Naziv opreme / Equipment name

Mjerač temperature PCE – 313
Hydrometer PCE – 313

Proizvođač / Manufacturer

PCE Group, Southampton, Hampshire, UK

Namjena i opis / Purpose and description

Prenosivi mjerač za temperaturu i relativnu vlagu.
Tehničke značajke opreme:

- mjerna područja: 0 ... 100 % r.F., - 20 ... + 60 °C
- rezolucija: 0,1 % r.F., 0,1 °C
- točnost: +- 2,5 % r.F., +- 0,7 °C
- spremnik podataka: 16.000 mjernih vrijednosti
- senzor: 190 mm x 13 Drm.
- baterija: 1 x 9 V PP3 blok baterija
- veličina: 186 x 64 x 30 mm
- masa: 320 g
- mjerna područja: 0 ... 100 % r.F., - 20 ... + 60 °C

Portable gauge for temperature and relative humidity.
Equipment technical specifications:

- ranges: 0 ... 100 % r.h., - 20 ... + 60 °C
- resolution: 0.1 % r.h., 0.1 °C
- accuracy: +- 2.5 % r.h., +- 0.7 °C
- memory capacity: 16.000 readings
- sensor: 190 mm x 13 mm diameter

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- battery: 1 x 9 V PP3 battery
- dimensions: 186 x 64 x 30 mm
- weight: 320 g
- operation conditions: 0 to 40 °C; <80% r.h.

Naziv opreme / Equipment name

Mjerač buke PCE -355
Noise gauge PCE -355

Proizvođač / Manufacturer

PCE Group, Southampton, Hampshire, UK

Namjena i opis / Purpose and description

Prijenosni mjerač za buku.
Tehničke značajke opreme:

- automatski raspon: 70 to 140 dB(A)
- rezolucija: 0,1 dB
- točnost: 1,5 dB
- raspon frekvencije: 20 Hz do 10 kHz
- kapacitet logera: 5000 mjesta
- frekventno procjenjivanje: A, C
- display: 25 mm LCD-display
- okolina: 5....+40 °C, ispod 80 %rH
- napajanje: četiri 1.5V LR-6/AA alkalne baterije
- izmjere: 106 x 64 x 34 mm
- klasifikacija: ANSI SI.25, ISO 1999 & BS 6402
- težina: 350 g

Portable noise gauge.
Equipment technical specifications:

- measurement range: 70 to 140 dB(A)
- resolution: 0.1 dB

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- accuracy: ± 1.5 dB (ref. 94 dB at 1 KHz)
- frequency range: 20 Hz to 10 kHz
- memory capacity: 5000
- frequency weighting: A, C
- display: 25 mm LCD-display
- operating conditions: 5....+40 °C
- power: 4 – AAA batteries
- dimensions: 106 x 64 x 34 mm
- standard: ANSI SI.25, ISO 1999 & BS 6402
- weight: 350 g

Naziv opreme / Equipment name

Mjerač debljine laka PCE-CT 28
Coating thickness gauge PCE-CT 28

Proizvođač / Manufacturer

PCE Group, Southampton, Hampshire, UK

Namjena i opis / Purpose and description

Prenosivi mjerač debljine laka.
Tehničke značajke opreme:

- mjerno područje: 0 ... 1250 µm
- rezolucija: 0,1 µm (0...99,9 µm), 1 µm (> 100 µm)
- točnost: ± 2% or ... 2,5 µm
- prikaz: 4-znamenkasti, 10 mm LCD-display
- radni uvjeti: 0 ... +50 °C
- napajanje: 4 x 1,5V AAA-baterije
- dimenzije: 126 x 65 x 27 mm
- masa: 120 g

Portable coating thickness gauge.
Equipment technical specifications:

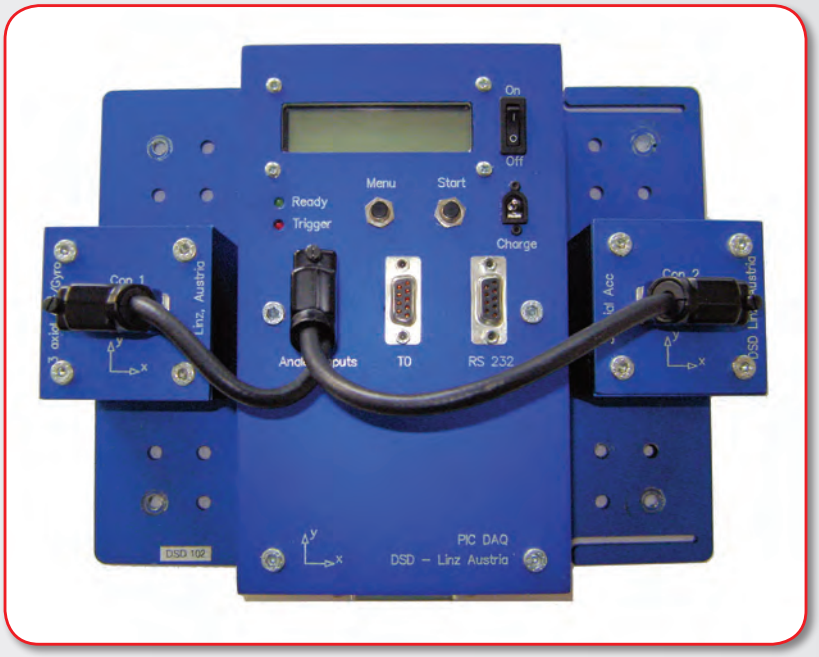
- measurement range: 0 ... 1250 µm
- resolution: 0.1 µm (0...99.9 µm), 1 µm (> 100 µm)
- accuracy: ± 2% or ... 2.5 µm
- display: LCD with 4 x 10 mm high digits
- operating temperature: 0 ... +50 °C
- power: 4 x 1.5V AAA- batteries
- dimensions: 126 x 65 x 27 mm
- weight: 120 g

Naziv opreme / Equipment name

Uređaj za mjerenje dinamike kretanja vozila Pocket DAQ
Device for measuring vehicle dynamics Pocket DAQ

Proizvođač / Manufacturer

DSD Dr. Steffan Datentechnik GmbH, Linz, Austrija



Namjena i opis / Purpose and description

Uređaj služi za mjerenje i ispitivanje dinamike kretanja vozila pri izvođenju tzv. *crash* testa. Uređaj je opremljen senzorima za mjerenje ubrzanja i kutne brzine vozila te može prikupljati podatke po tri osi (X, Y, Z). Uređaj prikupljene podatke snima na SD karticu što je pogodno za kasnije analize.

Device for measuring the dynamics of the vehicle is used for measuring and testing vehicle performance during crash tests. The device is equipped with sensors for measuring accelerations and angular velocities of the vehicle and can collect data from three axes (X, Y, Z). Collected data is recorded on the SD card which is suitable for later analysis.

Naziv opreme / Equipment name

Uređaj za mjerenje usporenja i ubrzanja vozila XL - Meter
Device for measuring vehicle deceleration and acceleration XL - Meter

Proizvođač / Manufacturer

Inventure Automotive Electronics Research & Development, Budapest, Hungary

Namjena i opis / Purpose and description

XL metar je jednostavan uređaj koji služi za mjerenje usporenja i ubrzanja vozila. Uređaj se pomoću vakumskog "priljepka" instalira na vjetrobransko staklo sa unutrašnje strane vozila. Uređaj može snimiti podatke do osam mjerenja a pogodan je za ispitivanja koeficijenta prianjanja pneumatika te zaustavnog puta vozila.

Device for measuring acceleration is a simple device used to measure the deceleration and acceleration of the vehicle. The device is attached to the windshield with a vacuum "hanger" on the inside the vehicle. Can record up to eight measurement datasets and is suitable for testing the coefficient of adhesion pneumatics and stopping distance of the vehicle.

Naziv opreme / Equipment name

Ručni uređaj za mjerenje duljine puta tipa M4
Handheld device for measuring travel distance M4

Proizvođač / Manufacturer

Glunz Technik GmbHw, Recklinghausen, Deutschland

Namjena i opis / Purpose and description

Uređaj za mjerenje duljine puta.
Tehničke značajke opreme:

- razred točnosti: III
- mjerni opseg: 5,00 – 9999,99 m
- najmanji podjeljak: 1 cm

The length measuring device.
Equipment technical specifications:

- accuracy class: III
- measurement range: 5.00 – 9999.99 m
- smallest division: 1 cm

Naziv opreme / Equipment name

Uređaj za prikupljanje podataka o dinamici vozila SBX-110
Smart Black Box recorder SBX-110

Proizvođač / Manufacturer

KCI Communications, Lake Zurich, USA

Namjena i opis / Purpose and description

Uređaj služi kao tzv. eksterna crna kutija u vozilu te prikuplja podatke o putu i dinamici kretanja vozila. Ima ugrađen GPS te je u naknadnoj analizi moguće vidjeti podatke o ruti kretanja vozila. Uređaj se instalira na unutrašnju stranu vjetrobranskog stakla, a budući da posjeduje kameru može snimati i video zapis vožnje.

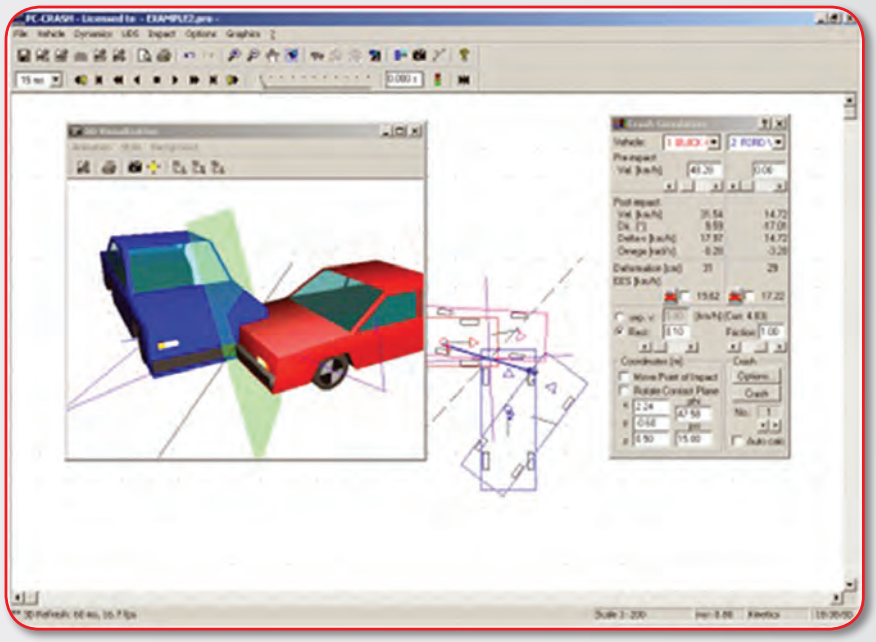
The device serves as an external black box in the vehicle and collects data from travel information and the dynamics of the vehicle. It has built-in GPS and the subsequent analysis can show information about the route of the driver. The device is installed on the inside of the windshield and it has a camera which can record the trip.

Naziv opreme / Equipment name

Program za simulaciju prometnih nesreća PC CRASH
Traffic accidents simulation software PC CRASH

Proizvođač / Manufacturer

DSD Dr. Steffan Datentechnik GmbH, Linz, Austrija



Namjena i opis / Purpose and description

Program služi za simulaciju prometnih nesreća u cestovnom prometu i omogućava preciznu analizu sudara motornih vozila i drugih čimbenika. Na temelju unesenih vrijednosti program automatski izračunava sve parametre u sudaru, a na temelju oštećenja na vozilima moguće je dobiti vrijednosti i o utrošenoj energiji u sudaru. Posjeduje bazu podataka od nekoliko tisuća vozila te simulira i kretanje pješaka ili vozača u trenutku sudara.
Program omogućava simulaciju u 2D i 3D formatu iz različitih kutova pa tako i iz perspektive vozača.

The program is used to simulate traffic accidents in road traffic and can provide an accurate analysis of motor vehicle collisions and other factors. Based on the entered value, the program automatically calculates all parameters in a collision. Based on the damage of the vehicles it is possible to get the values of consumed energy in the collision. It has a database of several thousand vehicles, and simulates the movement of pedestrians and drivers at the time of the collision.
The program enables the simulation of 2D and 3D from different angles and from the perspective of the driver.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Ispitni laboratorij Zavoda za prometnu signalizaciju

Voditelj
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4

SAMOSTALNI ZAVODI

ZAVOD ZA PROMETNU SIGNALIZACIJU

Department of Traffic Signalling Testing Laboratory

Head

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INDEPENDENT DEPARTMENTS

DEPARTMENT OF TRAFFIC SIGNALLING

Naziv opreme / Equipment name

Uređaj za ispitivanje debljine prevlake oznaka na kolniku
PosiTector 6000 FNS3
Device for mesuring coating thickness of road markings
PosiTector 6000 FNS3

Proizvođač / Manufacturer

De Felsko, New York, USA

Namjena i opis / Purpose and description

Uređaj je namijenjen ispitivanju debljine prevlake obojanih ili neobojanih metalnih površina kao što su čelik, željezo, aluminij, bakar, itd. Ispitivanja se vrše pomoću sonde koja na temelju magnetskih i vrtložnih struja određuje debljinu prevlake. U Zavodu se primarno koristi za ispitivanje debljine suhog filma boje za oznake na kolniku te ostala ispitivanja debljine prevlake.

The device is used for mesuring thickness of dry film on road markings (for measuring the ferrous and non-ferrous metal substrates based on magnetic and eddy current such as steel, iron, aluminum, copper, etc..) The tests are carried out using the probe based on magnetic and eddy current principle which determines the thickness of coating. In the Department of Traffic Signalling it is primarily used for testing thickness of dry film paint for road markings and other tests of coating thickness.

Naziv opreme / Equipment name

Uređaj za ispitivanje debljine prevlake oznaka na kolniku
PosiTector 200
Device for mesuring coating thickness of road markings PosiTector 200

Proizvođač / Manufacturer

De Felsko, New York, USA

Namjena i opis / Purpose and description

Uređaj je namijenjen ispitivanju debljine prevlake obojanih ili neobojanih metalnih površina kao što su čelik, željezo, aluminij, bakar, itd. Ispitivanja se vrše pomoću sonde koja na temelju magnetskih i vrtložnih struja određuje debljinu prevlake. Nudi mogućnost mjerenja i do tri pojedinačne debljine sloja u višeslojnom sustavu te daje grafički prikaz za detaljnu analizu višeslojnog sustava. U Zavodu se primarno koristi za ispitivanje debljine suhog filma boje za oznake na kolniku te ostala ispitivanja debljine prevlake.

The device is used to measure the thickness of road markings. It is possible to measure the desired thickness on wood, concrete, plastic, etc. thanks to ultrasonic technology. It also offers the ability to measure up to three individual layer thicknesses in the multilayer system and a graphical representation of a detailed analysis of the coating system.

Naziv opreme / Equipment name

Uređaj za ispitivanje debljine prevlake oznaka na kolniku ZMM 5000
Device for mesuring coating thickness of road markings ZMM 5000

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj je namijenjen za brzo određivanje debljine suhog filma oznaka na kolniku i sličnih premaza. Koristi se za brzo i jednostavno ispitivanje debljine suhog filma oznaka na kolniku na terenu. Ispitivanja se vrše na principu magnetskih i vrtložnih struja te je rad uređaja u skladu s europskom normom EN 13197. Također, sadrži i posebno pomično mjerilo za određivanje širine oznake na kolniku.

Precision measuring instrument for the rapid determination of thickness of dry film on road markings and similar coatings. It is used for quick and easy testing of dry film thickness of road markings on the road. Tests are carried out on the principle of magnetic and eddy current and the operation of this device is in accordance with the European standard EN 13197. Also includes a special caliper for determining width of the road markings.

Naziv opreme / Equipment name

Uređaj za ispitivanje vlage na podlogama CME4
Device for measuring moisture on surfaces CME4

Proizvođač / Manufacturer

Tramex Ltd., Kilmacanogue, County Wicklow, Ireland

Namjena i opis / Purpose and description

Uređaj je namijenjen brzom i jednostavnom ručnom ispitivanju vlage na betonskim i cementnim podlogama. Uređaj radi na principu uspoređivanja promjena u impedanciji uzrokovanih prisutnošću vode i prikazuje sadržaj vlage na analognoj skali od 0 do 100 te očitava prosječnu vlažnost na dubini od oko 1/2“. Zavod ga koristi za ispitivanje vlage na betonskim i cementnim podlogama neposredno prije izvođenja oznaka na kolniku.

The device is used to measure the amount of moisture in concrete and cementitious substrates. The device works on the principle of comparing changes in impedance caused by the presence of water and shows the humidity content on the analogue scale from 0 to 100. The Department of Traffic Signalling uses it for testing humidity on concrete and cementitious substrates before the performance of road markings.

Naziv opreme / Equipment name

Uređaj za ispitivanje vidljivosti oznaka na kolniku ZRM 1021
Device for testing visibility of road markings ZRM 1021

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za brzo i jednostavno terensko ispitivanje faktora luminancije (sjajnosti rasvijetljene ili svjetleće površine) odnosno dnevne vidljivosti oznaka na kolniku. Uređaj u sebi sadrži halogenu žarulju koja osvjetljava oznaku na kolniku te na temelju osvijetljenosti mjeri dnevnu vidljivost oznake na kolniku. Rad uređaja je u skladu s normama DIN 55 984, ISO 6504, ASTM E 97.

The device is used for quick and simple field test of luminance factor (brightness illuminated or reflective surfaces) and daylight visibility of road markings. The device contains a halogen bulb that illuminates the road markings and based on luminance is measuring daylight visibility of road markings. Operation of the unit in accordance with DIN 55984, ISO 6504, ASTM E 97.

Naziv opreme / Equipment name

Komplet za kontrolu kvalitete oznaka na kolniku ZMK 5050
Set for quality control of road markings ZMK 5050

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Set se koristi za brzu kontrolu kvalitete oznaka na kolniku u toku izvođenja. Sastoji se od opreme za određivanje debljine mokrog filma boje (mjerene u µm), temperature (mjerene u °C), relativne vlažnosti zraka (mjerene u % vlažnosti), te prijenosne vage za određivanje količine utrošenog materijala (staklenih kuglica, mjerenih u gramima) pri izvođenju oznaka na kolniku.

Set is used for quality control of road markings. It consists of equipment for determining the thickness of the wet paint film (measured in µm), temperature (measured in °C), relative humidity (measured in %), and portable scales to determine the amount of material used (glass beads, measured in gram) in the applying process of road markings.

Naziv opreme / Equipment name

Uređaj za ispitivanje retrorefleksije prometnih znakova ZRS 5060
Device for measuring retroreflection of traffic signs ZRS 5060

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje retrorefleksije prometnih znakova (vertikalna signalizacija). Zehntner ZRS 5060 je precizni mjerni instrument za određivanje koeficijenta retrorefleksije RA (noćne vidljivosti) prometnih znakova. Koristi se za sve vrste i boje retroreflektivnog materijala te omogućuje prijenos podataka na računalo.

The device is used for measuring retroreflection of traffic signs (vertical signalization). Precision measuring device for determining the coefficient of retroreflection RA (night visibility) of traffic signs. It is used for all types and colours of retroreflective materials and enables data transfer to a computer.

Naziv opreme / Equipment name

Uređaj za ispitivanje retrorefleksije prometnih znakova ZRS 6060
Device for measuring retroreflection of traffic signs ZRS 6060

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje retrorefleksije prometnih znakova (vertikalna signalizacija). Zehntner ZRS 6060 koristi LED osvjetljenje i 3,5" dodirni zaslon u boji visoke rezolucije s podesivim nagibom zaslona. Koristi se za sve vrste i boje retroreflektivnog materijala te automatski detektira boju retroreflektivnog materijala. Bilježi GPS koordinate te nudi opciju pregleda rezultata ispitivanja u „MappingTools" softveru.

The device is used for measuring retroreflection of traffic signs (vertical signalization). Zehntner ZRS 6060 uses LED lighting and a 3.5 " high-resolution colour touch screen with adjustable angle. Device is used for all types and colours of retroreflective material and automatically detects the colour of retroreflective material. Device stores GPS coordinates and measurements can be evaluated with the included mapping and data analysis software "MappingTools".

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Uređaj za ispitivanje kvalitete oznaka na kolniku ZRM 6013
Device for quality control of road markings ZRM 6013

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje kvalitete oznaka na kolniku (horizontalna signalizacija). Zehntner ZRM 6013 je uređaj visoke preciznosti za ispitivanje noćne (R_L) i dnevne (Q_d) vidljivosti. Uređaj također pohranjuje podatke kao što su GPS koordinate, temperatura i vlažnost. Sva provedena ispitivanja jednostavno se mogu pohraniti na računalo radi izrade dokumentacije i izvještaja ispitivanja.

The device is used for measuring day and night visibility of road markings (horizontal signalization). The ZRM 6013 is high-precision measuring device for all applications which provides precise, on-the-spot measurement of night (R_L) and day visibility (Q_d). The device also gathers important ambient data like GPS coordinates, temperature and humidity. All data is easily downloadable to the computer for comprehensive documentation and reporting.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Uređaj za ispitivanje kvalitete oznaka na kolniku ZRM 6014
Device for quality control of road markings ZRM 6014

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje kvalitete oznaka na kolniku (horizontalna signalizacija). Zehntner ZRM 6014 je najnoviji uređaj visoke preciznosti za ispitivanje noćne (R_L) i dnevne (Q_d) vidljivosti, a osnovna prednost mu je brzina (kraće vrijeme) ispitivanja. Zahvaljujući velikom zaslonu osjetljivom na dodir omogućuje jednostavniji unos podataka vezanih uz ispitivanje, te nudi mogućnost pregleda rezultata ispitivanja u „MappingTools“ softveru.

The device is used the measuring day and night visibility of road markings (horizontal signalization). Zehntner ZRM 6014 is the latest high-precision device for testing night (R_L) and day (Q_d) visibility, and its main advantage is its testing speed (shorter). Thanks to the large touch screen it allows simple data entry related to the testing, and offers the ability to view test results in “MappingTools” software.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Uređaj za ispitivanje retrorefleksije oznaka na kolniku ZDR 6020
Device for measuring retroreflection of road markings ZDR 6020

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za dinamičko ispitivanje noćne vidljivosti R_L (retrorefleksije) oznaka na kolniku (horizontalna signalizacija). ZDR 6020 je dinamički mjerni sustav za brzo i precizno ispitivanje vidljivosti oznaka noću, a omogućuje ispitivanja pri brzinama do 120 km/h. Ispitivanja se pohranjuju u Excel tablicama, a pomoću „MappingTools“ softvera omogućen je grafički prikaz na digitalnoj karti te generiranje PDF izvješća.

The device is used for dynamic measuring of night visibility (retroreflection) of road markings (horizontal signalization). The ZDR 6020 is a dynamic measuring system for fast and precise recording of night visibility and important ambient data over long distances or large areas. The markings of complete road networks are measured at speeds up to 120 km/h. For evaluation, a well-arranged Excel-sheet, PDF report or graphic representation on digital maps provides an easy overview of the condition of the markings.

Naziv opreme / Equipment name

Uređaj za ispitivanje hrapavosti oznaka na kolniku SRT 5800
Device for testing roughness of road markings SRT 5800

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland

Namjena i opis / Purpose and description

Uređaj se koristi za ispitivanje koeficijenta trenja asfalta i oznaka izvedenih na kolniku. Također je poznat kao klatno ispitne vrijednosti (PTV). Ovaj uređaj koristi se u cijelom svijetu mnogo godina pri ispitivanju hrapavosti novo asfaltiranih prometnica. U Zavodu za prometnu signalizaciju uređaj se koristi za ispitivanje hrapavosti oznaka na kolniku.

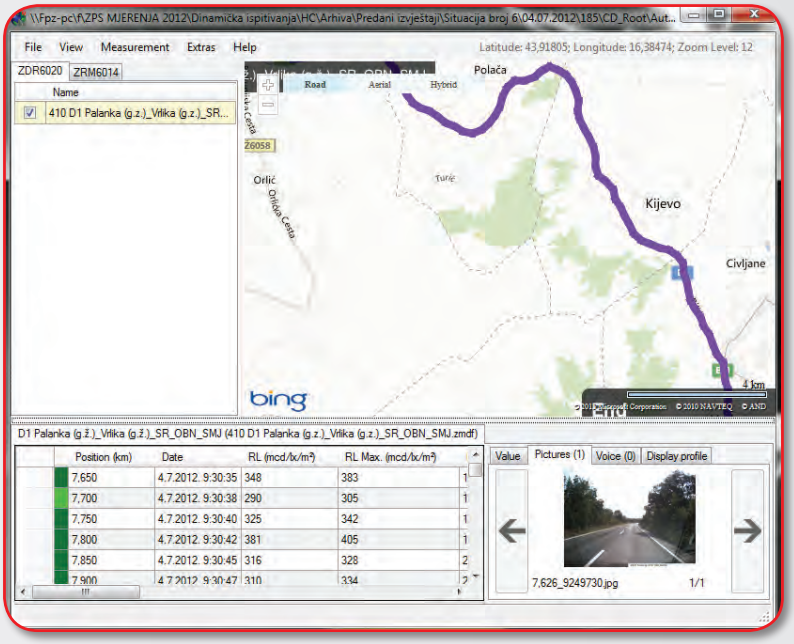
The device is used to measure the friction coefficient of asphalt and road markings. It is also known as the pendulum test value (PTV). This device has been used throughout the world for many years for testing roughness of newly paved roads. In the Department of Traffic Signalling the device is used for testing the roughness of road markings.

Naziv opreme / Equipment name

Program za kartiranje i analizu podataka Mapping Tools
Mapping and data analysis software Mapping Tools

Proizvođač / Manufacturer

Zehntner, Sissach, Switzerland



Namjena i opis / Purpose and description

Mapping Tools se koristi za interaktivni pregled rezultata ispitivanja prometnih znakova (vertikalna signalizacija) i oznaka na kolniku (horizontalna signalizacija). Time je omogućen pregled svake ispitane vrijednosti na interaktivnoj karti koristeći spremljene GPS koordinate, svi pripadajući podaci vezani uz to ispitivanje te izrada izvještaja u PDF formatu.

Mapping Tools is a versatile mapping and data analysis software for the models ZDR 6020 Dynamic retroreflectometer RL, ZRM 6014 Retroreflectometer RL/Qd and ZRS 6060 Retroreflectometer. Measurements containing GPS coordinates can be displayed on a map in different colours using adjustable profiles. Softver also generates measuring reports as PDF or XLS files.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Naziv opreme / Equipment name

Program za pregled rezulata ispitivanja retrorefleksije Retrorefleksija
Sofware for analysis of retroreflection test results Retrorefleksija

Proizvođač / Manufacturer

Steatoda d.o.o., Zagreb, Hrvatska

Namjena i opis / Purpose and description

Program razvijen od strane Zavoda za prometnu signalizaciju koristi se za pregled rezultata ispitivanja retrorefleksije oznaka na kolniku i prometnih znakova. Njime je omogućena detaljna analiza i obrada podataka za daljnja istraživanja, automatsko generiranje izvještaja za svako ispitivanje te izrada baze podataka i katastra za ispitane prometne znakove.

The Software developed by the Department of Traffic Signalling is used to view the test results of night visibility (retroreflection) of road markings and traffic signs. It provides a detailed data analysis for further research, automatic generation of report for each test (vertical or horizontal signalization) and preparation of databases and a registry of tested signs.

4 SAMOSTALNI ZAVODI
INDEPENDENT DEPARTMENTS

Laboratorij za primijenjenu ergonomiju u prometu

Voditelj
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5.

SAMOSTALNE KATEDRE

KATEDRA ZA OPĆE PROGRAMSKE SADRŽAJE

Laboratory for Applied Ergonomics in Traffic and Transport

Head
Davor Sumpor, Ph.D.
e-mail: davor.sumpor@fpz.hr

INDEPENDENT CHAIRS

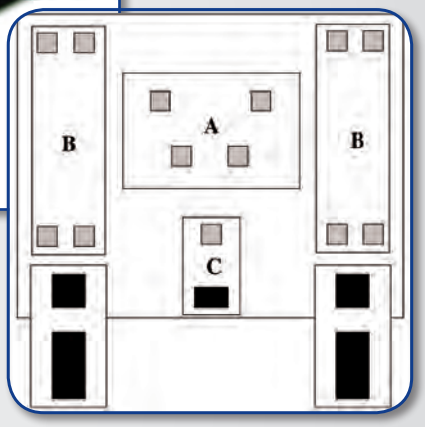
CHAIR OF FUNDAMENTAL COURSES

Naziv opreme / Equipment name

Mjerni komplet Reakciometar CRD4
Equipment kit Reactionmeter CRD4

Proizvođač / Manufacturer

Drenovac j.d.o.o., Zagreb, Hrvatska
* za signalno-komandni modul CRD4 s pedalama, generator novih testova i bazu za pohranu podataka
* for signal-command module CRD4 with pedals, generator of new tests and database for storing data



Namjena i opis / Purpose and description

Reakciometar CRD4 koristi se za potrebe praktične laboratorijske nastave studenata diplomskog studija na kolegiju Ergonomija u prometu, te za istraživački rad s ispitanicima sudionicima u prometu.
Omogućuje mjerenje različitih kognitivnih funkcija sljedećim testovima.
Testovi mišljenja:

- operativno mišljenje (identifikacija svjetlosnih signala)
- operativno mišljenje (diskriminacija zvučnih signala)

Testovi za mjerenje vremena klasičnih tipova psihomotornih reakcija (svjetlo/zvuk/otpuštanje/pritisak):

- testovi jednostavnog vremena reakcije
- testovi vremena disjunktivne reakcije
- testovi vremena izborne reakcije

Testovi se apliciraju na jedinstvenoj signalno-komandnoj ploči na kojoj se nalaze tri polja označena slovima A, B i C, u kojima su smještene signalne lampice. U polju A smještene su četiri, u polju B osam i u polju C jedna signalna lampica. Na komandnoj ploči nalaze se dvije velike tipke za reakcije lijevom i desnom rukom i jedna manja tipka za jednostavne reakcije prstom dominantne ruke. U postolje su ugrađene dvije velike pedale, za reakcije nogama.

Korelacija: kvocijent opće mentalne sposobnost i operativnog mišljenja.
Mjerni komplet Reakciometar CRD4 sadrži:

- signalno komandni modul CRD4 s pedalama*
- softver za automatski mjerni proces*
- generator novih testova*
- bazu za pohranjivanje podataka*
- slušalice PC Wintech WH-2688
- stolno računalo
- 19“ LED monitor
- crnobijeli laserski printer HP Laser Jet P1102

Reactionmeter CRD4 is used for the purpose of practical laboratory classes for graduate students in the course of Ergonomics in Traffic and Transport, and for research work with respondents, traffic participants. It enables measuring of different cognitive functions, and contains tests for the following measurements:
Tests of thinking:

- operative thinking (light signal identification)
- operative thinking (sound signal discrimination)

Tests for measuring the time of classical types of psychomotor reactions (light/sound/release/keystroke):

- tests of simple reaction time
- tests of disjunctive reaction time
- tests of the choice of reaction time

The tests are applied on an integral signal-control board. On the signal-control board there are three fields marked by the letters A, B and C, which contain the signal lamps. There are four lamps in field A, eight in field B, and one in field C. On the control board, there are two large keys for reaction using the right or the left hand, and a smaller key for simple reactions using a finger of the dominant hand. There are also two built-in large pedals to be activated by the feet.
Correlation: quotient of general mental ability and operational thinking
Equipment kit Reactionmeter CRD4 contains:

- signal-command module CRD4 with pedals*
- software for automated measurement process*
- generator of new tests*
- database for storing data*
- headphones PC Wintech WH-2688
- desktop computer
- 19“ LED monitor
- black and white laser printer HP Laser Jet P1102

Laboratorij za planiranje i modeliranje u cestovnom i gradskom prometu

Voditelj
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5

ZAJEDNIČKI LABORATORIJI

ZAVOD ZA CESTOVNI PROMET
ZAVOD ZA GRADSKI PROMET
ZAVOD ZA PROMETNO PLANIRANJE

Laboratory for Planning and Modelling in Road and Urban Traffic

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JOINT LABORATORIES

DEPARTMENT OF ROAD TRANSPORT
DEPARTMENT OF URBAN TRANSPORT
DEPARTMENT OF TRANSPORT PLANNING

Naziv opreme / Equipment name

Program za makrosimulaciju prometa Visum
Traffic macrosimulation software Visum

Proizvođač / Manufacturer

PTV AG, Karlsruhe, Germany

Namjena i opis / Purpose and description

Program je namijenjen za izradu multimodalnog transportnog modela analiziranog područja (grad, regija, država). Služi za prometno planiranje evaluacijom dobivenih izlaznih rezultata više predloženih varijantnih rješenja. Program služi za izradu multimodalnih modela prijevozne potražnje, odabir prikladnih metoda dodjeljivanja putovanja te optimizaciju linija javnoga gradskoga prijevoza i prometnih tokova na prometnicama. Osim analize prometnih tokova moguće je analizirati eksterne učinke prometa: razinu buke i emisiju štetnih plinova. Program omogućuje i analizu ekonomskih učinaka investicija u prometnu infrastrukturu.

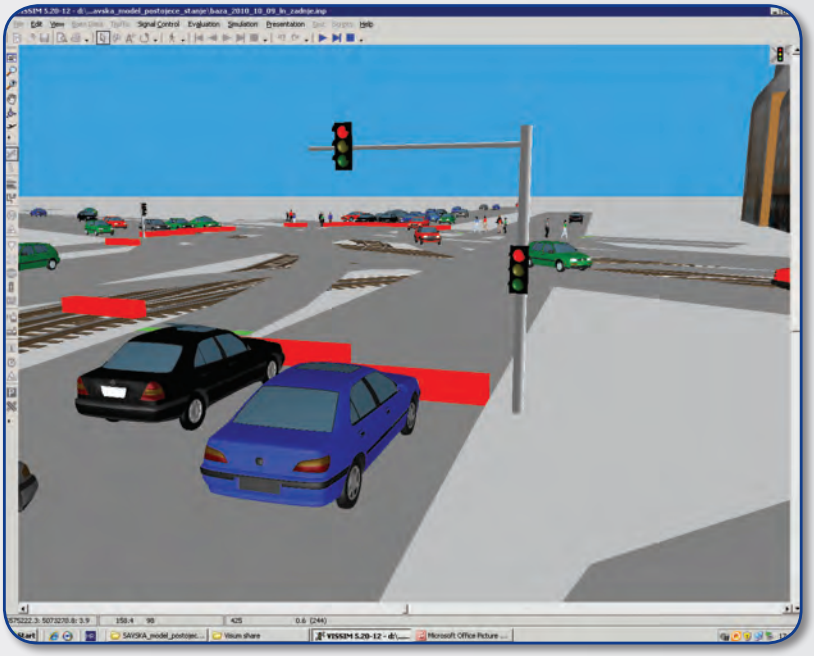
The purpose of the program is to create a multi-modal transport model of study area (city, region, country). It is used for transport planning using evaluation results of proposed variant solutions. The program is also used to create a multi-modal transport demand model, to select appropriate travel assignment methods and to optimize public transport lines and traffic flow on roads. In addition to the analysis of traffic flows it is possible to analyze the external impacts of transport: noise and emissions. The program also provides analysis of the economic impacts of investment in transport infrastructure.

Naziv opreme / Equipment name

Program za mikrosimulaciju prometa Vissim
Traffic microsimulation software Vissim

Proizvođač / Manufacturer

PTV AG, Karlsruhe, Germany



Namjena i opis / Purpose and description

Program omogućuje realističnu i detaljnu simulaciju (2D i 3D) prometnih tokova na prometnicama i raskrižjima. Na raskrižjima, osim analize relevantnih parametara (kapacitet, razina usluge, duljina repa čekanja itd.), moguće je i fino prilagođavanje signalnih planova. Podmodul VisVAP služi za izradu signalnih planova upravljanih algoritmima ovisnim o prometnim tokovima na mreži te omogućuje dodjeljivanje prioriteta vozilima javnog gradskog prijevoza. Program omogućuje simulaciju i detaljnu analizu javnog gradskog prijevoza kao i pješačkih tokova.

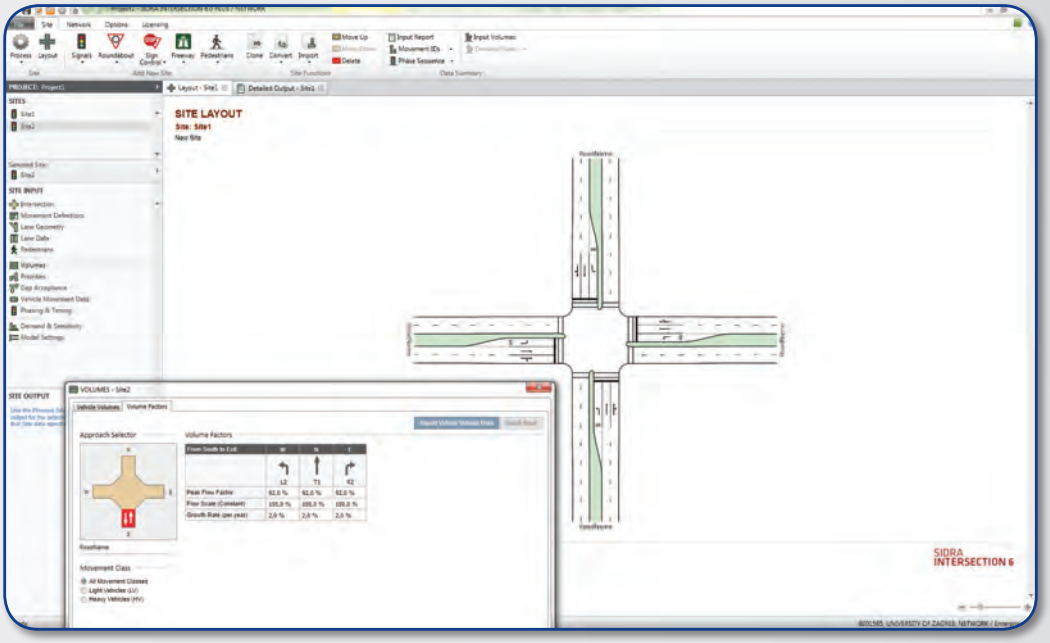
The program allows realistic and detailed simulation (2D and 3D) of traffic flow on roads and intersections. At intersections, apart from analysis of relevant parameters (capacity, level of service, queue length, etc.) it is possible to fine tune signal plans. Submodule VisVAP is used to create signal plans controlled by algorithms dependent on real traffic flows. It allows assignment of priority for public transport vehicles at signalized intersections. The program allows simulation and detailed analysis of public transport and pedestrian flows.

Naziv opreme / Equipment name

Program za analizu prometa u raskrižju Sidra Intersection
Software for traffic analysis at intersections Sidra Intersection

Proizvođač / Manufacturer

Akcelik & Associates Pty Ltd, Greythorn, Australia



Namjena i opis / Purpose and description

Program služi za detaljnu analizu semaforiziranih, nesemaforiziranih i kružnih raskrižja. Osim raskrižja u razini omogućuje analizu dionica autocesta i pješačkih prijelaza. Analizom izlaznih rezultata (propusna moć, razina usluge, vrijeme čekanja, duljine repova čekanja itd.) omogućuje vrednovanje varijantnih rješenja raskrižja. Proračuni su temeljeni na HCM 2010 metodologiji.

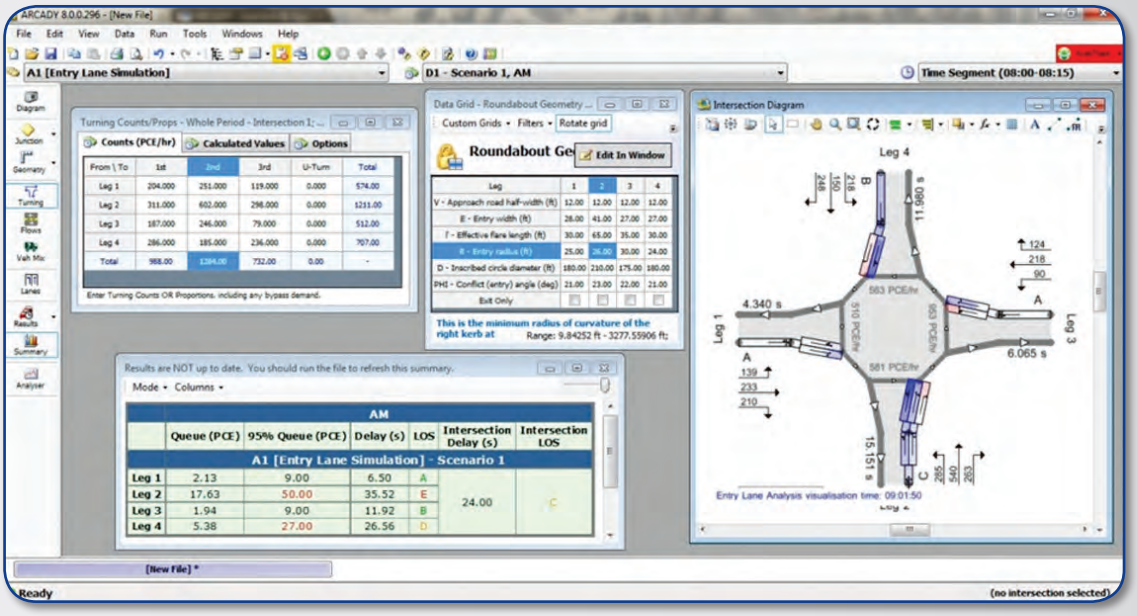
The program is used for detailed analysis of the signalized intersections, unsignalized intersections and roundabouts. Besides at-grade intersections it allows analysis of motorway sections and pedestrian crossings. The analysis of outputs (capacity, level of service, delay times, queue lengths, etc.) enables the evaluation of alternative solutions of intersections. Calculations are based on HCM 2010 methodology.

Naziv opreme / Equipment name

Program za modeliranje prometnog toka na raskrižju
JUNCTION - ARCADY
Software for intersection traffic flow modelling JUNCTION - ARCADY

Proizvođač / Manufacturer

Transport Research Laboratory - TRL Software, Berkshire , UK



Namjena i opis / Purpose and description

Junction - ARCADY 8.0 upotrebljava se za predviđanje kapaciteta, repova čekanja, vremena kašnjenja i rizika nastanka prometnih nesreća na raskrižjima s kružnim tokom prometa. Koristi se za oblikovanje i modeliranje novog raskrižja s kružnim tokom prometa, za ispitivanje učinaka postojećeg raskrižja s kružnim tokom prometa, te prilikom njihove rekonstrukcije. Raskrižja s kružnim tokom prometa modeliraju se upotrebom TRL/Kimber metodologije. Kako bi predvidio kapacitete, repove čekanja i vrijeme kašnjenja, empirijski model suštinski povezuje oblikovne elemente raskrižja s ponašanjem vozača. Moguće je analizirati različite prometne profile uz kalibraciju prema lokalnim zahtjevima. Također, sadrži „što ako“ scenarije, a direktna usporedba rezultata omogućuje preglednu usporedbu oblikovnih elemenata, odabranih modela, profila ili karakteristika pojedinih raskrižja.

Junction - ARCADY 8.0 is used for predicting capacities, queue lengths, delays and accident risks at roundabouts. It is used for designing of new roundabouts and assessing the effects of modifying the existing ones. Roundabouts are modelled by using the well-established TRL/Kimber capacity relationships. This empirical framework links roundabout geometry to driver behaviour in turn to predict capacities, queues and delays. Different traffic profiles can be analysed and simple calibration options are available for local considerations at different sites. ARCADY 8.0 contains “what if?” scenarios and direct comparison of results makes it simple to compare different geometries, models or performances side by side.

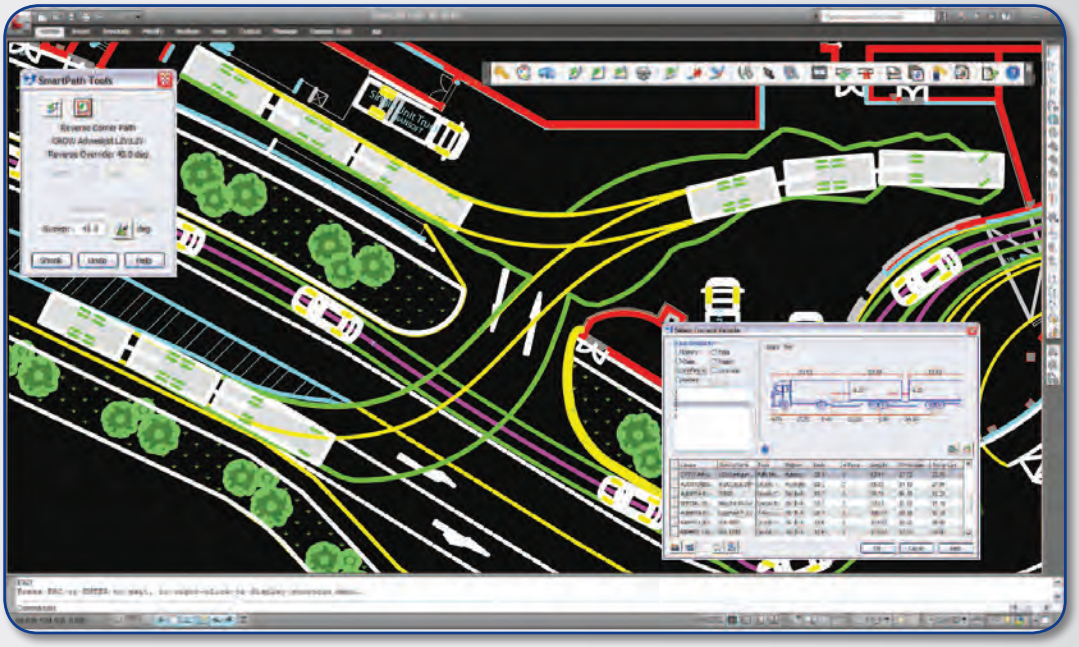
5 ZAJEDNIČKI LABORATORIJI
JOINT LABORATORIES

Naziv opreme / Equipment name

Program za projektiranje raskrižja i prometnica AutoTURN Pro 3D
Software for intersections and roads design AutoTURN Pro 3D

Proizvođač / Manufacturer

Transoft Solutions, Richmond, Canada



Namjena i opis / Purpose and description

AutoTurn Pro 3D je program za dvo- i trodimenzionalni prikaz koji se koristi na AutoCAD platformi u svrhu simulacije krivulja provoženja i okretanja različitih modela mjerodavnih vozila. Služi za analizu projektiranih elemenata raskrižja i prometnica sa stajališta provoznosti mjerodavnih vozila.

AutoTURN Pro 3D is a software for two- and three-dimensional presentation that uses the AutoCAD platform for simulation of swept and turn paths of different vehicle models. It is used for the analysis and correction of intersection and road design elements concerning swept paths of relevant vehicles.

Naziv opreme / Equipment name

Program za simulaciju pješačkog toka SimWalk Transport
Software for simulation of pedestrian flow SimWalk Transport

Proizvođač / Manufacturer

Savannah Simulations AG, Herrliberg, Switzerland

Namjena i opis / Purpose and description

Program služi za izradu simulacija u pješačkom prometu. Pomoću ovog programa omogućava se kvalitetnije planiranje, povećava se učinkovitost i sigurnost pješačkih tokova na terminalima (autobusni, željeznički, zatim na metro sustavima i slično). Program omogućava izradu 2D i 3D prikaza prema stvarnim parametrima iz realnog okruženja.

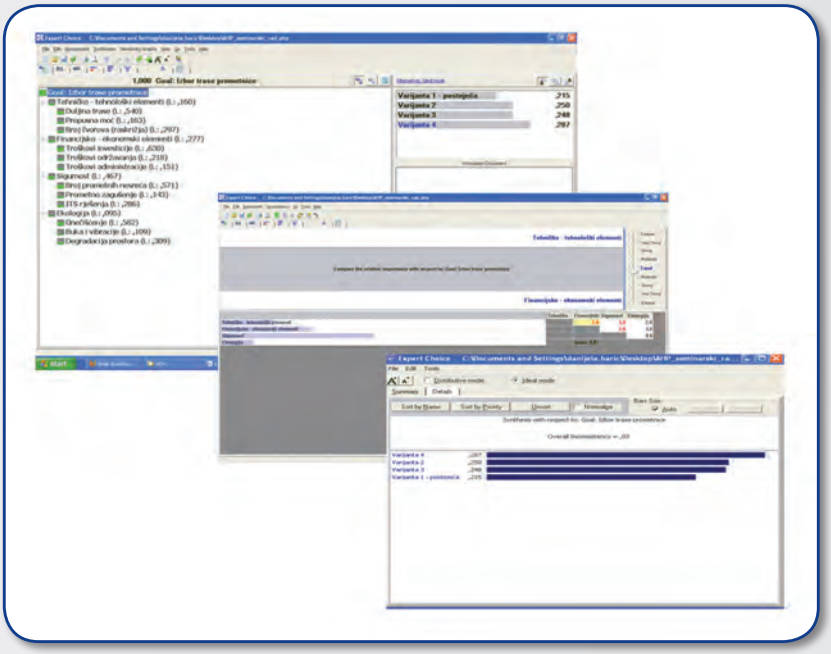
The program serves to create a simulation of the pedestrian traffic. Use of this program enables better planning, efficiency and safety of pedestrian movements at the terminals (bus, train, metro systems, etc.). The program allows you to create 2D and 3D views of the actual parameters of the real environment.

Naziv opreme / Equipment name

Program za potporu višekriterijskom odlučivanju Expert Choice
Software for multicriteria decision making Expert Choice

Proizvođač / Manufacturer

Expert Choice, Arlington, USA



Namjena i opis / Purpose and description

Programski paket Expert Choice koristi se u svrhu donošenja odluka višekriterijskim odlučivanjem. Metoda Analitičkog hijerarhijskog procesa (AHP) implementirana je u programskom paketu Expert Choice koji u potpunosti podržava sve korake karakteristične za primjenu AHP metode, omogućava strukturiranje hijerarhijskog modela problema odlučivanja te uspoređivanje kriterija, potkriterija i varijanti u parovima. Posebnu vrijednost programu daju različite mogućnosti provođenja detaljne analize osjetljivosti koje se temelje na vizualizaciji posljedica promjena ulaznih podataka. Analizu osjetljivosti moguće je prikazati kroz četiri opcije, odnosno pomoću grafova Performance, Gradient, Dynamic i Head to Head. Program omogućava kreiranje različitih vrsta izvješća.

Expert Choice is a software package used for multi criteria decision making. Method of Analytic Hierarchy Process (AHP) has been implemented in the software package Expert Choice, which fully supports all the steps specific to the application of AHP method. It allows structuring the hierarchical model of decision problems and comparing the criteria, sub-criteria and variations in pairs. Possibilities of making a detailed sensitivity analysis based on the visualization due to changes of input data represent a special value of the program. Sensitivity analysis can be displayed through the four options, using graphs Performance, Gradient, Dynamic and Head to Head. The program allows creating different types of reports.