UAV Road Surface Monitoring and Traffic Information

ICT & HighTech for Transportation and Utilities
Czech Republic

Population: 10 300 000
Surface area: 78 864 km²
Czech Road and Motorway Network
Czech Railway Network
Transport telematics (ITS) integrates telecommunication and information technologies (ICT) with transport engineering in order to optimize transport and forwarding processes.

- It is an instrument of a sustainable transport in Europe helping to better economy, ecology and safety.
- Telematic principles are applicable in all the transportation modes and in other utilities (construction, energy, telecommunications) as well.
ITS macro functions

- electronic tolling
- management of rescue services
- traffic management
- public transport management
- intelligent vehicle
- journey planning & information provision
- fleet and freight management
- enforcement systems
ITS&S - Intelligent Transport systems & services

ITS&S (Sdružení pro dopravní telematiku) is a **successful sector cluster** in the area of transport telematics with a multiyear tradition.

Representing Czech & Slovak Transport Telematic Community
ITS&S

- Founded 2000 as ITS&S Czech Republic
- Today 80 Czech and Slovak companies & institutions on board. Fast growing membership base.
- Complying with the COMMUNICATION FROM THE COMMISSION, COM (2004) 353 final Brussels, 16. 6. 2004: Science and technology, the key to Europe’s future – Guidelines for future European, Union policy to support research
- Member of the steering committee of the Network of ITS National Associations
ITS&S – WEB – www.sdt.cz

Our Mission

We are ITS&S – association of companies, institutions and universities from the Czech Republic and Slovakia, that deal with using information, communication technologies and services (ITS) in transportation sector and other utilities. Our mission is:

Representation of Czech & Slovak ITS
- Strategic marketing & product development
- International co-operation
- Assistance in Eastern European ITS initiatives
- Education & training of ITS professionals, users
- Co-ordination of members' projects
- ITS projects support via working groups

Joint Industry Portfolio
- Sensors & actors: gate crossing signals, cameras, active and passive detectors, radar
- Communications: GSM-R, GSM, GPRS, EDGE, DSCC, RFID, WiMAX, CALM
ITS&S - WEB - www.sdt.cz
Representing Czech & Slovak Telematic industry over Europe

- **Sensors & actors:** gate crossing signals, cameras, active and passive detectors, radar
- **Communications:** GSM-R, GSM, GPRS, EDGE, DSRC, RFID, WIMAX, CALM
- **Positioning:** GPS, Glonass, Galileo, EGNOS, gantry systems
- **Data processing:** GIS, billing, management, expert systems
- **End user devices:** on-board units, chip-cards, user terminals
- **Services:** technical, financial consulting
ITS&S - Structure

- **Public sector**: Road & Highway directorate, regions: Prague, Brno, Plzeň, Zlín, Olomouc, …
- **Universities, R&D**: TU Zilina, CTU Prague, CDV, UDI, Telematix, VUS Banska Bystrica, …
- **Domestic consulting**: KPM Consult, BABTIE, PBA, TRANIS, TECHNOLOGIES&PROSPERITY, …
- **System integrators**: PVT, XT Card, ČD Telematika, …
- **Transport operators**: Prague, Brno, Bratislava, …
- **Car manufactures**: Škoda Auto
- **Domestic suppliers**: AŽD Praha, CEDA, Camea, CROSS, ELTODO, Evolving Systems Consulting, Mikroelektronika, EMTEST, Princip, Spell, CSAD SVT, Značky Praha, …
- **International corp.**: Alcatel, Kapsch, Navteq, Siemens, …
- **Telco**: O2 Telefónica, T-Mobile CZ, …
- **Construction comp.**: Metrostav, VIS, Brněnské komunikace, …
- **Banking sector**: ČSOB
ITS&S Success Stories

- Education of domestic market
- Czech industry promotion in EU & Slovakia & Bulgaria
- Lobby & media support of space technologies (CZ a new member of ESA)
- Interoperability of electronic ticketing in public Transport
- Efficiency of national tolling systems
- E-Vignette SSADM methodology
- Road safety of lives in Europe
New capabilities for Unmanned Aerial Systems

- Current usage (military operation service)
- Possible civil usage (possible missions)
- Legislative background
- Needs for suitable technologies (collision avoidance, BLOS communication, data processing, ...)

Suitable UAS missions

- Any kind of monitoring or surveillance missions
- Substitution for satellite monitoring (weather monitoring, environmental monitoring, civil security, ...)
- Substitution for piloted flights (police monitoring planes or helicopters, fire guard planes or helicopters, dusting planes, coast guard planes ...)
UAS advantages in comparison to satellite missions

- Rapidly lower purchase price, lower cost of operation and maintenance procedures
- Much better accuracy of acquisition data (picture resolution, …)
- High maneuverability
- Wide availability
- Ability to accomplish a broad spectrum of narrow specified missions
UAS advantages in comparison to piloted missions

- Lower cost of operation and maintenance procedures
- Higher duration of flight
- Minimized risk of failure of human factor (lassitude, carelessness, ...)
- Minimized risk of human losses in case of crash or accident
JAA/ Eurocontrol, UAV TASK-FORCE

- A CONCEPT FOR EUROPEAN REGULATIONS FOR CIVIL UAVs (2004)
- Airworthiness & certification
- Security
- Operations, Maintenance, Licensing
- ATM
- Aerodromes
Applicable technologies and technical needs

- Collision avoidance systems (Sense & Avoid)
- Terrain avoidance systems
- Beyond Line of Sight (BLOS) communication
- Bandwidth requirements
Proposed UAS missions

- **Mission #1**: Roads Surface Condition Monitoring (in mountain region)
- **Mission #2**: Highway Traffic Monitoring
- **Mission #3**: City Traffic Information and Management
Mission #1: Roads Surface Condition Monitoring (in mountain regions)

- Monitoring road icing and surface condition with respect to meteorological situation
- Prediction of danger traffic situations
- Gritting vehicles management
UAS Payload

- Electro-Optical/Infrared sensor (with ability see through clouds and fog)
- Surface temperature measurement system (thermal camera)
- Future development of necessary sensors
- Data processing must be specified
Scheduled UAS missions

- Mission planning according to the actual weather forecast
- Navigation by following way-points tracking roads in desired areas
UAS availability

- During winter period continual missions to ensure actual state information
- Actual availability regarding weather forecast and actual conditions (temperature, snow-fall, ...)
- Emergency situations in case of snow calamity
HAES Scanner
Mission characteristics

- Payload: 10 kg
- Range: 25 km
- Altitude: 1000 m
- Speed: 80 - 150 km/h
- Endurance: 2 hr
Mission #2: Highway Traffic Monitoring

- Highway traffic monitoring using UAS on-board camera
- Providing real-time video information for Uniform Traffic Information System
- The most important information: car accidents, traffic jams, road work information, weather conditions
- Desired characteristics: as quick as possible reaction on actual occurrence
Uniform traffic information system (Czech Republic)

- Road and Motorway Directorate (RSD)
- Uniform Traffic Information System (JSID)

**Inputs:** emergency calls (police, ambulance, …), toll-gates sensors/cameras, static cameras, radars

**Outputs:** radio, Internet, information panels, GPS, SMS/MMS
UAS Payload

- High resolution camera in daylight conditions, infrared imaging system in case of night operations
- Effective data processing of flow of moving vehicles
UAS availability

- Continual missions to observe actual situation
- Following way-points tracking highways
Mission #3: City Traffic Information and Management

- Monitoring of city traffic situation
- Insist on traffic during morning and afternoon peak time
- Monitoring of critical areas (highway exits, cross-roads, ...)
- Adaptive semaphore algorithms regarding actual situation
UAS Payload

- High resolution camera in daylight conditions, infrared imaging system in case of night operations

Key issues:
- Optics
- Chip resolution
UAS availability

- Daily continual missions insist on traffic peak time
Experience with using UAS

- Demonstration tests
Technological needs

- High performance UAV (all-weather operations)
- BLOS datalink
- Collision avoidance
- Terrain avoidance
- Suitable IR sensor (road surface analysis)
- Camera (sufficient optics, chip resolution)
Services delivered by UAS providers

- Analysis of mission with respect to technical aspect of deployment
- Mounting of required payload necessary to accomplish mission
- Transport to operation area and detailed mission planning
- Ensure UAS operation service and necessary maintenance procedures
- Providing gained data in given format
Let’s co-operate together!

- Topics
- Financing
- Research & Development
- Mobility
- Economy, Ecology & Safety
- ITS deployment
- Complex ITS Offerings Delivery
Looking forward to our co-operation!

Mr. Richard Sysala
e-mail: richard.sysala@evolvsys.cz
Mr. Jiří Novák
e-mail: jiri.novak@evolvsys.cz
Mr. Roman Srp
e-mail: r.srp@sdt.cz

ITS&S (Sdružení pro dopravní telematiku)
Bartolomějská 11 or Konviktská 24
110 00 Praha 1
Czech Republic
tel.: +420 226 207 111
fax: +420 226 207 110
More details here: www.sdt.cz