

Session Report

Date: 12/04/2022

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**TECHNICAL SESSION R 10.2 ROAD NETWORK OPERATIONS TO INCREASED RESILIENCE - PART 2
THURSDAY FEBRUARY 10TH, TIME ZONES: GMT: 02/10| 16:45 - 18:15 PARIS : 02/10| 17:45 -
19:15 NEW-DELHI : 02/10| 22:15 - 23:45 TOKYO : 02/11| 01:45 - 03:15 SYDNEY : 02/11| 03:45 -
05:15**

1. KEYWORDS

Road users, ITS, Road Network Operations, Data, Mobility, Smart Roads, Traffic, Network

2. PRESENTATION OF THE SESSION

When disruptions happen the ability of road operators to deliver information properly to road users may be compromised and the efficiency of road operations may be jeopardized. Hazards occurring along the network (like winter extreme situations or high impact events for example) can be a challenge for many Road Operators in terms of ensuring the viability of the road, and therefore the mobility of people and goods along the network itself.

New technologies offer new possibilities to engage with road users and avoid disruptions.

This session aims at presenting some of most promising applications of new technologies to Road Network Operators and ITS solutions.

3. PROGRAMME OF THE SESSION

Session Chair: Valentina GALASSO, Chair of TC 2.4, Italy

Session Organiser: Valentina GALASSO, Chair of TC 2.4, Italy

Session Secretary: Kaouther MATCHA, French-Speaking Secretary of TC 2.4, Tunisia

Q&A Moderator: James ELLIOTT, English-Speaking Secretary of TC 2.4, United Kingdom



Presentations

Person	Organisation, Position...	Title of the presentation
Paula PÉREZ LÓPEZ	General Directorate of Roads - Spain ITS Expert at MITMA (Misterio de Transportes, Movilidad y Agenda Urbana)	Intelligent communication system that alerts road users of the presence of operators on the road (IP270)
Toni PAJU	Finnora Oy – Finland Managing Director of Crowdchupa, a company building a mobile game to crowdsource data collection from infrastructure assets with the	Crowd sourcing road condition surveys through a mobile game (IP0018)

Person	Organisation, Position...	Title of the presentation
	help of artificial intelligence.	
Martin MARGREITER	Technical University of Munich - Germany Research Group Leader and Lecturer, Chair of Traffic Engineering and Control, TUM, Munich, Germany (Member of PIARC TC 2.4)	Increasing Freeway Network Resilience by Advanced Congestion Type Analytics (IP0069)
Luigi CARRARINI and Daniela DE NIGRIS	ANAS S.p.A. – Italy Program Manager for ANAS Smart Road Project (Member of PIARC TC 2.4). Head of Technological Infrastructure Plant and Energy Management Division (Member of PIARC TC 2.4)	ANAS Smart Road Cortina 2021 - A first implementation of C- ITS services on Italian roads (IP0370)

4. TECHNICAL FINDINGS AND DEBATE

This session presented some interesting case studies that show real application of new technologies and big data for road network management. There are several ways to include data collection and analysis within road operators' activities and experiences on this field are various and depends a lot on the approach each country / road operator decided to apply.

ITS and C-ITS technologies are based on data in order to perform. So the data mastering is a key issue for road operators.

In the following is proposed a short description and main findings from each of the presentation proposed:

Title of the presentation	Abstract
<i>Intelligent communication system that alerts road users of the presence of operators on the road (IP270)</i>	Without workers in the road maintenance, maintenance and operation sector, commonly known as COEX operators, the road safety of all drivers would be severely compromised. Our challenge is to significantly reduce road maintenance worker crashes through the use of Internet of Things IoT technologies. We want to connect workers and vehicles, to increase their visibility on the road and to use connectivity as a digital shield to protect them in dangerous situations. From the Ministry of Transport, Mobility and Urban Agenda we are studying for its possible future implementation, a service that will connect in real time COEX operators with road users to ensure their safety. In addition, this innovative service could be applied in the autonomous cars of the future, key information for preventive decision-making in this type of link. We are certain that digitalisation in the field of prevention is a key factor in reducing the number of accidents caused by road accidents involving workers.
<i>Crowd sourcing road condition surveys through a mobile game (IP0018)</i>	Crowdchupa is a mobile game for crowdsourcing the collection of video data. In the game, people collect virtual objects by recording video and artificial intelligence analyses pavement defects from the videos. The data can, then, be used in a road asset management system to make optimized maintenance plans.
<i>Increasing Freeway Network Resilience by Advanced Congestion Type Analytics (IP0069)</i>	This paper presents an approach that increases the resilience of a freeway network while differentiating patterns of freeway congestion events and investigating hot spots of each pattern both spatially and temporally. Based on an automated pattern recognition, an emerging congestion event can be identified and classified into one of four predefined congestion patterns. Determining the spatial and temporal extensions of several congestion events, hot spots of each pattern can be localized. Additionally, possible traffic management and control measures are compiled and evaluated by expert statements to mitigate and

Title of the presentation	Abstract
	<p>dissolve the found congestion hot spots. This approach provides a helpful toolbox for freeway operators to classify occurring congestion into predefined categories and to select appropriate countermeasures based on the hot spot analysis to increase the resilience of the overall system. By applying the presented methodology, optimized traffic information is provided to the operator in time-critical situations, which enables an improved decision-making process in traffic management. The data base is three large-scale data sets from stationary detectors, vehicle re-identification sensors, and floating car data collected on a German freeway in 2019.</p>
<p><i>ANAS Smart Road Cortina 2021 - A first implementation of C-ITS services on Italian roads (IP0370)</i></p>	<p>Anas S.p.A., the Italian Authority for national roads, has been conceiving, designing and implementing Cooperative-Intelligent Transport Systems (C-ITSs) so as to improve road safety and traffic control and enable advanced driving experience since 2013. During the FIS Alpine World Ski Championships taking place in Cortina d'Ampezzo in February 2021, "Anas' Smart Road" is going to exhibit how powerful its pioneering infrastructure can turn out to be: a series of road-side "flying poles", powered by green energy and featuring IoT sensors, Wi-Fi Access Points, DSRC hotspots and LTE-Vehicle Base Stations, communicates with On-Board Units (OBUs), which vehicles are equipped with, to provide drivers with Day 1 and Day 1.5 services. Given the location and the climatic context, the road has been equipped also with a one-of-a-kind patented weather sensing system in order to enable the acquisition of real-time information on precipitation, visibility, road pavement conditions and air temperature with very high spatial granularity. In addition, Anas S.p.A. has set up a monitoring system called AREA (Automatic RoadWorks Extension Alert) System, for real-time localization and characterization of road works (both moving and stationary ones).</p>

5. RECOMMENDATIONS FOR DECISION MAKERS, FOR PIARC OR FOR INTERNATIONAL ORGANISATIONS

Main take away from this session:

- IoT and new technology applications are very relevant for road works management: protect workers, improve road network operations and inform road users are the main key aspects to be taken into account;
- Crowdsourced data collection can be a way to increase quality and variety of road data thanks to AI that improve Asset management;
- High level analysis of traffic data related to congestions, can increase both awareness of traffic phenomena and management of situation, together with better planning along the road network
- Road operators might want to put together different kind of innovations and new technologies in order to pursue several purposes: from optimizing road network operations to prepare for autonomous vehicles;
- Data collection and analysis is a big issue to consider for road operators and it will be more and more a key aspect for road network management
- Main challenges for road operators for the future are:
 - Managing data
 - Mastering data analytics and data-driven decisions
 - Breaking the individual vs. system tradeoff
 - Building a public-private coalition to drive transportation innovation

6. PREPARATION OF THE SESSION

This session was planned, designed, and organised as follows.

Session Chair: Valentina GALASSO, Chair of TC 2.4, Italy

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Case studies presented were selected among papers submitted to Calgary Congress' Call for Papers. Selection was made by a panel of reviewers from TC 2.4 according with the level of innovation proposed and the alignment of the subject to the them of the call for papers.