ID: 0039

Road Weather Nowcast (RWN) data in winter maintenance and ITS systems

Pavel Stingl

ChanGroup s.r.o.
Palackého 307
Dolní Rychnov, Czech Republic

Corresponding author's E-mail: soft@changroup.cz

ABSTRACT

RWN project, which was started with cooperation with Institute of Atmospheric Physics (part of the Academy of Sciences of the Czech Republic) and Czech Hydrometeorological Institute, reaches the state of the operational outputs from numerical model and is usable in the end-user SW application.
Our presentation software is designed not only to display data output from the model, but to provide complete data platform for other systems that use these data. It means we are able to prepare other modules/software applications with current forecast data in any form (XML, JSON etc.) to the other users in very short time after the data are available.
Software is able to distribute visualized forecasts to end users in very short time in heterogeneous network environment, with instant impact on decision process in winter maintenance. The data are delivered in context with measured data from each road weather station and forecasts are further validated by currently measured values on hour basis.
This software with current, accurate nowcasts will deliver the basic platform for further more difficult decisions in winter maintenance processes and generate additional data for delivery to Intelligent Transport Systems or to other applications in traffic infrastructure, winter maintenance and public ITS portals to be able to react on changing weather conditions a bit earlier the change actually occurs.
Keywords: Information system, winter maintenance, nowcasting.

1 INTRODUCTION

The RWN project was started to deliver to end users in winter maintenance process accurate, reliable and current data, with forecast and nowcast data as accurate as possible. Main motivation is very unstable weather, which complicates winter maintenance in the Central Europe, mainly influenced by the temperatures of the road pavement, which very often varies very near to 0°C. Our project is mainly targeted to visualize and process the data from METRo-CZ model, which has highly accurate forecast of pavement temperature and prospective road state, and also the data read from many sources (ie. Road Weather Stations, special short-term forecasts, mobile measurement etc.). The RWN project brings together this data to get the full overview of weather situation with short-term view, what needs to be done to maintain drivable roads.

2 RWN PROJECT

The project was started in 2013, based on existing winter maintenance dispatcher system called ARWIS (Advanced Road Weather Information System). This platform was chosen, because integrating the data from METRo-CZ system developed by the Institute of Atmospheric Physics, Academy of Sciences of the Czech Republic and Czech Hydrometeorological Institute, is very simple due to very sophisticated modular import platform of the system. Following integration in the visualisation layers was developed, and data is used in DSS module used for very accurate recommendation for dispatchers of winter maintenance. ARWIS has export

modules, which are used to further share the data, either in raw form and as computed or processed data for use in other software systems as ITS systems and RDS and navigation software.

3 VISUALIZATION LAYER

Short overview of current weather condition and visualization of warnings, forecasts and other data entering the system is managed in maps, where the end user can very quickly get the thorough information about the state of the maintained area. If there is something suspicious, user can get more detailed information by clicking on the map, or by entering textual and graphical section of the system.

Fig. 1

In the figure 1 is an example, how looks visualisation of the special short-term forecast (blue color) and warning for heavy precipitation as red-colored area. Every warning or forecast is for specific area, which is described in map. The colors are changing by the type of forecast/warning so the dispatcher has very quick idea, what the information from meteorologist is about.

On the Fig 2 is the behavior of mobile measurement in the overview map, where the data is acquired by moving car with special sensor detecting road state, and transmitting currently read data to the system. The lines tracing the movement of the car are most saturated if the data are current. The older the data is, the line is losing saturation, and finally disappear from the map. The color coding is the same for road states from Road Weather Stations. The colored boxes in the map are data from immobile stations, where dispatcher can view the current road state nowcast in the bar on the top of box, and actual data about road state and pavement temperature in the lower part of the station box. If the box is round shaped, it means the station is equipped with camera, and there is image available.

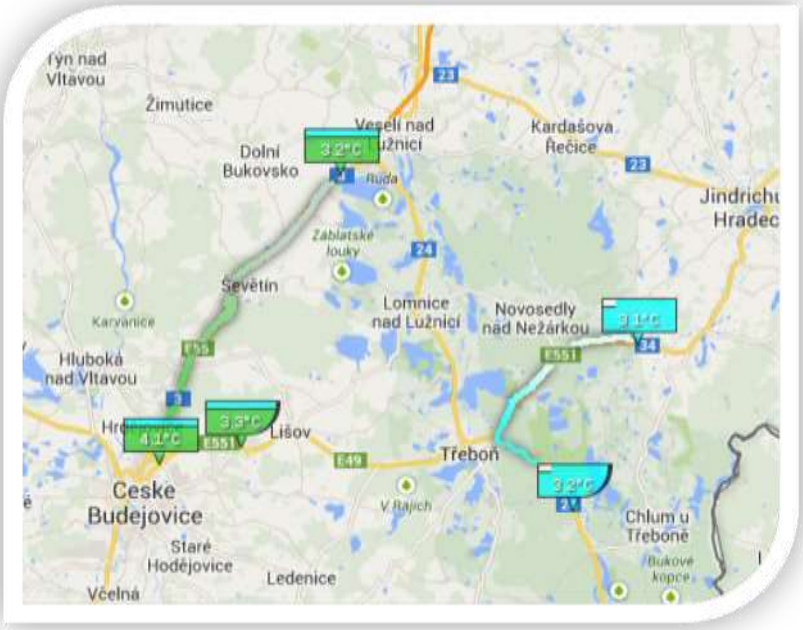

Fig. 2

In the Fig. 3 is presented table with current and historical values coming from currently selected road weather station, with graphical representation of every value and graphical presentation of nowcast for current station.

Fig. 3

Fig. 4

In Fig. 4 is interface for station cameras, where user can have very quick look on desired stations. After clicking on the camera image, user can see 2-hour history images from the station in native resolution of the image.

4 OTHER MODULES OF THE SYSTEM

The next parts of the system are interfaces for reading data from variable traffic signs, which are controlled either by dispatcher (textual tables with warnings, restrictions for drivers) or automatically controlled by the road weather station. System has a mechanism to check, if states on signs correspond to the weather conditions on the road by comparing data coming from station and sign.

ARWIS has also the mechanism to check the incoming data from automatic stations to detect, if data is valid, sensors are working as required and all false values are filtered and reported to the maintainer of the station, who takes countermeasures and ensures the station state.

Decision support system module is software, which monitors the situation in the monitored area (which can be set by user), and gives the users information about dangerous conditions on the road together with the recommendation, what needs to be done. This module will be in future replaced by more sophisticated model, which will use the DSS output of the METRo-CZ model.

Export module for METRo-CZ model fetches the system with currently measured data, which the model computes to further refine the forecast. Nowcasts are released on hour basis, thus very accurate and current.

5 CONCLUSION

The system in combination with RWN project and all the data coming into the software is very compact and thorough interface, where winter maintenance dispatchers can find every data available to further ease the decision in the winter maintenance process, in very simple form and assisted by the DSS, which gives the user recommendation for the next steps to be done. The nowcasts are an alternative approach to the systems relying on the thermal mapping of the roads, with much more flexible possibility to further expand the measuring network with almost zero additional costs, compared to the thermal mapping of the specific locations and roads. The further sharing data between different software systems gives to this system status of flexible data source to many software appliances.