IMPLEMENTATION OF GOOGLE MAPS API AND XML STANDARD FOR NEAR REAL-TIME MONITORING OF METEOROLOGICAL PHENOMENA

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Spatial and temporal variability of meteorological phenomena plays an important role in mountainous catchments. Flood concentration times are short, meteorological conditions can change very fast and often extreme events are observed only locally. Żywiec County, with total area of about 1000 km^2, situated in the Carpathian Mountains near Polish-Czech-Slovak border is one of such regions affected by extreme hydrometeorological events. After big flood in Poland in 1997, decision about construction of 28 automatic stations for flood prevention and forecast in this area was undertaken. Many meteorological parameters are presently measured by monitoring system every 10 minutes and transmitted to central database in Cracow. Main user of the system is county crisis management team. Public access to gauged information starts to be also an important issue. For that purpose, scalable and well-documented standards and tools for data exchange and visualization were needed. Combination of XML and Google Maps API was tested within presented research.

XML (eXtensible Markup Language) is a markup language used i.a. for data exchange. Supported by many modern applications integrates also easily with Google Maps – user friendly, web mapping service. Google Maps enables spatial visualization of custom markers on vector maps and satellite images covering the whole Earth. Within Google Maps framework JavaScript language is used for interaction with user. Google Maps API (Application Programming Interface) offers functions for zooming, panning, geocoding, search and others.

Two different methods of source data access were implemented in presented system – direct database request and XML files. Direct database request method is good for analytical purposes when wide temporal range of data is needed and access time is not of main concern. In the case of emergency, fast access to current data is crucial and this goal was assured by use of XML files. Presently the following meteorological phenomena can be visualized in the system: air temperature at three levels, precipitation depth, relative air humidity, wind speed and direction. Custom set of markers was developed for simultaneous presentation of different meteorological processes on map in compact form (Figure 1).

Recent monitoring data are available trough on-the-fly generated XML text files. Meteorological information is presented in the form of markers related to different phenomena. More detailed information is available in two tabs related to each monitoring station. First tab displays values of meteorological parameters at selected station (Figure 1). Total amount of information at every gauge station exceeds direct on-map presentation possibilities, so complementary graphs and animations of temporal changes of meteorological phenomena were grouped in the second tab (Figure 2). Additional (historical) data for this task are read directly from database. Developed application is customizable. For example, user can change colors of created objects and chart elements. Working in web browser environment, system does not need installation, thus can be
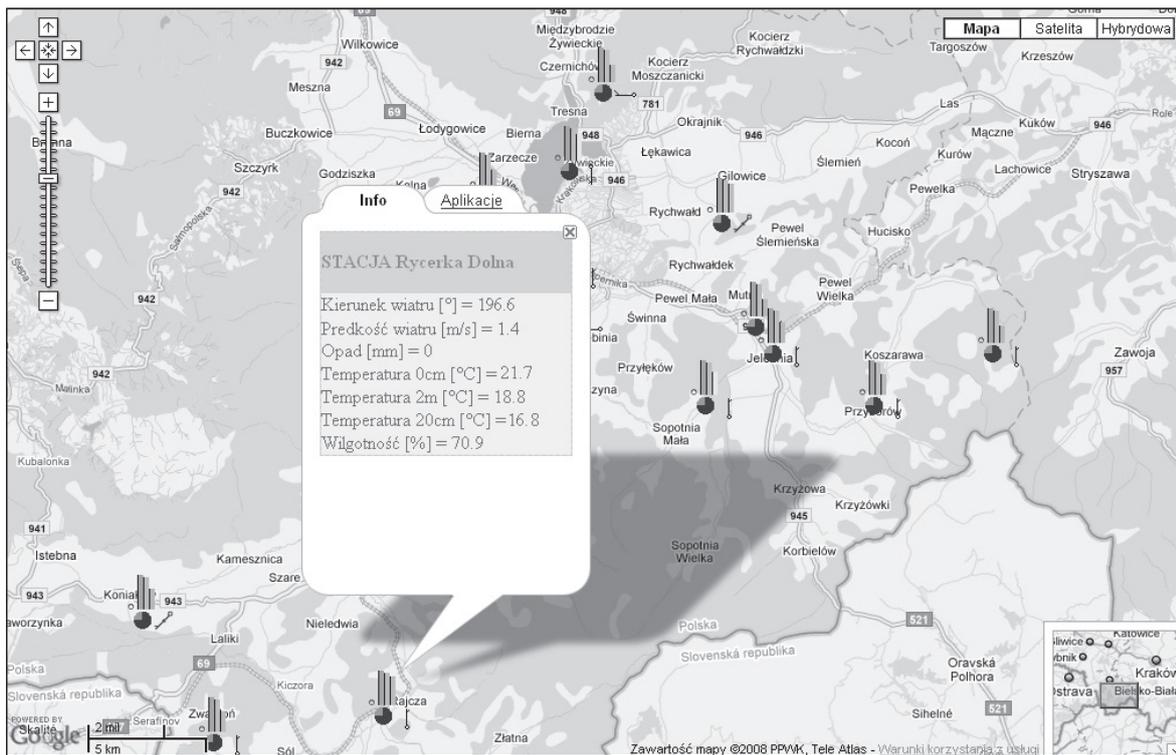
Figure 1. Google Maps interface (map) with markers corresponding to current data from monitoring stations in Żywiec County and pop-up window with detailed data for Rycerka Dolna station
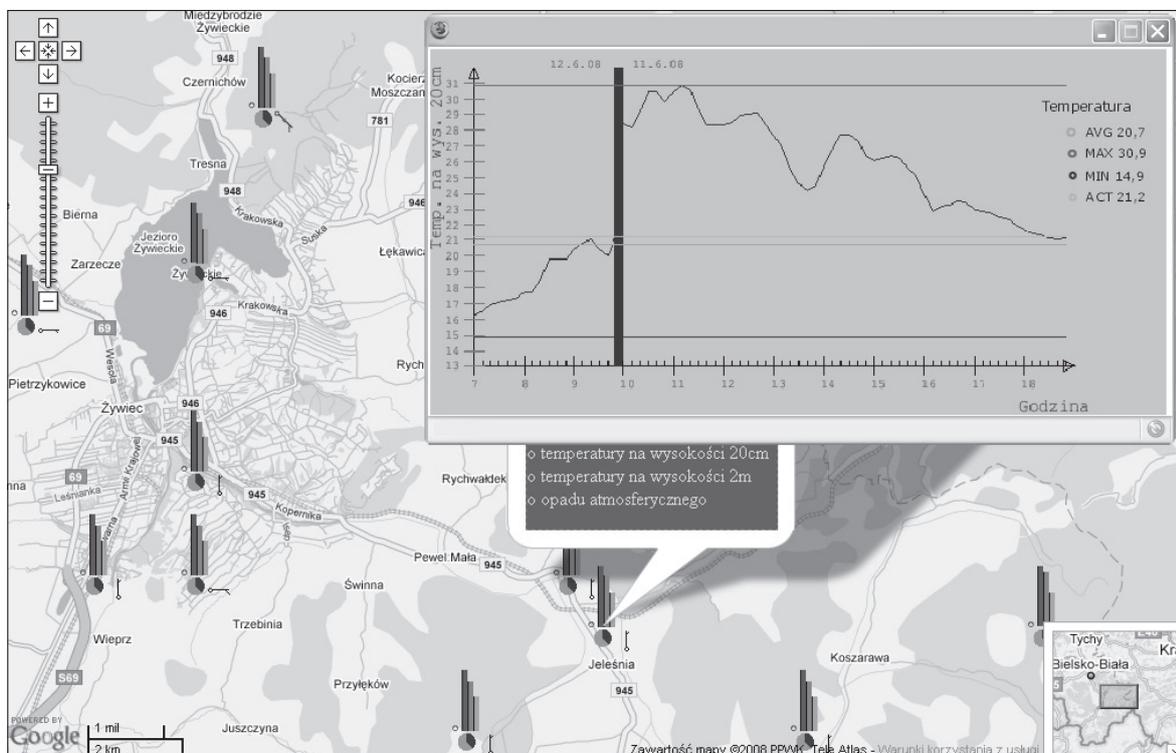

Figure 2. Pop-up window with animated temporal changes of air temperature at 20 cm. Dark vertical line indicates "24-hour time shift" in two corresponding days. Left side – current, right side – previous. In the background - hybrid image with current meteorological data

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easily accessed by everyone with access to Internet. Potential user should however have latest version of web browser with JavaScript enabled. Presented system can be useful for local government users in near real-time threat monitoring, for local communities in rising public awareness and for scientists as additional tool for data visualization. Integration of data from different sources is possible within Google Maps, so it can become good environment for interoperability testing and data cross validation.

Żywiec County monitoring system is only one of many other sub-networks of the whole system managed by "TRAX Elektronik". At the moment it covers area of Poland and consist of about 440 monitoring stations. Described monitoring system for Żywiec County is however unique due to its density, and from that reason can be good experimental field for implementation of such modern technologies.