UrbanFlood: automatically create early warning systems that watch internet data streams

Internet attached clouds supply data center capacity on demand. Sensors are read out via the Internet – wherever they are.

Data centres, early warning systems and parts are automatically created and (re)connected to information flows.

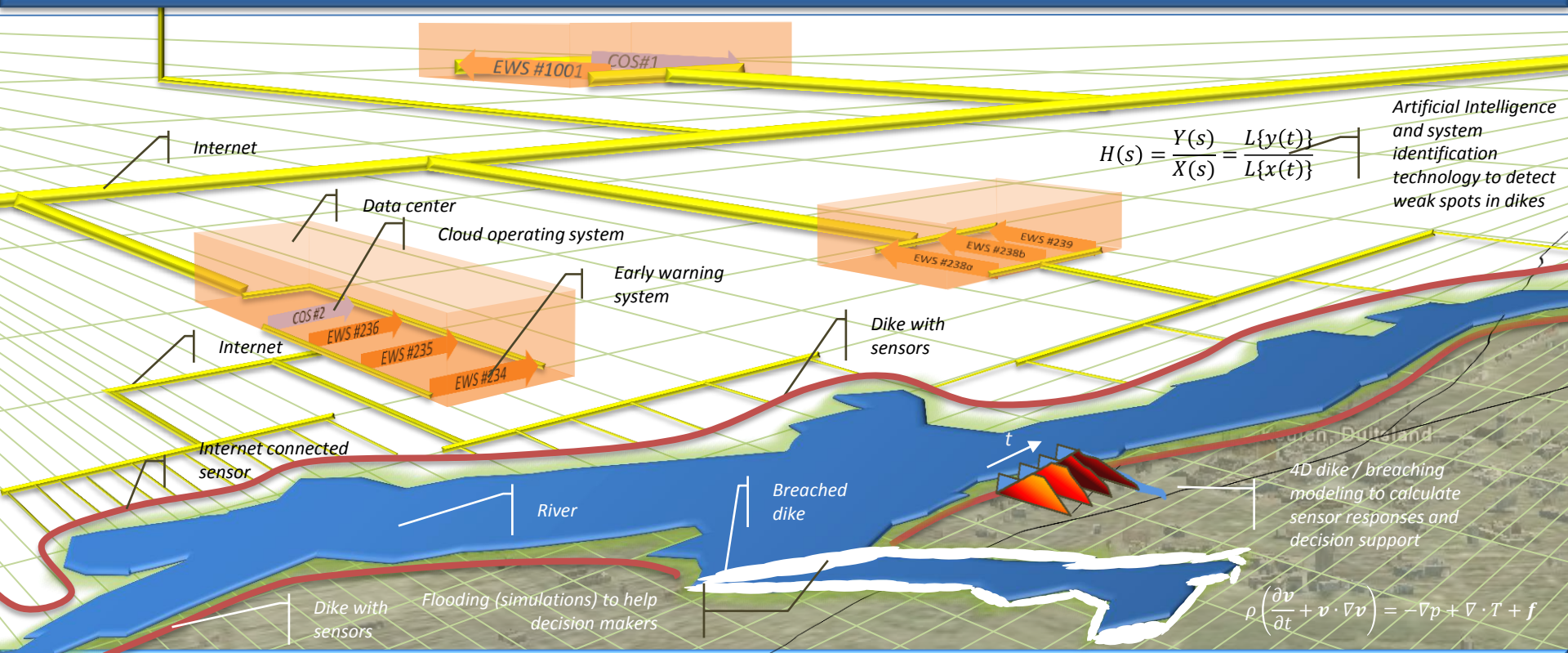
The early warning systems can monitor many types of sensors residing in roads, homes, windmill farms, environment, machines... Specific software is easily incorporated.

The system is applied in dike monitoring and flooding. The system is trained to handle generation 2 dike sensors and contains software that models dike behavior.

End user interaction via multi touch tables and the web. Common information spaces to exchange information with other computers.

The UrbanFlood technology also monitors its own ICT infrastructure.

Common Information Spaces, 4D visualisation, decision support, automatic capacity scaling



Application: world wide monitoring of dikes that protect urban areas

UrbanFlood Consortium:
TNO (The Netherlands)
Cyfronet (Poland)
HR Wallingford (United Kingdom)
OOO Siemens (Russia)
STOWA (The Netherlands)
University of Amsterdam (The Netherlands)

www.urbanflood.eu

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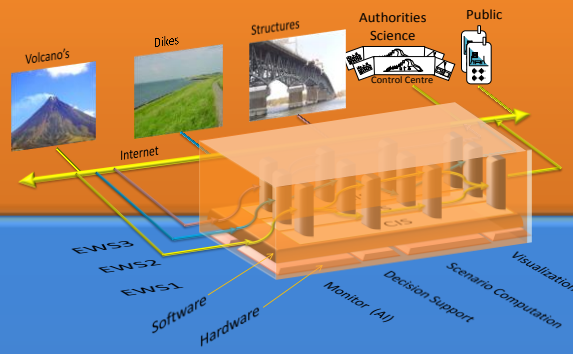
SEVENTH FRAMEWORK PROGRAMME

UrbanFlood
TNO
Eemsgolaan 3
PO Box 1416
9701 BK Groningen
The Netherlands
info@urbanflood.eu

TNO CYFRONET HR Wallingford Working with water SIEMENS stowa Computational Science

UrbanFlood: ICT to mitigate the effects of climate change in urban environments

Extreme weather conditions, caused by the climate change, may affect the environment of urban area's in such a way that a disaster is triggered: forest fires, mud slides, avalanches and floods are well known examples. In many of these environments, sensor networks can be used to detect potential dangerous conditions. The EU funded project UrbanFlood develops an early warning system (EWS) technology to monitor these sensor networks via the internet.



UrbanFlood applies its EWS technology to the case of flooding due to the breaching of dikes. From a technical point of view this is a most demanding case. The UrbanFlood is able to monitor thousands kilometers of dikes with potentially thousands of EWSs. Dikes monitored can be as small as a hundred meters (typically used for tests) or as large as a few hundreds of kilometers (e.g. part of the dike along the Rhine river). The UrbanFlood EWS technology monitors dikes through the internet, hence dikes can be anywhere in Europe – or even in another continent.

UrbanFlood technology allows to generate internet based EWSs. Each EWS contains a common information space (CIS) containing facilities for data storage and workflows. These workflows connect computer programs within and between EWSs, command and control centres and web applications. Internet attached clouds are used to create, on demand, new EWSs, as well as to adapt the processing capacity of running ones to the needs of a situation. To increase capacity, for example, parts of an EWS, being an spreadsheet, artificial intelligence software or another EWS, are disconnected from the workflows, replicated multiple times on other cloud computers and reconnected to the workflows.

Dikes in the United Kingdom, US, Netherlands and Russia will be monitored by the UrbanFlood technology. Artificial intelligence and system identification technologies discover anomalous dike conditions. Once a potential weak spot is discovered, models for dike stability, the breaching process itself as well as flooding simulations determine the associated risks. Decision makers research "what if" issues via multi touch tables that spawn 4d dike stability calculations and flooding simulations on clouds.

www.urbanflood.eu

Experiments with dikes (picture left, www.ijkdijk.nl) and long time monitoring of dikes (picture above, www.livedijk.nl) enable UrbanFlood to deal with generation 1 and 2 types of sensor measurements. Generation 1 sensors typically yield information that experts can directly plug in their models and calculate the probability of breaching: water height in seas and channels, water pressure and humidity in a dike. Generation 2 sensors excel in detecting directly the onset of breaching, e.g. fiber optic accelerometers. However, events like tides and passing ships cause temporal movements of dikes. UrbanFlood exploits these events to infer if the dike reacts as expected – on basis of past observations, AI and system theory as well as 4D calculations of dike movement.

World wide monitoring of 10000's km of dikes