Event Prediction and Decision Support based on Huge Data from Physical-Social Systems

At a glance

Project acronym:
EPPICS

Project type:
Integrated Project (IP)

Programme and area:
Seventh EU Framework Programme (FP7-ICT-2013-11)
Scalable data analytics (ICT-2013.4.2)

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TEMIS S.A. (France)
Bristol City Council (United Kingdom)
Knowledge-Now Limited (United Kingdom)
Alto Adriatico Water Authority (Italy)
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Project website:
www.eppics-project.eu

Objectives

EPPICS aims to disrupt the status quo of managing complex situations by harvesting large-scale physical and social sensor data and making it understandable in real-time for decision makers. To this end, EPPICS will develop a platform for managing and analyzing large velocity, large volume and large variety of physical and social sensor data. EPPICS has therefore the following objectives:

- *Provide analytical support over a range of physical and social sensors relevant for evaluating the unfolding of events* such that authorities will be able to make better informed decisions leading to an unprecedented capability to react to unplanned events such as accidents or natural catastrophes and assure improved routing of traffic, reduction of noise and pollution as well as increased safety and security for citizens during large-scale events.
- *Deliver a platform for physical and social sensor data analytics that will improve the decision making capabilities of service providers.* The analytics platform will comprise a trusted cloud platform, which will be safeguarded against misuse. To this end, the platform must represent the situation as observed by physical sensors (traffic light sensors, water level sensors, GPS location, acceleration, orientation, etc) and by social sensors (sensing from social media, such as Twitter or Facebook).
- *Optimize the processing and analysis of huge amounts of heterogeneous dynamic multimodal data* in a seamless manner enabling the processing and mining of information in scales not possible before.

Approach

EPPICS will focus on developing large scale adaptive methods to enable pervasive modelling, monitoring and predicting of events in the real world by extracting and combining data and information from physical and social sensors. Application domains will cover the intelligent management in urban settings with a particular focus on traffic management as well as water management, specifically monitoring and reacting to widespread floods.

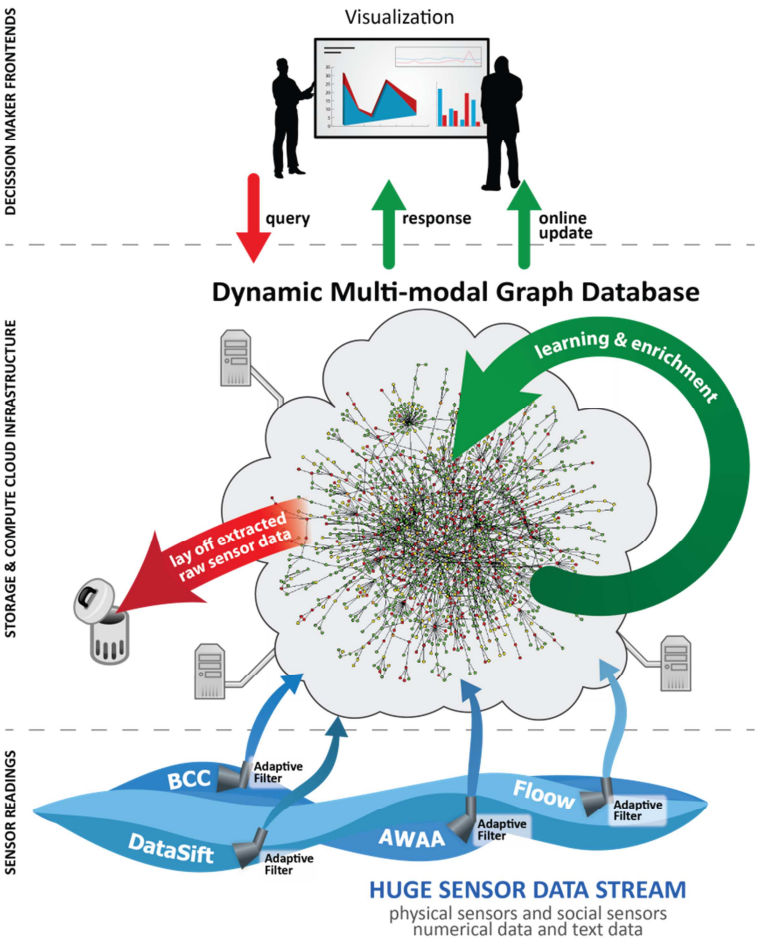
We believe that while physical sensors are pivotal to achieving identification of events while they happen, e.g. they allow locating an issue such as a traffic jam, they provide limited context to the event, e.g. why a traffic jam has happened. Modelling and understanding the context around the physical sensor readings allow a deeper understanding which is crucial in our complex modern societies. We claim this context can be contributed by people by planning, sensing, capturing, modelling and communicating their activity on personal and social media. These readings may be noisy and often largely irrelevant to the task, sometimes misguided, but they can potentially give complementary, highly relevant information, e.g. that a large part of the population planning to participate in an event will cause a traffic jam or that a rather minor accident is however blocking a major road. Predicting and monitoring target events and supporting individual as well as social decisions requires both aspects: precision and insight.

EPPICS will tap into huge sensor data streams, filtered already at its source. Filtered sensor readings (numbers and text), but also background data (e.g. rather static information about traffic routes) will be stored in a dynamic multi-modal graph database that is distributed in an elastic storage cloud. To perform preprocessing, but also to deploy powerful machine learning models (with complex learning, but fast inference algorithms), EPPICS foresees a generic support by means of suitable computational models for parallel operations on the dynamic multi-modal graph database. Asynchronous learning and enrichment processes living in an elastic compute cloud will use these computation models to work on filtered raw sensor readings and to extract higher-level information such as named entities, relational information between entities from text data or unusual patterns or clues for an emerging event such as a traffic jam from numerical data. Finally, Decision makers will use the EPPICS visualization frontend to ask queries to the database. The database will answer these queries by an initial response almost instantaneously and eventually refine the answer through online updates over time.

Description of Work

EPPICS will run for 36 months and involve three phases:

- Phase 1: project take up, collection of requirements and definition of the initial architecture (M1-M6)
- Phase 2: building of an initial prototype tested in the first field trials (M7-M18)
- Phase 3: building of an advanced prototype evaluated in the field trials in terms of real-world situations (M19-M36)



Expected results

The expected outputs of EPPICS are:

- A platform for capturing, integrating, modeling and forecasting of the large-scale hybrid information deriving from hundreds of sensors, thousands of cars and large-scale social media.
- Novel services will provide authorities with situation awareness. Thus, authorities will be able to make better informed decisions leading to improved routing of traffic, reduction of noise and pollution as well as increased safety and security for citizens during large-scale events.
- Large scale analysis algorithms to model, forecast and respond to emergencies like widespread floods in real-time.
- Scientific papers, contributions to standardisation bodies and new analytics services.

EPPICS