Framework for Network Event Detection Analysis and Prediction

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CCS CONCEPTS

• **Information systems** → **Stream Management**; **Information system applications** → Spatial-Temporal systems; Data Mining.

KEYWORDS

Dynamic Model, Event, Link Analysis, Prediction

INTRODUCTION

Nowadays, there are millions of connected and distributed devices that portend complex networks of people, processes, and sensors, created by social and physical networks, or by process management. We are witnessing more and more measurements and reports of different events like weather, flu, traffic congestion, and sports tournaments. This increase in the data stream is coming to be available as Open Data for use in knowledge discovery and decision making. The greater understanding of real-world events from observational data becomes possible, but with challenges including heterogeneity (e.g. video, image, tweets, check-ins), incompleteness, uncertainty, qualitative and quantitative measures, and dynamic environmental changes.

There will be a positive impact on traffic, event and disaster management systems, health monitoring systems, and city planning if tools can be provided to solve these challenges. This also makes it easier for decision-making by city stakeholders.

While there has been some progress in the fields of event recognition and processing from various data streams, still there are open issues. This work identifies and tackles critical challenges related to the mining of identified data collections, in a resilient manner.

APPROACH

We address problems related to event detection, heterogeneous data stream integration, incomplete data streams and adaptation to environmental changes. Our approach is based on event processing theory and statistical learning algorithms. We take advantage of event detection and event fusion methods to identify salient spatial-temporal data streams automatically and fit them in common schema structures. This allows for multi-sensory analyses including pattern detection and prediction, by taking advantage of the collected event streams. We used statistical methods to evaluate relationships of correlation and causality among streams and predictive modeling that adapts to event stream changes. Since the environment is always changing throughout time, the associated data streams reflect the change.

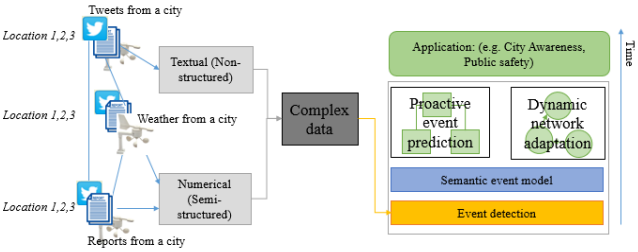

Figure 1: Framework global architecture

CURRENT STATUS

The current framework (Fig. 1) is based on the following components: event detection, semantic event model, and prediction modules. The semantic event model detects events of interest [1] and identifies the general set of entities from the data streams. This model reduces the representational complexity while retaining the maximum amount of information [2]. We ran multiple experiments using various data sets to answer queries like 'What places are less safe for pedestrians?' [2]. We also created a dynamic network model that adapts to data stream changes, like network leakages, device failures, incomplete information [3]. We have developed a prototype incorporating a statistical learning model that is under improvement such as considering the diversity of views and creating a multi-view regression, for identifying the likelihood of given future events.

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