

A distributed system of mobile sensing for urban monitoring and recognition

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- (1) **Motivation:** With the ubiquity and ever-increasing capabilities of mobile devices, cell phones and their locations could potentially become a powerful source to describe the pattern of the urban space. Traditionally, urban monitoring and analysis rely on a fixed location and a considerable amount of statistical data. This procedure does not permit the identification of multi-temporal events in wide areas. Another key problem is how to acquire and update the statistical data of the moving objects, for instance, humans and their activities in the whole city space.
- (2) **Approach:** In this research, the usage of mobile devices will be treated as a medium for data collection. Erlang data that represent a distribution of call duration in the Global System for Mobile Communication (GSM) network could be performed as aggregate-data sources to estimate the population density of a city. For the large scale monitoring, clusters of Erlang data from mobile base stations are excellent at providing indirect interpretations of spatial patterns of urban life and its temporal dynamics. Furthermore, mobile sensing is potentially applicable to public-marketing analysis. The distribution of a population at different points of time in each city space could be an ideal source to help people decide a place for urban

advertising or opening a shop.

- (3) **Objective:** Develop a prototype of mobile base population prediction to visualize and analyze large-scale moving entities over space and time and evaluate the merit of following proposals.

- Monitoring human flow over time
- Urban pattern analysis and change detection
- Hot spot detection and warning propagation

- (4) **Characteristics:**

- Utilize open sources and open standards for a backend system. Web Services, PostgreSQL, R/PLR and other related geospatial libraries will be considered as a core technology.
- The web browser we use as a universal front end, an Ajax map, is a hybrid web application which presents a rich UI to update and integrate contents asynchronously from multiple sources.
- Multi-temporal analysis can be done by implementing inverse distance weighted (IDW) and ordinary kriging models as interpolation APIs.
- Implement Timeplot, a DHTML-based AJAX widget to illustrate day and month population density of each location.

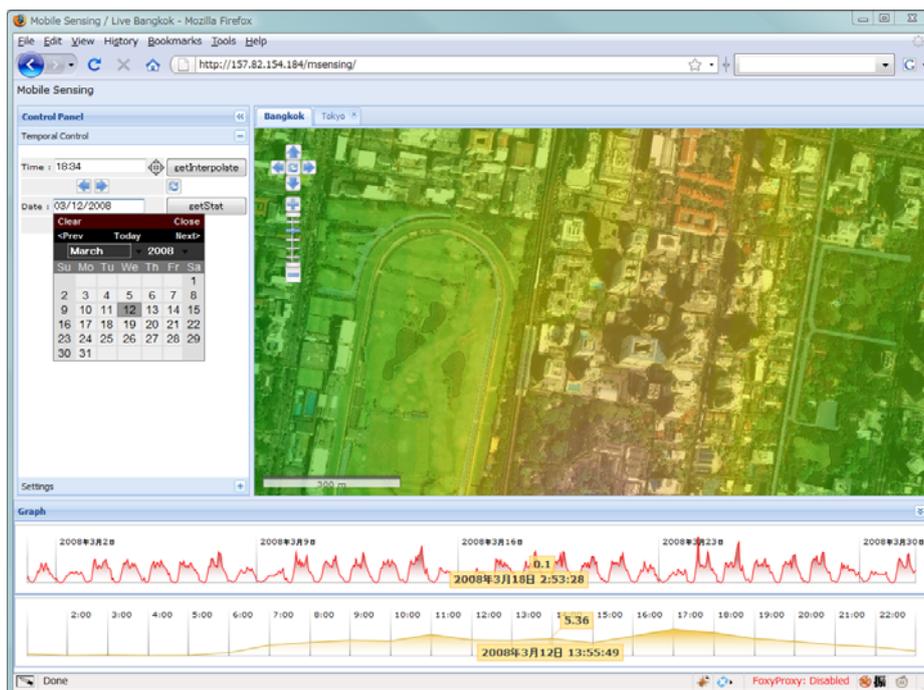


Fig. 1: A prototype system of Mobile Sensing Platform