

# Context Aware Mobile Services

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**Abstract**— Mobile devices allow access to cloud services anywhere and anytime. Mobile cloud services can give information about a user's location, status, recent posts, state of mind and information about other required services to improve user experience. Most of the decisions are mainly based on access to real-time data or information that can support the decision-making process. In this paper we study the various services that can be provided through the context aware mobile applications using mobile cloud computing.

**Keywords**— Context, Cloud, Real-time

## I. INTRODUCTION

Social Media is an interesting source of personal information when appropriately exploited. In addition, email and messaging can also serve as a good source of Information. There are many types of general information sources like, weather and public transport, information of books and museums etc. These information sources can be combined in various ways, enabling the development of smarter mobile services in different domains. Users are, however, reluctant to provide their personal information to applications; therefore, there is a need for new regulations and systems that allow applications to use such contextual data without compromising the user privacy. Context aware applications can broadly include the following modules based on the area of application:

- Context and situation awareness
- Location and position awareness
- Context modeling and reasoning
- Context prediction
- Context-aware services adaptation
- Mobile and ubiquitous computing
- Ambient Assisted Living
- Smart spaces
- Smart health
- Activity recognition
- Middleware and architecture of context-aware systems
- Security for context-aware smart spaces and devices

## II. LITERATURE SURVEY

This paper [1] is a review on Mobile context aware systems. The paper elaborates about the technique to model the context and future scope of context aware systems. The second paper [2] refers to a middleware framework for context-aware applications that generates intermediate,

reusable context extracted from input by breaking down applications into a set of functional units, or context engines. The technical report [3] discusses about building extensible applications that automatically adapt to the user's context.

## III. METHODOLOGY

Context aware applications should be able to manage the context information provided by various sources and process this information to the services that serve the relevant mobile users. Context managers can acquire information from:

- Direct sensor access, where sensor API's are used to collect information from various sensors.
- Middleware infrastructure which includes a intermediate software layer to manage the sensor data. It introduces a layered architecture that enhances reusability and provides concurrent sensor access.
- Context server, which in addition, allows gathering information from remote data sources and use the data for sharing context data and providing access to context history through a centralized server setup.

The Context Engine is responsible for collecting data from Context Data Source. After analyzing the resulting information on the context, it is then stored in the Context Information Source and used to adapt the application system to its current context.

## IV. IMPLEMENTATION

The context architecture consists of the context engine, context source and the actor. The context engine intern includes the context estimator, the context selector, context evaluator. The data from data source or context source is processed by context estimator, context selector and evaluator before it is sent to the actor. The actor acts as a link between implementation of the context architecture, the application system and possibly the user. The actor is responsible for enacting changes in the running application system. As most users will want to control the change in the system, the context evaluator proposes changes. After a while the involvement of user can be decreased once the context aware system is fully responsive.

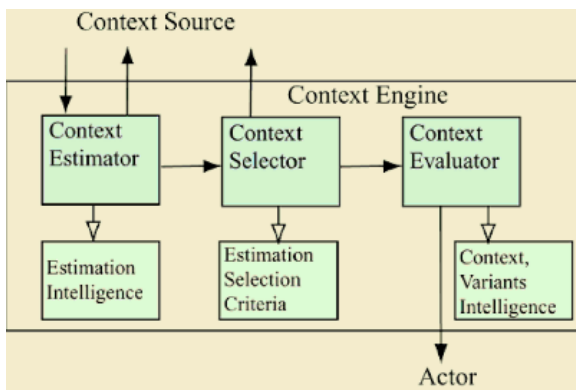


Figure 1. Context Aware System Architecture

This is a general architecture, the next challenge is to further define the context evaluator and its algorithms. The mapping between the context information and the possible configurations of the application systems is a topic to be explored.

## V. CHALLENGES

- How to represent context internally [4]
  - Storage or
  - Data structures and algorithms
- How frequently the system needs to be updated about context changes.
  - How often to poll?
  - How often to change behavior
- What type of sensors to use?

## VI. APPLICATIONS

Context-aware Services [1] are applied in many domains, including:

### A. Location-based Services

Location-based Services are those mobile services that adapt to user position. Many day to day applications are based on the location of the user. There are plenty of services that provide relevant information of places and events nearby the user using mobile devices. Also Geo-fencing is becoming a hot topic in Location Based Services applications, and many useful geo-fencing related services already exist, such as reminders to users when entering a specific geometric area, e.g. ATM nearby.

### B. Information Providers

There is an extensive amount of information in the web and users would benefit from information prefiltering and provision based on their preferences. Zomato is an agent-based infrastructure for information delivery, it provides information about best restaurants, café and bars near the preference area specified by you. There are other content delivery systems and search systems which create multimedia content tailored to their users' needs.

### C. Recommender Systems

Recommender systems were first reduced to the problem of estimating ratings for the items that have not been seen by a user, but are nowadays more influenced by the amount of user information available. Therefore, many pieces of information should be considered to improve recommender systems, such as all the information regarding user profiling and opinion mining.

### D. Education

Last research initiatives seem to opt for personalized learning services instead of one-size-fits-all solutions, such as DreamBox Learning, a context-aware adaptive and personalized learning system that supports semiautomatic adaptation of learning activities. Also, personalization has been used to boost learner motivations, optimal objective setting, etc. Advances in adaptive learning systems and platforms with their powerful feedback loops are used in blended learning environments for greater personalization.

### E. Sports

There are also many Context-aware Services useful in the area of sports, from sport tracking applications such as "Sports-tracker". This app uses your phone's internal GPS to track your route, time, distance, speed and lots more.

### F. Health

Context can be useful in the health domain. There are health care apps that monitor the users activities using sensors and suggests the type of exercise required to the user. Suggestions related to diet are provided based on the current health condition of the user. Based on patients condition, consultation services can be provided to a patient by connecting him to an appropriate medical practitioner.

### G. Traveling and Tourism

Context-aware applications have the large potential to be used in travel domain. The context-aware application "Trivago" is an intelligent electronic tourist guide that present to visitors, information tailored to both their personal and environmental contexts. It provides information about best accommodation within close proximity to the users current location.

Historical and streaming data can be analyzed for understanding, for instance, road traffic and provide tailored recommendations for routes by car or public transport, especially considering the trend of opening public transportation information in terms of timetables or even transport position information in real time. Some mobile personal assistant applications offer this kind of service, providing information of how to go from your actual location to destination.

### H. E-democracy

Studying opinion and sentiment of people in social media is a means for governments to perceive their citizens' insights, worries, etc., and this information might be of value for decision making. This is the objective of the German-funded project ALL-SIDES, Advanced Large-

Scale Language Analysis for Social Intelligence Deliberation Support, which uses language analysis to understand citizens' opinions.

#### *I. Smart homes and Smart Cities*

Context awareness is crucial for smart home systems to succeed.

Smart home applications use various sensors to automate certain day to day activities at home like, temperature control of AC, trigger based on-off activity of switches etc. Smart city applications use variety of networked sensor-based systems and devices that are deployed on the roads of cities to control situations like heavy traffic, breaking of signals and not following rules.

#### *J. Crowd-based Applications*

Crowd-based applications are those matching the needs of users to the available resources. The information of these resources are provided by individuals or companies. These services typically occur in a proprietary web platform where the individuals exchange such information or services. Some examples of these applications are OLX for selling goods; 99acres for renting space. Other potential activities include participatory involvement in local activities, voluntary works, e-commerce, crowd-based logistics, and peer-expert services.

### VII. CONCLUSION

Although many context manager frameworks have been proposed to work as general purpose frameworks, many different frameworks have been developed in practice for various specific purposes. The number of Context Aware Services make the task of rapid integration in mobile services a very difficult task. This discourages the mobile developers to build fully Context Aware Services because of its complexity. Another challenge is to develop Context aware applications without compromising the users privacy.

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