Feel the World: A Mobile Framework for Participatory Sensing

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Abstract. Nowadays, smartphones have almost replaced basic feature phones all over the world. Today’s smartphones come equipped with an increasing set of embedded sensors, computational and communication resources. All these gave developers the ability to design and implement a wide variety of applications in the domains of healthcare, social networking, safety, environmental monitoring and transportation. This paper presents a novel middleware platform, called Feel the World (FTW) which provides third party programmers, with little phone programming experience, the ability to develop applications that enable people to sense, visualize and share information about the world they live in.

Keywords: Participatory sensing, mobile applications, mobile data collection.

1 Introduction

Technological advances in sensing, computation, storage and communication have brought closer than ever a global sensing device that enables a great number of novel applications that weren’t available in the past. Small inexpensive sensors, low power processing but mostly the fact that today’s smartphones come equipped with an increasing set of embedded sensors, computational and communication resources, gave developers the ability to design and implement a wide range of applications. Analysts estimate that 5 billion people worldwide use mobile phones¹, more than half the world’s population.

While the real numbers are debatable, it is clear that the proliferation of smartphones equipped with cutting-edge sensing technology and high-end processors opens new horizon in participatory sensing having a tremendous impact on our society. In this context, smartphones represent an ideal computing platform to develop urban sensing applications across a wide variety of domains, such as social networking, environmental monitoring, healthcare and transportation [7,10]. Therefore, a key challenge in realizing the potential of participatory

¹ http://www.physorg.com/news185467439.html
sensing is to ensure the ease of developing and deploying such applications, so that the developer does not have to reinvent the wheel.

To address this challenge, we present a novel middleware platform, called Feel the World (FTW). FTW provides to third party programmers, with little phone programming experience, the ability to develop applications that enable people to sense, visualize and share information about the world they live in. FTW framework abstracts implementation details, like service and thread implementations, in order to provide a convenient way to handle sensors both embedded and external. Even though capturing sensor data is quite easy using the provided SDKs, developing a continuous sensing application that takes into account network traffic and the resources of the device (e.g., battery, processor utilization) on which the application is running is not a trivial task. Although several frameworks have been developed in order to address this challenge (e.g. MyExperience [9], Jigsaw [8], Funf [1], SociableSense [11], ODK Sensors [3]), FTW differs from the existing platforms since it provides a dynamic control of sensors (sampling rate) based on the specific technical specifications and the current resources state (battery level, number of running applications) of the mobile device. In addition, FTW provides a mechanism that determines when to upload the collected data to the server based on the priority of data, Wi-Fi availability and other configuration parameters of the mobile device. The key contributions of our work can be summarized as follows:

- A novel open source framework for developing people-centric sensing android applications. Through FTW, developers would be able to exploit and configure all the embedded sensors of mobile phone as well as external sensors. The general configuration properties of FTW are the sampling rate, the duration of each data collection, the priority of data and the running environment (background/foreground). Additionally, developers can specify whether or not the data will be uploaded on a server and how often this will take place. FTW framework can be downloaded from [http://grid.ucy.ac.cy/FTW/](http://grid.ucy.ac.cy/FTW/).
- We evaluate the proposed framework demonstrating its expressivity, the utilization of resources and the ease of use in developing a people-centric application using its built-in features.

The rest of this paper is structured as follows. Section 2 gives a brief overview of relevant frameworks. Sections 3 presents the system architecture of the proposed framework. Section 4 demonstrates the FTW framework. Section 5 gives an insight to the work that will follow on the framework and concludes the paper.

2 Related Work

Participatory sensing enables collection of environmental sensory data by ordinary citizens, through devices such as mobile phones, without requiring any pre-installed infrastructure. Despite the radical increase of mobile applications mainly due to the popularity of smartphones and app stores, there are still only a limited number of applications for participatory sensing purposes [1]. The reason