

Supporting Location-Aware Distributed Applications on Mobile Devices

Cristiano di Flora (1), Massimo Ficco (2), Stefano Russo (1)

*(1) Dipartimento di Informatica e Sistemistica,
Università di Napoli “Federico II”
Via Claudio 21, 80125 - Napoli, Italy
{diflora,sterusso}@unina.it*

*(2) Consorzio Interuniversitario Nazionale per l’Informatica,
Via Diocleziano 328, 80124 - Napoli, Italy
massimo.ficco@napoli.consorzio-cini.it*

1 Abstract

The Wireless World Research Forum (WWRF) has identified ambient-awareness and device diversity as two key properties of applications and services in future mobile systems [1]. According to the WWRF, emerging applications for mobile devices will be adaptive, personalized, and context-aware. Ambient-awareness in particular is a crucial issue in indoor applications. Indeed, these applications need to know the physical location of users and other entities (i.e. services and devices), so that they can adapt their behaviour [2], and report it to users as well [3]. Moreover they will be delivered to different end-devices (phones, computers, info appliances) over diverse wireless networks. Despite this diversity, many mobile devices (e.g. smart-phones and PDAs) now support the Mobile Information Device Profile (MIDP) of the Java 2 Micro Edition (J2ME) platform. This platform provides a common yet flexible computing and communication environment that could be fitted for – and shared by – devices having different capabilities. Many modern mobile terminals are equipped with wireless connectivity devices, such as IEEE 802.11 or Bluetooth adapters.

As for location-aware computing, no single location-sensing technology is likely to become dominant, since each technology can either satisfy different requirements or suit different devices. Since several technologies will coexist into future mobile systems, such systems will need a high-level software application programming interface for technology-independent location sensing [4].

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The Java Community Process (JCP) has recently finalized two Java Specification Requests (JSRs) in order to cope with location-awareness (JSR-179) [5] and bluetooth communication (JSR-82) [6] in Connected Limited Device Configuration (CLDC). Unfortunately, the Bluetooth API provides no useful classes to support the Location API so far.

In this paper we propose to extend the JSR-82 API in order to provide the Location API with a source of local information. Our solution is based on the insertion of a `LocationEstimator` component into the JSR-82 API. This is in charge of producing all the information needed to build `Location` objects as defined in the JSR-179. The bridge between the two APIs is established by implementing a specific `LocationProvider` class (i.e. a location-providing module, generating `Locations`, defined in JSR-179) which exploits the `LocationEstimator` to generate `Locations`. The proposed solution can achieve a wide variety of mobile devices, since no additional positioning device is needed except for a bluetooth adapter. Based on the designed extension, we propose an implementation of the `LocationEstimator` which relies on a specific indoor positioning technique [7]; this technique estimates device location by evaluating the Received Signal Strength Indicator (RSSI) which provides a good fingerprint for the room in which the Bluetooth sender is moving in. We evaluate the effectiveness of the approach by providing preliminary experimental results obtained from our prototypal system.

References

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