Smart usage of context information for the analysis, design and generation of power-aware polices for mobile sensing apps

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Introduction

- There is a massive adoption of mobile devices by society in almost any daily activity.
  - Any-where, any-time connectivity
  - Possibility of installing new mobile applications
  - Increasing computing, memory, and sensing capabilities
- Sensing capabilities of smartphones improve interaction with user, turning mobile devices into *omni-sensors* able to *know* about their surrounding environment.

Introduction

- Hence, mobile devices have achieved a considerable degree of sensitivity that tries to mimic the sense of humans.
- In this way these devices have become *context-aware*, which is translated to an increasing level of understanding about user's activity.

Motivation

- Despite the increasing computing, storage and memory capabilities of smartphones, battery is not evolving at the same pace **?**.
- Each new generation of smartphones keeps improving and including new hardware embedded components, which imposes a higher energy demand.
- This limitation is highlighted when a continuous access to sensors data is needed, which is the core requirement of **mobile sensing applications**.
- Then it is mandatory for any mobile sensing application development to consider the energy constraint and implement mechanisms or strategies to optimize battery duration.

Hypothesis

Hypothesis

Intelligent policies produced through context information built from sensors data can be employed to reduce the energy consumption in a mobile device when performing continuous sensor readings.

- An intelligent policy is a special rule that defines how sensors should be accessed in order to reduce the energy consumption and achieve the requirements of a mobile app. It is intelligent in terms of self-adaptness to changes detected in context information.
- This research work aims to employ data coming from GPS and inertial sensors in order to obtain context information about user mobility that helps to adapt the sensor usage and reduce energy consumption.

Problem statement

Problem statement: Mobility pattern identification

Given a set $V = \{v_1, v_2, \ldots, v_n\}$ of data values read from sensor S in the time interval $T \in [t_1, t_2]$, identify the current behavior pattern p_S that represents the activity of user.

$$\text{PatternIdentifier}(V) \longrightarrow p_S \in \textit{Patterns} \tag{1}$$

Where *Patterns* is a set of patterns that represent an interesting state in the user activity. Especifically, the set $\{\textit{no\_movement}, \textit{walking}, \textit{running}, \textit{vehicle\_transportation}\}$ represents these interesting states.

Problem statement

Problem statement: Policy generation

Given the set of detected patterns $\mathcal{P}_S = \{p_{S_1}, p_{S_2}, \ldots, p_{S_n}\}$ in data from sensors $\mathcal{S} = \{S_1, S_2, \ldots, S_n\}$, parameters for assigning weight to energy e and accuracy a, and physical constraints status c of a mobile device, find a policy that selects and configures the operation of proper sensors while meeting application requirements.

$$\text{PolicyGeneration}(\mathcal{P}_S, e, a, c) \longrightarrow d_S \tag{2}$$

The policy will be generated considering the trade-off between energy and accuracy parameters that are specified by the mobile application.

Objectives

Main objective

To reduce energy consumption in the mobile sensing apps, which perform continuous sensor readings, through power-aware policies generated from context information obtained from sensors data.

Objectives

Particular objectives

- To identify mobility patterns from context information obtained from an inertial sensor (accelerometer) and location providers (GPS, WPS).
- To generate policies for a smart sensors' usage from identified mobility patterns, accuracy and energy requirements of mobile application, and status of mobile device's constraints.
- To ease the development of mobile sensing applications that require user location tracking, i.e., LBS, by means of a middleware that isolates the complexity of sensors' access and the associated efficient energy management.

Methodology

Schedule

sdasd

Contributions

Brief state of art revision

Proposed solution

Schedule

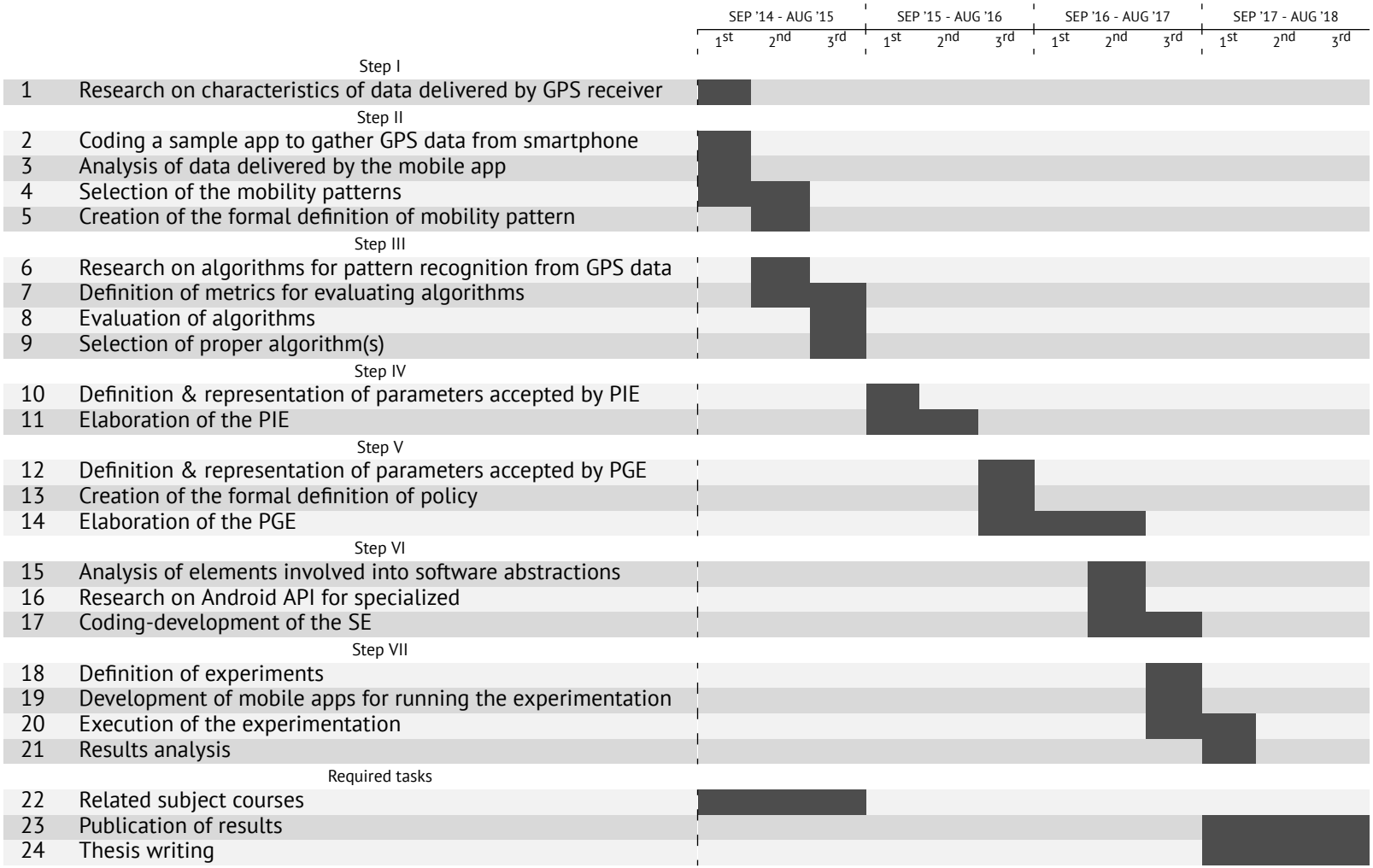

Table: Schedule of activities (each column represents a four months period)