

Chapter 13

Sensing Platforms for Prototyping and Experimenting Wearable Continuous Health Monitoring Systems: A Quick Starter Point Guide

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ABSTRACT

Continuous monitoring generally imposes a set of constraints including form factor, energy consumption, and mobility support in order to enable anywhere and anytime monitoring. Sensors, within this context, play an important role as the first building block of such systems and the main entry point for the monitoring process. Therefore, to experiment continuous health-monitoring systems in real-like conditions, sensing platforms need to meet a number of related requirements and constraints, especially for mobility factor. This chapter aims to present an overview of popular sensing platforms meeting appropriate constraints, allowing experimenters and researchers to start prototyping and experimentation projects for continuous health monitoring. For that, a number of requirements and constraints for continuous monitoring prototyping are firstly identified, then sensing platforms are classified into three proposed and compared categories, namely, ready-to-use, ready-to-compose kits, and do-it-yourself platforms. On that basis, a set of interesting platforms are reviewed and compared under each category.

INTRODUCTION

Wearable health monitoring systems' (WHMS) goal of enhancing life's quality of persons without disturbing their daily activities requires a number of features to be satisfied. In fact, form factor, energy consumption as well as mobility support enabling an anywhere and anytime monitoring, are major concerns to consider in order to allow a continuous monitoring. In this context, sensors play an important role as they represent the first building block and the main entry point for the monitoring process (Boulemtafes, Rachedi, & Badache, 2015; Boulemtafes & Badache, 2016).

Besides, prototyping and experimenting systems through test beds are important steps before attaining the final realization stage and achieving pretending goals. Within this perspective, and in order to experiment continuous health monitoring in real-like conditions, sensing platforms meeting appropriate factor and constraints should be used.

This work aims to present a quick overview of popular sensing platforms for prototyping and experimenting health monitoring systems, particularly heart and motion-based monitoring applications, such as cardiovascular risk factors prediction, Myocardial Infarction detection, gait analysis, sleep efficiency prediction, or fall detection and risk assessment.

Starting from identifying constraints' requirements to be fulfilled, the goal of this work is not to review all available sensing platforms but rather, to present a set of interesting models of platforms along with their main features, allowing experimenters and researchers to start prototyping and experimentation projects. The presented sensing platforms are reviewed and compared according to a proposed classification comprising three categories namely ready-to-use, ready-to-compose kits and do-it-yourself platforms.

CONTINUOUS MONITORING AND PROTOTYPING CONSTRAINTS' REQUIREMENTS

Ensuring continuous health monitoring implies inevitably dealing with a set of related constraints, particularly, keeping connectivity and coping with its intermittence, which is considered as one of the main concerns regarding mobile users (Boulemtafes et al., 2015). However, from sensing devices point of view, a number of criteria should be also taken into consideration in order to enable continuous and convenient monitoring. Two major constraints are: (1) The probability of relying on devices' batteries for long periods. In fact, recharging devices might be disturbing, or even impossible if there's no access to a power supply, like in case of mobility; and (2) Relying on wearables, which need not to disturb the monitored user and his daily activities (Maciuca, Popescu, Strutu, & Stamatescu, 2013; Boulemtafes & Badache, 2016).

Consequently, sensing platforms should ideally follow a number of recommendations in order to cope with continuous monitoring (Boulemtafes et al., 2015; Boulemtafes & Badache, 2016), principally:

- Sensing platforms should be as much as possible lightweight and unobtrusive in order to minimize disruption of the user and his daily activities.
- Sensing platforms should communicate through wireless networks in order to offer freedom of movement.
- Sensing platforms should be energy-efficient in terms of operation and processing, as well as in terms of communication. This aims to keep continuous monitoring as long as possible, like by

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