miva: Constructing a Wearable Platform Prototype
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ABSTRACT
This paper describes the prototype of a mobile and autonomous system, namely miva, which provides the necessary support for the execution of virtual and augmented reality applications. The objective of this work was to construct a small, lightweight, low-powered platform with enough processing power to guarantee the quality of these interactive applications. This new “wearable computer-like” dedicated system is capable of satisfying even the most demanding users in their daily processing and real world communication activities. Although using head-mounted displays, data gloves and trackers, new devices can easily be added to the platform. Two developed applications, mivaDesk and mivaTherm, are used to validate the support provided by the miva wearable platform. Details of the prototype are given and some considerations about its integrity, robustness and components organization are examined.

Keywords
Wearable computers, virtual and augmented reality mobile systems.

1. INTRODUCTION
During recent years, there has been an expanding tendency to seamlessly integrate daily used equipments into common platforms with support to mobility. Continuous advances in device miniaturization, allied with the emergence of various wireless communication technologies, universal plug-and-play devices and powerful portable processing units has opened the door for research into wearable platforms.

Wearable computers are seen as mobile and autonomous platforms, tailored to daily use, in order to provide dynamic interaction, without limiting user’s freedom of movements and behavior. For instance, they can be integrated to clothes or accessories [1][2][3].

This work presents our experience in the building of a wearable platform capable of handling a high level of interaction and user immersion. Such platform makes use of Augmented Reality (AR) to amplify interactivity and user perception quality of the applications and tasks at hand. It allows real world object manipulation through the insertion of relevant digital information, increasing user problem solving capabilities, access to advanced services and applications. The platform adopts both a software and hardware modular design. Hence new software components and devices can be added seamlessly in a plug-and-play manner.

In fact, one of miva’s strongest features besides portability, is its high flexibility, supporting various applications and use scenarios, through the addition of new hardware and software modules. Most importantly, miva supports non-conventional interaction techniques giving a wider range of interaction techniques and devices than conventional platforms such as PCs and PDAs.

The prototype’s current version stretches over about 31x36 square centimeters of area, weights approximately 3 kg. Next generation miva platforms will certainly be subject to a number of hardware optimizations to make them even lighter.

In Section 2 some works that have piloted the wearable computer concept for use in augmented and virtual reality are presented, as well as other similar projects. Section 3 gives some examples of already developed and in progress applications that make use of the prototype. Section 4 describes miva, detailing its hardware and software components. Section 5 describes the software architecture created for the platform in order to facilitate the development of multimedia applications and shows a part of this architecture to a cell phone. In Section 6, some considerations about the designed prototype and its organization are stated, and enhancement suggestions are listed. Section 7 highlights this work’s contributions and presents some ideas for future work.

2. RELATED WORK
Component miniaturization has been at the forefront of wearable and nearly invisible systems enabling individuals to move around and interact freely. However, the construction of such systems involves a series of cumbersome issues, varying from hardware restrictions to usage limitations. In [4], some social aspects and interaction devices related to this context are discussed. In [5], there is a comparison of wearable devices taking in consideration their power consumption, size, type of processor used and operating system support.

Further in [6], a mobile AR system for exploring urban environments was built to provide real-time information about the