

A Wearable Personal Assistant for Surgeons – Design, Evaluation, and Future Prospects

Shahram Jalaliniya¹, Thomas Pederson¹, Diako Mardanbegi²

¹Dept. of Computer Science / Internet of Things and People (IoTaP) research center, Malmö University, Sweden

²Computing and Communications Department of the Lancaster University, UK

Abstract

In this paper, we present our body-and-mind-centric approach for the design of wearable personal assistants (WPAs) motivated by the fact that such devices are likely to play an increasing role in everyday life. We also report on the utility of such a device for orthopedic surgeons in hospitals. A prototype of the WPA was developed on Google Glass for supporting surgeons in three different scenarios: (1) touch-less interaction with medical images, (2) tele-presence during surgeries, and (3) mobile access to Electronic Patient Records (EPR) during ward rounds. We evaluated the system in a clinical simulation facility and found that while the WPA can be a viable solution for touch-less interaction and remote collaborations during surgeries, using the WPA in the ward rounds might interfere with social interaction between clinicians and patients. Finally, we present our ongoing exploration of gaze and gesture as alternative input modalities for WPAs inspired by the hospital study.

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1. Introduction

Mobility is one of the main characteristics of work in hospitals. Due to the spatial distribution of departments, wards, and offices in clinical settings, clinicians need to move between different departments all the time. Aside from the considerable time that clinicians waste on moving in hospitals, having access to the right information in different situations is a big challenge. The majority of previous work on providing remote access to the patient information have used mobile devices (e.g. PDAs and smartphones). However, most mobile devices do not support interaction on the move, which means the users need to stop, pick up their device, and direct their attention away from the task at hand [1]. This way of interaction often requires the user's full attention and occupies at least one hand which most of the time interferes with the task at hand. Furthermore, interaction with the dominant touchscreen-based mobile devices does not comply with sterility restrictions in hospitals. Emerging

wearable computers such as Google Glass provide various hands-free input modalities (e.g. head motion and voice commands) and raise the question as to whether such new computing platforms can address some of the challenges of interaction on the move. What are the potential advantages and limitations of using such devices in hospitals? To answer these questions, we implemented and evaluated a wearable personal assistant (WPA) for orthopedic surgeons [2]. In this article we provide a more detailed look into the design and evaluation of this previously presented prototype. Our WPA supports three specific tasks throughout a workday of surgeons: 1) touch-less interaction with medical images, 2) tele-presence during surgeries, and 3) mobile access to the Electronic Patient Records (EPR) during ward rounds.

2. Wearable Personal Assistants (WPAs)

The idea of designing wearable systems in the shape of "personal assistants" is mainly inspired by earlier studies on intelligent interface agents [3]. Interface agents are intended to (1) observe the user's actions and imitate them, (2) receive user feedback on the systems'

*Corresponding author. Email: shahram.jalaliniya@mah.se