

Browsing Medical Records in Mixed Reality with MR²

Vittoria Frau
University of Cagliari

Carlo Cuccu
University of Cagliari

Lucio Davide Spano
University of Cagliari
davide.spano@unica.it

ABSTRACT

In this paper we discuss the design and implementation of a preliminary Mixed Reality interface for Microsoft HoloLens, supporting medical records retrieval and navigation. The goal is to ease common activities in the dynamic clinical context, using facial recognition and multimodal commands for accessing medical records on the fly through a free-hand interaction.

KEYWORDS

mixed reality, Microsoft HoloLens, facial recognition, clinical records

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1 INTRODUCTION

The availability of commercial headsets such as the Microsoft HoloLens¹ is currently enabling developers and designers to create Mixed-Reality (MR) experiences without being bound to the see-through lens metaphor used on mobile devices. The aim of MR² (Medical Records in Mixed Reality) is creating an interface targeted to medical doctors for accessing the patient's records *while* wandering around the clinic. Wearing the HoloLens, the doctor receives timely contextual information triggered by a facial recognition that identifies the patients and she can visualize and navigate the clinical information through gesture and voice commands.

2 RELATED WORK

One of the most popular MR applications in the medical field is surgery training and planning. For instance, El-Seoud et al. [2] introduced an MR system for noninvasive surgeries planning. Similarly, Duff et al. [1] present a novel MR rehabilitation system for improving reaching movements of people affected by hemiparesis, providing real-time, multimodal, and adaptive feedback from their movement patterns. Our project targets a different MR application in the medical setting, supporting the contextual and multimodal retrieval of the patient's record, visualizing the information through multimedia and 3D overlays.

¹<https://docs.microsoft.com/en-us/windows/mixed-reality/holoLens-hardware-details>

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3 THE MR² PROTOTYPE

In order to implement the first version of the prototype, we focused on visiting activities in the hospital ward. The doctor, wearing the HoloLens, approaches a patient and the system automatically identifies him through facial recognition. Then, she automatically obtains his or her clinical information and browses such pieces of information through a multimodal interface, using gestures and voice commands, while carrying-out the visiting activity.² The interface informs the doctor about the recognition process through the colour of the rectangle that bounds the patient's face. The green colour means the patient is on the list, while a red box means a not identified person. If the application recognizes a person, the interface shows a label with his name. Selecting such label the doctor confirms the intention to navigate his/her medical records. If a person was not recognized, the resulting label will be a question mark. In case more than one person was detected, the doctor will see more than one bounding rectangle. He can select which medical record to open simply gaze-pointing one person's bounding rectangle and confirming the selection through a tap gesture. Once the medical record has been retrieved, the recognition process stops and the interface shows it. The interface has been designed in order to be clear and understandable to the user, adapting the structure of the printed medical records in use. It splits the data on two navigation levels: i) the global that includes the high-level groups and ii) the local, showing sub-categories of the selected global item. Once the user selects the global item, the interface shows the local navigation in the upper row, whose groups depend on the main item.

MR² is developed in Unity, which exploits the standard interaction capabilities supported by the development framework; the face recognition support was developed using OpenCV.

4 FUTURE WORKS

In the future, we will add more complex data visualizations for such records, including localized information on top of the real patient's body or 3D models. In addition, we are going to collect real doctor's feedback organizing interviews and focus groups where we would try to let them experience the interface and collect qualitative feedback for further design iterations.

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²A video showing a sample interaction with the application is available at <https://youtu.be/s4U7GuC1a-o>