Online Visual Attention Monitoring for Mobile Assistive Systems

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1 Introduction

Every now and then there are situations in which we are not sure how to proceed and thus are seeking for help. For example, choosing the best product out of dozens of different brands in a supermarket can be difficult, especially when following a specific diet. There are, however, also people who have problems with decision making or sequencing actions in everyday life, e.g. because they suffer from dementia. In such situations, it may be welcomed when there is someone around noticing our problem and offering help. In more private situations, e.g. in the bathroom, help in shape of a human being cannot be expected or even is not welcomed.

Our research focuses on the design of mobile assistive systems which could assist in everyday life activities. Such a system needs to detect situations of helplessness, identify the interaction context, conclude what would be an appropriate assistance, before finally engaging in interaction with the user.

2 Our Contribution

To approach the problem of detecting the cognitive state of helplessness or demand for assistance, our idea is to observe the eye movements of the user. This way, the system is at the same time attentive but quiet in the background until it detects user behaviours which elicit assistance. Only then, the system awakes and enters in direct interaction with the user.

We report about our experiences with such mobile assistance systems which we have gathered in two scenarios: shopping and chess playing. For the shopping situation, the assistance system has been created as a functional prototype in a 3D immersive virtual supermarket scenario (Figure 1). The second system has already been tested in real-world scenarios: Here, computer vision-based detection of the configuration on a chess board provides the basis for context identification.

In the virtual supermarket scenario, we currently investigate which basic features of eye movements could be used to decide in which phase of a decision process the users are currently in [1,2]. In a pilot user study, we tested different ways of presenting augmented information to support the decision process, inter alia an approach in which additional product information is presented on simulated augmented reality glasses. They appear attached to the product currently focused by the

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Figure 1: Prototyping of the mobile assistance system in a 3D immersive virtual supermarket.

user. The augmentation thus adapts in real-time to the current target object via analysis of gaze information. We report about first results of this pilot study.

For the chess scenario, we show how we map gaze positions to locations on the chessboard and present a way to provide feedback on the strength of the fixated chess figure based on sonification. We report on a pilot study in which we tested the user experience of that system.

3 Discussion

Eye movements could provide viable information for mobile assistance systems that automatically adapt to the context of use and the cognitive state of the user. We present work of several projects and report on first pilot studies on user experience.

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