Chapter 72
Enabling Context Aware Services in the Area of AAC

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ABSTRACT

Technology can be used to assist people with disabilities in their daily activities. Especially when the users have communication deficiencies, suitable technology and tools can assuage such needs. We envision that context awareness is a potential method suitable to provide services and solutions in the area of Assistive and Augmentative Communication (AAC). In this chapter, the authors give an introduction to context awareness and the state of the art. This is followed with the elaboration on how context awareness can be used in AAC. The Context Aware Remote Monitoring Assistant (CARMA) is presented as an application designed for a care assistant and his patient. A demonstration of a context aware component implemented in the CARMA application is shown in this chapter. An experiment that investigates movement recognition using an accelerometer in a smartphone and the obtained results are presented. This chapter ends with a discussion on challenges, future work and the conclusion.

INTRODUCTION

In our daily lives, we communicate with different parties as a matter of course. In human to human communication, languages and gestures help to convey one's thought to the other. We have the ability to interpret implicit information. This helps to reflect certain situations that take place around us. Our senses help us to accomplish this rather complicated task. Without this ability, communication can be challenging. When it comes to situations where communication cannot be carried out normally and naturally, we need appropriate applications and methods to fill the gap. Machines and systems can be designed to emulate human communication and comprehension capabilities. These capabilities can help those who need this assistance to fulfill communication needs.

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People with certain disabilities or illnesses may have some communication deficiencies. For example, some children with cerebral palsy have difficulties to talk. People with Parkinson's disease may have motor deficits and communication difficulties, which cause them to face problems in carrying out daily activities and in interacting with others. Most of these people can be helped by using Assistive and Augmentative Communication (AAC) technology. Tools ranging from simple low-tech methods such as drawing and writing tools, to high-tech devices such as multipurpose computer-based communication aids are being researched, designed and developed. When we look at the high-tech devices of the AAC technology, computing devices play an essential role in assisting both AAC users and people who need to communicate with them. These devices fulfill more complicated tasks including text-to-speech generation and eye-movement tracking techniques, especially for those who have speech and movement impairments.

In cases where an AAC user needs care and monitoring from a care assistant, the communication needs do not stop at face to face communication. The care assistant also potentially needs to have the means to keep track of the person he is taking care of, particularly if the AAC user has memory, motor or speech deficits. Instead of requiring the care assistant to manually perform these tasks, suitable devices and techniques can be used. For example, sensors can be installed to monitor different information regarding the AAC user. Implicit information can be captured and recorded. Based on this information, the care assistant can review and evaluate decisions suitable for the AAC user. Applications can also adapt to the captured information in order to serve the AAC user's needs.

One of the research areas that apply techniques similar to the above example is context awareness. The word context refers to the implicit information interpreted from different sensors. A context aware system utilizes context information to perform service behaviour adaptation. Depending on the contexts, the system may offer location or situation specific functions to the user. It can also automate processes when the obtained contexts fulfil pre-defined conditions. In other words, context awareness aims to "understand" and to satisfy the needs of a user by providing intelligent adaptation.

The following scenario is selected in order to demonstrate how context aware technology can be used in the area of AAC:

James is the care assistant for an AAC user, Bob. Bob has Alzheimer's disease. He can no longer independently carry out the various activities of daily living (ADLs). His condition requires constant supervision and monitoring in order to assist him and to ensure his safety. With the help of sensors and a context aware system, his activities and situations are constantly being measured and observed. He carries a smartphone, which is placed in a waist pouch. The rooms in his house are equipped with different types of sensors such as Bluetooth beacons, temperature sensors and humidity sensors. Bob stays alone in his home and he only gets occasional visits from his children.

James is responsible to take care of Bob and uses the system to keep track of Bob's activity. The system takes note of places Bob has visited throughout the day. James can check the location log to see which room Bob is currently in, and which rooms has Bob previously been to. If a certain home appliances had been left unattended, James gets a notification and it is also possible for James to remotely turn off the appliance.

On one particular day, Bob had an accident - he fell down at the corridor as he came out from the washroom. James almost immediately received a warning notification on his mobile phone that an accident had possibly taken place and Bob requires immediate assistance. While on his way to Bob's home, James enquired for status update