An Evolutionary System for the Sc@ut Platform

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Abstract

The Sc@ut platform is a series of tools for creating augmentative and alternative communication (AAC) systems. This platform is based on a two-level architecture: the communicator and the meta-communicator. The meta-communicator is used by designers (usually the child's educators or parents) to create and adapt the communicator. The communicator is used by a person with disabilities (normally a child) who interacts with it in order to communicate. In this paper, we will propose the addition of a new system to help designers and which provides the platform with automatic evolution and adaptation.

Introduction

Augmentative and alternative communication systems (AAC) are a growing field of study. These are mainly concerned with providing devices and techniques to increase the communicative ability of people with disabilities which impede speech or which make their communication difficult to understand [3].

The Sc@ut project is a platform that allows adaptive communicators [4] to be created for people with certain communication needs due to disability. The communicator runs on a Pocket PC device, which has the advantages of being cheap, versatile and portable. We are currently focusing on autism, but due to the numerous settings that Sc@ut offers, we have designed communicators that can be adapted for other people with disabilities such as cerebral paralysis or dysphasia.

Next section of this paper presents Sc@ut's current architecture which comprises two levels and which we will see in the subsections. Following section describes the thesis to be developed over the coming years. Finally, we outline future work arising from this thesis.

Sc@ut architecture

As we are currently working on autism, we will consider autistic children to be the communicator's end user. Figure 1 shows the Sc@ut architecture, which is organized, into two levels: the communicator and the meta¬ communicator. The first of these is used by the child, and the second is used by the child's educators, parents or teachers. In this figure, we can also see the complete process for designing and creating a communicator which has been adapted to one particular child. We will now briefly examine *who* the final users of each level are and what each level is for.

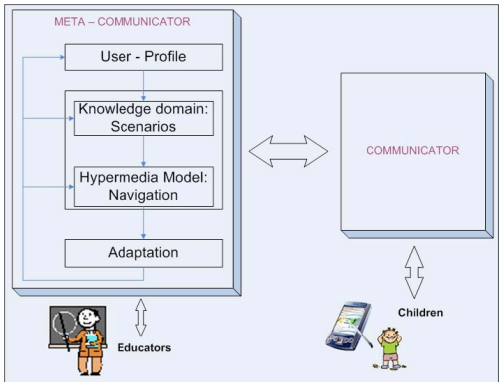

Figure 1: Sc@ut Process

Communicator

The communicator is a hypermedia system which enables the child to navigate pages with different scenarios (templates) and to select components from each page to express what he/she wants. Each child has their own communicator because of differences in their ability to understand language, their capabilities and their skills[4]. In order to collect information about the child's navigation, log files are created.

Meta-Communicator

The meta-communicator is the application used by educators to create the communicator for each particular child. Figure 1 shows the steps taken to create the communicator.

3 Towards an evolutionary system

At present, the communicator must be evolved and adapted manually. Our aim, however, is to semi-automate this process by designing a new system (the Evolutionary System) at the same level of the communicator system in order to carry out changes at runtime with the educators' intervention.

To adapt the communicator, the following steps must be followed (see Figure 2):

1. Educator defines detection rules informally to detect anomalistic behaviours in the child
2. Evolutionary system translates detection rules into a formal language (colored net petri, set theory, ...).
3. System analyzes log files with detection rules.
4. System detects alerts of anomalistic behaviours and searches the set of evolutionary actions (previously prepared) associated them.
5. System checks communicator integrity with the Integrity Rules for each evolutionary action.
6. System shows evolution and change alternatives to educator. Every action showed is coherent with communicator.
7. Educator chooses an option available.
8. System applies evolutionary actions in order to make the changes automatically.

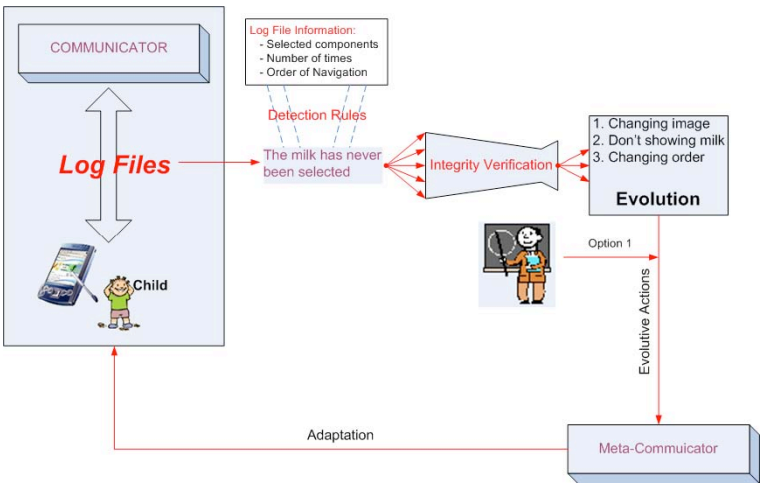

Figure 2: Example of evolution and adaptation

The following information can be obtained about the child's interaction from the log file: which templates, components or links between templates have been visited or selected, and when; the number of times that each one has been visited; navigation order followed; the time taken to observe a component, etc.

Educators must intervene to control the child's evolution. It is in this area that we should focus our effort with the help of psychology and pedagogy experts, and educators and parents who know the children and know whether their profile or environment has changed, making decisions about the most suitable changes at each moment.

Evolution and Adaptation rules must be formally specified and verified in order to allow the automation of changes in the communicator. Our ideas are based on previous work by members of our research group [2] (her thesis is supported by Brusilovsky's work which adaptation rules are being considered in this research within other authors), [5], [1], who uses formalisms as temporary logic and occurrence graphs of Petri nets. These rules must be specified with the help of psychologies and pedagogues of Sc@ut to ensure the right change.

Conclusions and future lines of work

In this paper we have presented a platform for creating ACC systems. We have proposed the inclusion of a new system to manage the evolution and adaptation process so that it may better suit each user's characteristics and environment.

Our first line of work is to select and use a formal method or language for writing the evolution and adapting rules used during the process. Secondly, we aim to create a tool which uses the rules and which may be used by developers to help with the creation and evolution of the communicator. We are also interested in collecting information from the educators while the child is using the communicator and which can then be used to better understand the log files and to make decisions about changes. With this proposal, we are researching the exchange of files between the computer and the Pocket PC device. Finally, information about the environment (such as where the user is ¬ubiquity) can also be used to make decisions about user adaptation. We are interested in studying how this may be obtained and used.

Acknowledgements

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