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A New Tool to Support Interactive Narrative Experience for Children with Communication Disorders

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Short Abstract

An interactive narrative tool for children with communication disorders has been developed that aims to provide children with the experience of interactive narrative based conversation. The tool, which runs on a tablet PC, automatically generates an interactive narrative based on information collected by the tool using environmental sensors and other data. Staff can also record voice messages which are automatically integrated into the narrative text. The child can personalise the generated story by adding comments or deleting unwanted events before using it for interactive communication. A user-centred design involving children, staff and parents led to the development of the prototype, which was evaluated with two children in a special school. The results of the initial evaluation showed that both children could use the system for interactive conversation and that it provided parents with a focus when discussing the school day. A follow-on project is now underway to address issues about everyday use in a school environment and its use with a wider spectrum of intellectual/learning disabilities.

Extended Abstract

Introduction

Children with communication disorders, especially those using augmentative and alternative communication (AAC) devices, can find it difficult to engage in conversation about personal experiences (Waller, 2006). In contrast to their non-disabled peers who learn how to tell personal narratives from an early age, children using an AAC device seldom move beyond single words or short phrases and often rely on conversation partners to ask appropriate questions.

Relating past experience is one way in which children learn to engage in conversational narrative. To facilitate this type of interaction, a prototype narrative tool has been developed for children with communication disorders to support conversations about a child's school day.

The prototype has been designed to address event capturing (knowing what has happened), story identification (identifying which events form a story) and event narration (being able to edit and tell a narrative interactively). Using natural language generation, the system creates a sequence of sentences about school day events based on sensor data which the child can later use when

narrating the story within an interactive conversation. The prototype system has been trialled in a school.

Background

When children first learn to tell stories they are usually supported by an adult conversation partner who elicits the story in a process called "scaffolding" were the child fills in missing parts of a story (Bruner, 1975). During the process of learning to tell stories speaking children develop from using a monologue style – with no room for interaction – to a balanced dialogue allowing for co-construction of the narrative (Peterson and McCabe, 1983).

A common opportunity for children to engage in personal narrative is when talking with their parents about the school day. However, AAC systems provide little support for co-construction and extended narration of personal experience necessary for conversational interaction. To facilitate information transfer between school and home, techniques such as diaries and message recording are used to share experiences. These techniques are however dependent on a facilitator to provide up-to-date information (Beukelman, 1991).

One way of providing this information is to collect data about the school day and to convert this into story texts which children can use for interactive narrative. Data-to-text systems, a field of natural language generation, are computer programs that can produce texts in English or other languages from non-linguistic input data (Reiter, 2007).

A pilot study was conducted to investigate whether an interactive narrative tool could be designed using such data-to-text applications to generate interactive conversational narrative templates automatically.

Design of an Interactive Narrative Tool Prototype

To gather requirements for the system and to understand the environment in which the prototype would be used, a short ethnographic study was conducted at the participating school. This included the study of home-school diaries, recorded and programmed messages on children's SGDs and questionnaires for staff and parents about the sharing of stories between home and school. As a user centred design approach was followed throughout the development of the prototype, ethical approval for the study was obtained from the local University's Ethics Committee and all participants gave written consent. Assent using symbol supported information was obtained from the participating children.

The challenge in designing an interactive narrative tool focused on three areas: the capture of events, the identification of a story, and the interactive narration of the story.

Event Capture

Basic event information was captured using radio frequency identification (RFID) sensors; door tags identified the location of the child, swipe cards identified interaction with people, objects and lunch menu choices. This information allowed for the generation of event utterances such as: "This morning I went to Music class." "Mrs Sound was there." "I played the tambourine." In order to capture additional event information, a voice recording system was implemented. Staff could record additional information, such as "We were practicing for the school concert" which was automatically linked to the generated event utterances.

The Identification of a Story

Stories are more than a list of daily events (Grove, 2009) and not all events are worth telling. Potential story events were identified by looking for changes in the child's routine (data was automatically compared with the child's timetable to detect e.g. room or staff changes) or the presence of voice messages within an event time frame.

Story editing and narration

The user interfaces to edit and narrate the generated stories were designed in close collaboration with staff and pupils at the school. Screen mock-ups were developed using Microsoft PowerPoint and Cricksoft Clicker 5. These mock-ups enabled staff and pupils to give feedback on the functionality of the system.

The editing interface allows the child to delete unwanted or incorrectly detected events and to add evaluations. By selecting a positive or negative evaluation, utterances such as "It was great!" about events or "She is nice!" about people are automatically generated.

The narration interface contains a navigation row showing five events and an editing row with smiley buttons for adding positive or negative evaluation and a deletion button. The centre of the screen shows the current event with its sequence of utterances. Next and previous buttons allow for a sequential narration of all utterances in all events. The interface is switch accessible using row/column scanning.

Evaluation and Results

At the end of the twelve month feasibility study two children used a prototype each during one week. The children's systems collected data throughout each day. The children used the generated stories to tell researchers, staff and a parent about the previous day.

Julie (all names changed) used the system on her DynaVox SGD via head switch using row/column scanning. The following transcript shows an extract of a conversation Julie had with her speech and language therapist (SLT) on day three about her experiences during day two.

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1	Julie:	{next utterance} [Then I went to junior primary instead of reading.]
2	SLT:	Right, you went to junior primary? I wonder why that was?
3	Julie:	{next utterance} [A visitor was there.]
4	SLT:	Oh, a visitor, right. Wonder what the visitor was doing?
5	Julie:	{next utterance} ["The dental hygienist came to give a talk."]
6	SLT:	Oh, dental hygienist.
7	Julie:	{previous utterance} [A visitor was there.]
8	SLT:	That was the visitor, okay. That's why you went to junior primary, uhm, what did you think of the talk?
9	Julie:	{positive smiley} [She was nice.]
10	SLT:	She was nice, that was good! ((laughs))

Notation:

Natural speech: standard text.

Computer generated language accessed using one button: [standard text in square brackets].
Recorded messages accessed using one button: ["quoted standard text in square brackets"].
Paralinguistic behaviours: ((standard text in double brackets)).
Switch selected button by Julie: {curly brackets}

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In this example Julie starts a new topic, inviting her communication partner to prompt for more detailed information. Julie provides this with her next generated phrase. When she is asked about the event she replies with an evaluation the system has generated in relation to its previously generated message [A visitor was there.]. Note that the system is able to refer to the correct gender of the visitor.

A second child, Jessica, had functional speech and used the system as a diary/prompting device to help her to remember better and relate her experiences from the day. She used a head switch for row/column scanning although switch access was restricted to the {next utterance} option after Jessica displayed considerable difficulties in navigating the interface. Jessica stepped through utterances without pausing for any interaction; a developmental stage also observed in typical development (Waller, 2006). Although time constraints did not allow observation of possible development in narrative use, feedback from parents was very positive with regards to using the system as it provided them with a focus when discussing the school day.

Further Development

The evaluation of the prototype showed the feasibility of generating interactive narrative of personal experiences during a school day based on sensor and other data. The participants in the study were able to use these narratives successfully for interactive conversation about their day. However, the current system is not yet suitable for everyday use in a school environment and is not adaptable for use with a wider spectrum of intellectual/learning disabilities. A follow-on project is now underway to address these issues. The new system will be trialled for five months with up to four children.

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