A Limited Communication Domain Mobile Aid for a Deaf patient at the Pharmacy

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Abstract- This paper discusses a prototype for a health communication aid on a mobile phone to support a Deaf[1] person visiting a public hospital pharmacy. The aim is to prevent problems of non-compliance to treatment due to poor communication between a Deaf patient and a pharmacist. We aim to study the limited communication exchange between pharmacists and Deaf patients in a pharmacy in order to extract the most relevant content between the two parties. A prototype has been developed for a mobile phone using stored sign language videos arranged in a programmatically structured sequence to allow pharmacists to give medical instructions to a Deaf patient using text. The technical goal is to implement the prototype on a mobile device and tie the resulting communication structure which takes place between a pharmacist and a Deaf patient to a string of sign language videos a Deaf patient can later watch and understand in order to take their medicine correctly as prescribed by the doctor.

Index Terms— Internet Services; End User Applications; Mobile Applications; Secondary Storage.

I. INTRODUCTION

This paper describes a mobile prototype for a limited domain scenario that helps a Deaf person use South African Sign Language (SASL) and text to communicate with a non-signing pharmacist. South African Deaf people are often not literate in spoken and written languages [1]. They can therefore struggle with basic human interaction such as visiting a doctor. Looijesteijn, an industrial design engineer from the Netherlands, designed a system to support such an interaction on a mobile phone. SignSupport version 1 was mock-up that ran on a PC [6]. A computer scientist Mutemwa implemented the idea on a mobile platform. Mutemwa's prototype, SignSupport version 2, ran on a Symbian mobile phone and employed a guided set of web pages with a combination of SASL videos and English text to enable a Deaf person to 'tell' a doctor how s/he is feeling by pointing where it hurts. At each step, the Deaf user responds to a series of questions presented in SASL, finally enabling the system to convey how the Deaf user is feeling into simple English for a doctor to understand [6]. SignSupport version 3's interface was designed by Chininthorn from the Technology University of Delft. She moved the project from the doctor context and concentrated on a pharmacy context [2]. The reason for moving to pharmacy is that the doctor's domain is too wide to put all medical conditions in SASL videos on the phone whereas the more limited communication domain attached to pharmacy was more doable. We investigated the limited communication exchange between Deaf patients and pharmacists, and crafted a solution that can be implemented on a mobile phone for Deaf users to help them understand instructions from a pharmacist during medication dispensing. SignSupport helps a Deaf user to communicate with a pharmacist, and vice versa without sign language translation. We do not utilize automatic natural speech or sign language recognition because these technologies cannot currently guarantee enough accuracy for medical use. This prototype is therefore not an expert system and does not use comprehensive artificial intelligence methods.

The rest of this paper is organized as follows. Section II covers work related to sign language communication in a limited communication domain exchange. Section III describes SignSupport and what it does in detail. Section IV describes its current implementation. Section V concludes and outlines future work.

II. RELATED WORK

MobileASL is a video compression project that enables mobile wireless cell phone communication through sign language [4]. MobileASL works on commercial phones that are accessible to Deaf people. The motivation for MobileASL is to make as clear a sign language video as possible to transmit over a mobile network. MobileASL is targeted at mobile video and is also a general solution to solving a communication problem for signing Deaf people.

TESSA and ViSiCAST targeted limited domain exchanges with Deaf people. TESSA is an interactive system that operates in a limited domain to aid transactions between a Deaf person and a clerk in a Post Office by translating the clerks' speech to sign language [3]. A speech recognizer recognizes speech from the clerk and the system then synthesizes the appropriate sequence of signs in British Sign Language (BSL) using an avatar. TESSA was developed for a post office environment because most of the conversations are predictable and rather restricted.

The goal of ViSiCAST was to improve the quality of Deaf people by widening their access to services and facilities enjoyed by the community at large. The project identified a number of aspects of life where the integration of Deaf individuals in society would be improved if sign language communication were available: such as access to public services, commercial transactions and entertainment

[1] Deaf with a capital 'D' is different from deaf or hard of hearing in that Deaf people primarily use sign language to communicate and this defines their sense of culture, similar to other groups that use textual languages like English or Xhosa.

[5]. The ViSiCAST team started their first prototype with real sign language videos and later changed to using an avatar. The objective of the ViSiCAST project was to produce adaptable communication tools allowing sign language communication where only speech and text are available at present. A face-to-face transaction virtual signing system was tested at a Post Office. A clerk would speak into the microphone and an avatar would translate in sign language and a Deaf person would sign into the camera, then ViSiCAST would translate to sign language to text or speech.

III. SIGNSUPPORT

SignSupport's greatest challenge is to close down the communication gap between a Deaf patient and a hearing pharmacist during medicine dispensing. Usually when a Deaf person wishes to communicate with a hearing person in a public setting, there has to be an interpreter present unless the hearing person can use SASL. In general, public workers in South Africa cannot use sign language.

SignSupport operates as follows. A pharmacist interacts with the application's interface shown in Figure 1 by tapping information on the phone's display screen, selecting from the provided options and taking a picture of each medicine. This information is later delivered in a SASL video format for the Deaf patient. In this way the Deaf patient can review instructions shown on the right side of Figure 1 in SASL, where the pharmacist can also verify that he has given proper instructions and if not, correct them.

Every choice the pharmacist makes is an instruction that relates to a SASL video a Deaf patient can later access for clarity. SignSupport not only holds SASL videos but also patient history and vital information a pharmacist is required to get from the patient before dispensing. We keep all SASL videos stored on the phone's memory card so as not to incur network costs. However, should a communication break down occur, however, we provide a video relay service to support an interpreted conversation with a remote SASL interpreter via the use of Skype.

Figure 1: *The interface of SignSupport's Time-of-day and Patient Review screens*

IV. PROTOTYPE

To gather results we conducted role plays with student pharmacists. The leader of the experiment was an actual pharmacist who covertly observed the interactions between the student pharmacist and a simulated patient, and also primed the student pharmacists. We studied the conversation flow between a pharmacist and a patient during medicine dispensing. The reason for conducting role plays was to efficiently recognize and discover trends that occur often between pharmacists and Deaf patients at public hospitals. The conversations are simple, easier to follow and predictable in a limited domain exchange. Results from the role plays were used for redesigning the communication structure for a newer version of SignSupport that was implemented on an Android phone. These conversations later formed part of the videos that reside on the phone for explaining to the patient what they need to do next as instructed by the pharmacist.

Overall, SignSupport translates textual and decision-based input from a pharmacist into SASL videos. Our program searches, finds and compares text/choices and then plays corresponding SASL videos for a Deaf patient.

V. CONCLUSION AND FUTURE WORK

The next phase is to conduct user trials with "real" Deaf users at a non-governmental organization (NGO) called Deaf Community of Cape Town (DCCT). Again, we will use role playing as a means of collecting data about the prototype. The data collected will be used for the second phase of developing SignSupport to meet Deaf users' specifications. We will also tighten the limited domain exchange to make it more efficient by finding out from Deaf users and pharmacists how to better structure the information presented to both users by SignSupport.

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