An IP based Multi-Modal Semi-Synchronous Rural Telehealth Service: Adding Video Messaging and Conferencing to MuTI

Xolisa Vuza, William D. Tucker
Computer Science Department, University of the Western Cape, 7535, Bellville
Tel. No: (021) 959 2461, Fax No: (021) 959 3006, E-mail: {9912326, btucker}@uwc.ac.za

Abstract – We intend adding video messaging and conferencing to Multimodal Telemedicine Intecommunicator (MuTI), a previous system that has already been in place in the target environment. This is to allow a semi-synchronous communication to occur over the Internet Protocol. Videoconferencing can be used to communicate synchronously and video messaging in a store and forward fashion can be used to communicate asynchronously. MuTI supports store and forward of still images, voicemail and text. The system also supports real time communication by means of audio. The aim of this research is to learn how to bridge the digital divide by building applications that are useful and relevant to the users we build for. We are developing this application together with the users of the application in an iterative fashion where we build the prototypes and show the users at each cycle. The feedback that we get from the users plays an important role in building a prototype for the next cycle. The software will be instrumented to provide statistics about the system usage. We are also going to get data from the users by using questionnaires and compare this data with the statistics about software usage to see how much the system has been used and which features in the system do the users like. We are using a rural South African context in conducting this research. We hope to bring about guidelines and recommendations on how to develop applications to bridge the digital divide in a developing world context.

Index Terms **– multi-modal, semi-synchronous, prototypes, digital divide, rural South Africa.**

I. INTRODUCTION

The application we are building is based on a previous system, Multimodal Telemedicine Intercommunicator (MuTI) developed using techniques in [1]. The application supports text, voice and still images on a store and forward approach. MuTI came about as a result of the problem with power and network outages in the system that was already put into place in the target environment by the Council for Scientific and Industrial Research (CSIR) [2].

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The CSIR system runs over a wireless network and supports remote diagnosis of patients from a nurse in a local village by the doctor in a hospital in a different village. The system supports sending of still images, synchronous voice as well as video from a web camera. MuTI provides communication between the nurse and the doctor in a semi-synchronous fashion. This kind of communication enables the doctor or the nurse to be able to write data to be sent immediately as soon as the network and power are up. We intend adding video messaging and videoconferencing to the current MuTI system. This means that the nurse can send patient video to the doctor. The doctor can play the video clip and make a diagnosis to send to the nurse. This will also enable the doctor and the nurse to communicate while seeing each other. We feel that this will therefore enhance the quality of their communication. We believe that building these applications start from the users because they are the experts in their problems and environments. We have chosen a health context as a place where we will develop, deploy and test this kind of an application.

II. BACKGROUND

MuTI, developed by using techniques in [1] came about as a result of the problems with the network and power outages in the CSIR system [2]. The other problem was with time scheduling because the doctor is busy sometimes and does not have time to use the system at the same time with the nurse. These problems all came out from the interviews we held with the users of the system. The way the system works is that when the power is up and the network is up, users i.e. doctor and nurse can communicate in a normal synchronous fashion where they send data between each other and receive it in real time. As soon as the power and network go down, then these users can still send data to each other but they cannot communicate in real time. This means that as soon as the power and network come up again, the data is sent asynchronously to the users; they can read and reply to each other. The other scenario is when the nurse sends data to the doctor and the doctor is busy, the nurse can still send it and the doctor can read and listen to the data later on when he has time because at the moment there is only one doctor. This helps a lot in solving both the power/network and time-scheduling problems that are currently in place in the target area.

Multi-modal applications are applications that combine different modalities in one application. These modalities

can be text, voice, video and images. Examples of these applications are Windows Messenger, MSN messenger and Microsoft Netmeeting. We believe that these applications are special in the sense that they do not limit the user in terms of what he/she can use to communicate. Different users prefer different modes of communication.

III. RELATED WORK

The India healthcare project [6] is one example that shows how the use of ICT can help in improving the lives of people in rural areas of developing countries while at the same time involving them in all the aspects of the design process. In this example, nurses are using handheld devices to collect data about patients in rural India. This shows how this method can help in reducing time taken while doing this job compared to when using a book. This example in general shows how helpful it is to use ICT in these types of problems. The nurses here use handhelds to store patient data and this data can be easily integrated to the government and the government can easily see how many people need health care and how many people are already receiving healthcare. This then helps the government to speed up delivery as well as have an idea as to how far they are with the process of health care delivery. The Healthnet Uganda project [4] involves the use of Personal Digital Assistants (PDAs) by the doctors in Uganda to provide healthcare as well as health data dissemination.

IV. METHODOLOGY

We are going to develop the application together with the users in a Participatory Design [5] fashion where we design prototypes and show the users at each cycle. This process will follow repetitive cycles until we finish developing the application. What happens in this process is that we get the requirements from the users of the system, we build the prototype based on the requirements we got from the users, and we evaluate the prototype together with the target users and collect new requirements for the next cycle. This approach is repetitive until we finish developing the application with all the target requirements. We will instrument the software to collect usage statistics and also use questionnaires to get data about system usage from the users. We will then compare the data from the system against the data that we get from the users so that we have an idea of which features are mostly used and for how long, for what and when. We are using Outcomes Mapping techniques described in [6] to evaluate how much change in user behavior the system has brought.

V. FUTURE WORK

1. Building the prototype.
2. Deploying the prototype in the target environment and testing.
3. Collect data from the users and the system.
4. Start from 1 until requirements are met.
5. Write up the thesis.

VI. CONCLUSION

The project produces software that will show impact in a rural environment. The software that will come out is software that must meet the needs of the target community in such a way that they get value out of it. The other thing that is expected out of the software is that it must be tolerant to conditions in a rural setting where the software will be deployed. Apart from producing the software, we wish to publish our results so that other people who are also interested in doing the same thing can have a basis of improving or criticizing this kind of work that we have produced. Another important thing that will fall out of this study is the guidelines on how to conduct these kinds of studies in rural South Africa. We hope to contribute these guidelines to other computer scientists with the hope that they can also follow this approach once it has proven to be helpful or useful.

We feel that there is a need for us to develop applications that are relevant to the conditions in which we are developing the applications for. We feel that this will help in bridging the Digital Divide. This study is an attempt to producing such an application and guidelines on how to develop applications of this nature.

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