



Kotha Bondhu: Translating Sign Languages into Bengali Voice

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ABSTRACT

Sign languages are the only communication medium for mute and deaf people all over the world, but all the general people are not familiar with it. It is really tough for these people to make other people understand their voices. In the context of Bangladesh, we have studied these community people specifically from the *Tablighi Jamaat* community who use different sign language to communicate with people. By studying them we have gathered the local signs along with global standard sign languages in an application named *Kotha Bondhu*. It is a very simpler application that is understandable to any community people and is able to translate the sign languages into Bengali voice.

Keywords

Sign Language; Mute and Deaf People; Tablighi Jamaat Community; Communication Application.

INTRODUCTION

Sign language globally is a form of visual-manual communication medium having own lexicon and constructive grammar [11]. Sign languages may differ region to region such as British Sign Language (BSL) and American Sign Language (ASL) are much different [11] in nature. Mute and deaf community people always use sign language to communicate with other people. In Bangladesh, more than 2.6 million people are recorded as deaf and mute [12]. Sign languages are not familiar to all people, and that is why mute and deaf people often face problems in communications.

In Bangladesh, some of the people of these communities have attended religious gatherings all around the country. They have to travel to different places. Most of them are coming from Madrasahs (Institution of Islamic education) where Madrasahs generally are the social services part of the mosques [14]. Usually, the sign language is different, particularly for these people because they do not follow the global trend. They made their own sign representation for local available Arabic words.

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The religious gathering in Islam for a certain time is known for *Tablighi Jamaat* gathering [13]. Every year a large group of people frequently visit different parts of Bangladesh from time to time under the name of this *Tablighi Jamaat* community. Some of the mute attendees who are eager to communicate, but face difficulties in communication. Though the signs they usually use, is much simpler comparing standard sign language, but general people do not know this sign languages at all as it is not a part of natural linguistics. In the *Tablighi Jamaat* community, they have an interpreter to manage a group of mute people but this system is not feasible as this creates pressure on the interpreter.

In this scenario, we have come up to make an application-based solution that would help to represent their voice to any community people. There exist some mobile applications to learn sign language, developed specifically for third world countries like us [8, 9]. Mute people who are uneducated but can communicate with individuals via gestures, face significant problems in their daily lives [10]. Though all are a primitive level approach, this gives us the motivation to provide them with a simple way of communication with many people.

We have studied different age group people in several time frames. The study was a focus group study having $n = 47$ participants from different mosques in several areas. We focused on them because we have found different sign languages from this community. Again, it is hard to get or gather a bunch of mute and deaf people at a time to study. Thus, the study analysis of their day to day life problems motivated us to design an Android Sign Language tool that can translate the local sign language into Bengali Voice.

We named this application as "*Kotha Bondhu*" (*Talking-Friend* in English) because it helps mute people to talk digitally. The application contains audios and videos with the standard and the local gestures of sign language that are being personally used in Bangladesh. The prime focus of this research initiative is to help the mute and deaf people of Bangladesh. This research contribution will help not only the *Tablighi Jamaat* community mute people, but also focuses to rest of the 2.6 M mute people in our country context.

RELATED WORK

Interaction techniques are developed for mute and deaf people in some research works. A data glove technique consisting of a flex sensor was used to detect finger gestures

to translate the signs into English by PIC [3]. Image processing-based application (matching gestures with stored gestures), sign language interpreter-based communication, and tutorial-based application (having 3D visuals) were developed several times but no such thing is properly appropriate in the Bangladeshi context [4, 7, 15]. Similar gesture recognition of sign language has been developed in India [9] where the work recognizes only English alphabets. In recent days mobile application-based communication is a new dimension that developed to communicate between mute people and general people, but the system only deals with English and Arabic language [6]. Text-driven deaf-mute sign language synthesis system helped [2] the people who are able to talk but do not know the sign language. Again, text translator application was also made for mute people to communicate based on ASL [5]. An experimental system “TESSA”, is an aid transaction system between a deaf person and someone who can hear by translating another person’s speech to sign language [1].

However, the above existing systems are not feasible in Bangladesh, because all the systems deal with different languages and complicated systems that are focusing on global standards. In *Tablighi Jamaat* Community the sign languages are different, simple and there is no such communication method developed yet in Bengali in the context of Bangladesh. Our application aims to cover the other way of communication. Though our approach is similar to others, we focus only on Bangladeshi mute and deaf people, and most likely to introduce the local sign languages. Our application will help mute people to communicate in Bengali which is more feasible than communicating in English in Bangladesh.

METHODOLOGY

This research was conducted in three phases of time (June – September) in a year. The study contains more than 22 hours of fieldwork around Dhaka city in three different mosques. We conducted 3 focus group studies with n = 47 participants as shown in Table 1. We chose these focus groups from *Tablighi Jamaat* background because it was easier to share common experiences in dealing with mute and deaf people when it comes to communication. Each discussion lasted 45-60 minutes on average. We went to the participant’s place (mosques) which made them get the highest comfort and safety.

Table 1. Details of the FGD

GROUP AND PARTICIPANTS	Age	Gender	Mosques in Dhaka
Group 1 (n=18)	20-65	Male	Baitul Aman
Group 2 (n=12)	20-65	Male	Kakraail Mosque
Group 3 (n=17)	20-65	Male	Al-Amin Mosque

Participant Recruitment, Moderation and Incentives

Before recruiting participants, we focused on three categories of people who are related to mute people. Here Group 1: *Tablighi Jamaat* people (who face problems dealing with

mute and deaf people), Group 2: Interpreter of the mute and deaf people and Group 3: the mute and deaf people themselves. We reached out to them through an interpreter. We orally mentioned the research purpose to the participants and the participants of each FGD known to each other.

In every discussion, an interviewer had a conversation with the participants and others took the notes. Incentives for participants were determined after talking to the participants to make sure that the incentives did not manipulate them in any way. We provided them BDT 100 mobile recharge card. After each session, we verbally thanked all the participants.

Analysis and Ethics

All the discussions were conducted in native Bengali language and transcribed into English. We also had separate discussions with the interpreters and *Tablighi Jamaat* people. Inductive analysis was conducted on the raw interview data. We conveyed the key themes and developed categories from a close reading of transcripts. A codebook was created based on the themes. Codes were run through according to conducting research. Mute people found interest when we told about the application what we want to develop for them. For the safety of our participants, we created a neutral comfort zone for them. We went to mosques and their places where *Tablighi Jamaat* preaching occurs, to interview interpreters for mute people. Verbal informed consent was obtained from all participants. More than 20 minutes were spent explaining the purpose of the interviews. A method of recording, notes were chosen as many of the participants refused to go on verbal recording or videotaping. All the participants were aware of the notes taking. All notes were scanned and stored in the Google Drive, having access only to the research team.

FINDINGS

Working for the mute and deaf people is not very new, but specifically focusing on *Tablighi Jamaat* mute people is completely a new dimension in the Bangladeshi context. Communication difficulties are the main findings throughout the study, and designing an application-based communication model is a kind of our solution approach. In our study, we found a diverse opinion from the participants.

Problems in Communication

Among 47 participants, around 94% of them expressed their struggle to communicate. Mute and deaf people’s sign languages are not known to general people which creates communication difficulties particularly regarding asking regular questions (e.g., asking for essentials). Almost 34% of participants mentioned this problem where they keep themselves away from asking the question. Mute and deaf people get agitated facing challenges in expression, around 60% have reported that. Sometimes anger initiates in their personality due to such difficulties.

Participants Perception

The Mute and deaf people always face a lot of problem during expressing themselves. In our pre-study period, we got their feelings of suffering. They expressed as:

“No one understands the sign language everywhere. They try to guess.” – Focus Group 1.

“People avoid me when they find me as mute” – Focus Group 2.

Sometimes they avoid events to get away from the regrets. At the sensitive moments, they are helpless in a sense.

“I do not go to any invitation. Always staying in a mosque. I cannot express myself to other people” - Focus Group 1.

“Once, I needed to go to the washroom urgently. I couldn't tell anyone. No one understood me. I couldn't find the toilet by myself” - Focus Group 1.

Mobile Application as Solutions

Around 70% of participants considered a mobile application as a good initiative to help the mute and deaf people on the communication side. Again almost 72% of these participants including interpreters believed that our approach will solve the communication problem. The community suggested and informed us with proper recommended features and appropriate sign movements that are available in their community. A simple and easy to use application is preferred by around 58% of participants.

Our mobile application is a simple tool for this community to express their voice in the Bengali language to any people who do not understand sign languages. The major purpose of developing such an application is to give a smooth user experience by creating a simple user-friendly application rather than fanciness. To keep it simplistic, we gathered pieces of information, collecting common talks of the mute people that they use on a daily basis in any perspective.

DESIGN IMPLICATION

The design of the application circulated via our findings. Figure 1 represents the block diagram of the system. The features have been chosen based on the participants' feedback. Audio, video, a book section, scheduling, push notification, navigation drawer, user feedback, available sign language sections are necessary features for this application.

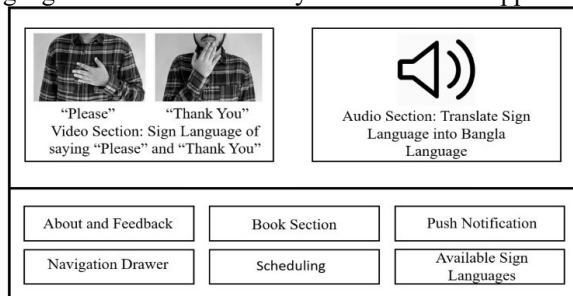


Figure 1. Block Diagram of System Design

Figure 2 and figure 3 represents the current sorting design. As most of our users are not tech savvy and literate, so we use colorful UI and Bengali texts that will make it comfortable to use. To make it more user-friendly, the video clips of sign language are also be played alongside the sound. These videos also help anyone to learn the sign movements perfectly. There is a section of audios that provides the collection of audios along with still pictures. Some common

sentences are provided there and after selecting a sign, telling the meaning in Bengali to other people.

This application is more focused on helping mute people on their religious journey. Mute *Tablighi Jamaat* people often face problems while borrowing religious books (e.g.: Islamic, Hadith, etc.) from people. They often need those but cannot carry all of them. Hence we incorporated a book section where all their necessary books are uploaded. There also have prayers time and scheduling options to help them.

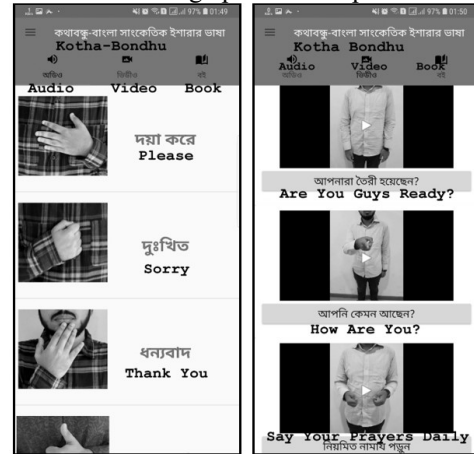


Figure 2. Audio and Video Section of Final Design

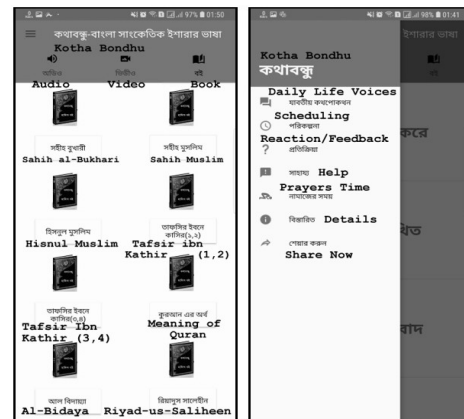


Figure 3. Book Section and Navigation Drawer of Final Design

We have figured out CPU utilization, RAM and Energy consumption of this application. The CPU Utilization reaches a maximum of 6%, and at that time the application consumes around 408.2 MB in maximum. However, it consumes very low power that it is not responsible for the power drain.

USABILITY STUDY

We informed them about this application, and then we conducted a short-term evaluation on focus group 3 and long-term evaluation of five different users. Short-term users tried the application for an hour, explored it and shared their experiences. There were positive remarks such as:

“It would be really helpful.”- Focus Group 2.

“I can now talk to you (researcher) directly with it.”– Focus group 2

Participants tried the application from 1-1.5 months and went to a rural location along with their mobile phone. It was a

‘Chilla’ (Muslim people gathering to somewhere for specific days) of 20 days where the group was strictly allowed to focus on religious rituals in the mosque. Participants shared their own experiences and experiences of the surrounding community using the new communication approach:

“Everyone was interested in the app, I have talked to others using it.” – Focus group 3.

“Many others asked for the app to me, some people who can talk also asked for it.” – Focus Group 3.

Participants focused on features that came into effect from user-centric design:

“The best thing is, we can run the app without the internet. There was no internet in Magura (District in Bangladesh) but I could still use it.” – Focus Group 3.

“I used it but did not need to buy it with money. It does not need money that is good.” – Focus Group 3.

We have experienced satisfaction in the expression of the participants who visited the crowded place that they avoid:

“It is very useful for asking questions. In Norail Bazar (the local market), I asked the way towards different places myself.” – Focus Group 3.

“I went out alone, used the app and did my own shopping from bazar.” – Focus Group 3

Here, around 48% of the users were familiar with this application as they used the beta version of this application. On the other hand, 86% of the users liked the UI (user interface) and from the rest of the users, had neutral opinion. They also stated that they did not have any problem using the application. Most of the users appreciated our way of solving their problems while communicating, and around 91% of the users were satisfied with it, and they can use these sign languages to communicate on a daily basis when they are on tour. Our users assured us that they will keep using our application in their daily lives.

LIMITATION

We have faced a few challenges during the study session of the mute and deaf people. Most of the mute and deaf people in our country use a mixture of different sign languages. Many of them still use baby sign language for many words and ASL (American Sign Language) for other words. Thus, it is difficult to track down the sign languages for most of them because it varies person to person and not available in ASL and BSL as well.

CONCLUSION

We have presented a communication model based on an efficient mobile application for the mute and deaf people who are suffering to share their voices with any people. This application aims to help mute and deaf people by providing the translation of sign languages into Bengali voice. We focused our study on mute people who always take part in a religious journey called *Tablighi Jamaat* where they have used different sign languages. By studying them we have found the locally available sign languages that are not available on the global standard. The development of this *Kotha Bondhu* application is now so handy for other mute

and deaf people. We are trying to explore the other mute and deaf community people of Bangladesh which will definitely help us to know the other dimensions. Thus this study helps us to know the diverse sign languages, and its impact will be increased when it reaches to every single mute people of Bangladesh.

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