PROJECT SANWADA

INTELLIGENT ASSISTANT FOR HEARING IMPAIRERS TO INTERACT WITH THE SOCIETY

Project ID: 17-092

Project Proposal Report

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Submitted on 27/03/2017

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(Proposal documentation submitted in partial fulfilment of the requirement for the Degree of Bachelor of Science Special (honors) In Information Technology)

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DECLARATION

We declare that this is our own work and this project proposal does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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……. …….

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Date

ABSTRACT

A language is a way of words or signs that people use to share feelings and ideas with each other. In view of the society there is an issue in communication among hearing impaired people and ordinary people. Most of the ordinary people have no idea about the sign languages and they are not having any desire to learn sign language. Thus, typically hearing impairers are used to be isolated. When considering about all the solutions there is an absence of a Sinhala application with Sinhala sign language. Since most of the solutions are desktop applications, hearing impairers feel so uncomfortable. Our intention is to fully integrate the hearing-impaired people in the society and to Empower themselves and grow into fully fledged citizens. In the modern era where mobile technology plays a superior role in day to day life, Project "Sanwadha" is an intelligent assistant for the hearing-impaired people for communication. The proposed application is under cross platform mobile development where users can reach the solution widely. The core of the Project "Sanwadha" is Instant Messaging(IM) chat. Here the project will get the text from ordinary person and it convert to sign language. The message will be directing to hearing impaired person in a format of GIF. It also available in offline mode to direct messages. 2D model can be used by the User (Hearing impaired) to grasp the idea by creating the sign as they wish. That sign would be altering in to either Text or Voice to interact with the society. Ordinary people also can cooperate with the hearing impairers with the voice recognition mechanism. This solution would come up with an intelligent application where hearing impairers makes empower in the society through communication. This hopes to narrow digital divide that between enabled and hearing impaired users. The significance of this proposed application is that it allows hearing-impaired individuals to communicate when they are long distance apart. This application would bridge the gap between hearing impairers with the society.

Key words: *Machine learning, Voice recognition, Natural Language processing, Graphic Interchange Format*

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LIST OF ABBREVIATIONS

NLP – Natural Language Processing

GIF – Graphic Interchange Format

ASR - Automatic Speech Recognition

SLU – Spoken Language Understanding

SLG – Spoken Language Generation

TTS – Text to Speech Synthesis

IM – Instant Messaging

1. INTRODUCTION

1.1.Background

In 2003, a research has been carried out about the number of deaf people in Brussels. The results of this study showed that about 1 on 1000 people are deaf. It wondered how Hearing-impairers deal with their situation daily and if there are difficulties with the hearing society. Different sources are referred by us and it was immediately clear that the life of a Hearing-impairer is not that much easy. Research has shown several discoveries concerning Deaf community. Most of the time Hearing-impairers discriminated and excluded by the society. It has been recognized that the hearing society has misperceptions about Hearing-impairers [1].

Problems can be found in several environments: at work, at school, in medical world, in social life etc. Due to the communication problems, Hearing-impairers face many barriers. Deafness is invisible disability which is not surprising. Because you can't see if a person is Deaf [2], [40].

Let's consider about the evolution in communication, in the last half of the 20th century the communication developed rapidly. Today this development has made communication in the day-to-day life easy. With the advancement of the technology, accessing internet has become the most imperative thing. Thus, people are more prone to use the internet as a means of communication more frequently. Using chat systems for communication has become a trend and the most popular way to connect with people all around the world. Although this is the case, today this facility is restricted only to ordinary people. Yet people who are differently-abled are isolated and denied of this facility just because of their disability. Per our knowledge and experience, most of the chat systems are based on text based chatting. Have you ever thought about, how a person with a disability uses this kind of application? Using new technologies to help people with disabilities is highly regarded and much research in this area is underway [3], [38].

The focus of this investigation goes towards the Deaf community. The technology has not sufficiently reached to the Hearing-impairs. If they want to use these kind of chat

applications, those applications should support the ways that deaf people can manage. Although visually-impaired people can communicate by using the human language. Hearing-impairers cannot use that language. They usually comfortable with the sign language. Hence, these applications should support the sign language [3], [39].

Sign languages are natural languages with their own grammar and syntax, specially formulated for the deaf people. Make use of finger spellings, body language, lip pattern and manual communication, to convey the meaning. It mainly involves the use of orientation and movement of hands. The language can be taught only by a person who is specially trained in it. Today, the 'differently-able' people can communicate to the rest of the world as easily and effectively as the able bodied. The credit goes to the sign language which was developed earlier. Most countries have their own national sign languages. Sri Lankan Deaf community also using Sinhala sign language [4], [37].

Nowadays few different applications for people using English sign languages and other sign languages. Our main aim is to reach the Sri Lankan Deaf community who are using Sinhala sign language. Besides Sinhala is the foremost language in Sri Lanka. Today communication of Hearing-impairers with ordinary people are done by an Interpreter. Furthermore Hearing-impairers comfortable with Lip reading. Yet with the absence of an Interpreter, there is a huge gap between Hearing-impairers and Hearing people.

In the investigation towards Deaf community, Ragama School for Deaf was the most imperative place visited. Along with that the Interpreter from “Ahanna” community supports us to reach our background study very effectually. The conclusion gained was that it is equally important that hearing people should learn to deal with Hearing-impairers.

1.2. Literature Survey

The deafness is variable. It can occur at any stage of life cycle, it may impact on the individual’s ability to function on a day-to-day basis and it may or may not be disabling. Conversational speech can be measured as having a Loudness of approximately 60 decibels (dB). Hearing is considered significantly restricted when the ear cannot interpret or process sounds of 25 dB or more [5].

The most natural way to communicate for human beings is through words. When considering about the experience of disability most of them don't have experience of expressing their thoughts with hearing people. High percentage of disabled people are Hearing-impairers. [1].

There are 75 million of deaf people use sign language as their first language. Each country has one or sometimes two or more sign languages. There are some common techniques used by deaf people to communicate with normal people. Some deaf people use speech or sign language only or a combination, some may use finger spelling or writing or body language and facial expressions. Like spoken languages, signed languages vary. Sign languages have their own accents, dialects, and idiosyncratic vocabulary. Signs may be limited to regions, schools, or even families [6].

As a help to these people so far, many applications, systems and devices have been introduced. But the main problem is to connect both non-hearing impaired with hearing impaired simultaneously. For that there are only limited number of systems are evolved. There are applications which can only turn voice to text or sign language to text separately. This research is introduced this system as a two-way communication system. These kinds of systems mainly focused on accuracy level. When working with hand gesture recognition part, many systems used image processing as the technique. It takes lots of time and lots of processing to work on. Even though it achieved, when it comes with hand gestures some rotational movements cannot be track with image processing [7].

The Bolt, Beranek and Newman System

The first computer-based speech training aid was developed around a Digital Equipment Corporation PDP-8E minicomputer. This was an experimental system, resulted directly from its development. The system consisted of 3 sensors (voice-microphone, accelerometer on the throat, and accelerometer on the nose) a preprocessor, the computer, and various output displays. The preprocessor included a pitch extractor, a spectrum analyzer, and a nasal detector [8].

Hand Gesture Recognition

This describes using RGB color spaces and models and presents, some possible ways of segmentation with algorithms. Various experiments were conducted for different gestures and results were obtained with accuracy. The algorithms were implemented in MATLAB programming language. Here it concluded Capturing the hand without the glove results in inaccurate outputs. Data base creation and testing using a GUI makes the system more user friendly. The database can be expanded with more number of hand gestures and its different possibilities to improve the performance of the system. This system consists of a basic web camera which points to the signer, MATLAB -which performs the image processing operations and an audio speaker or a display to convey the message shown by the signer. Here a colored glove is used by signer. The gloves will have red, blue, green color pattern on each finger. The intensity of the color changes with gestures. The gestures are captured by a camera. The intensity changes of the colors are detected. The gestures are detected with image processing using MATLAB [9].

Speech to Text Conversion in Real-time

This software is developed to enhance user's way of speech through correctness of pronunciation following the English phonetics. This desktop software allows one to learn, judge and recognize their pronunciation in English language. This also provide an extra add-on feature which enhance the user's communication skills by an option of text to speech conversion also. This software presents method to design a Text to Speech conversion module using Mat lab and visual studio. As a real time system, this provides a good timing (within 2-3 seconds) and less cost when compare to other voice to text converting systems. Yet this system only can be used with American accent and this is a desktop application [10].

Analysis and selection of features for gesture recognition based on a micro wearable device

This one is considering the flexibility of human finger, a device is developed which can be put it on a finger to detect the finger gestures, and 12 kinds of one-stroke finger gestures are defined per the sensing characteristic of the accelerometer. Designed a wearable device with an accelerometer to wear on finger and catch movements in 3D

space. Experiment results indicate the feature subset can get satisfactory classification results of 90.08% accuracy using 12 features considering the recognition accuracy and dimension of feature set. The system is a ring shape sensing device based on a 3-trial accelerometer. To the system adopt the algorithm of feature selection, stepwise regression. This system defines great accuracy level even with the gesture combinations. But with this system only can be performed very simple set of gestures plus this is not a portable system [11].

Recognition of no manual markers in American Sign Language (ASL) using non-parametric adaptive 2D-3D face tracking

This one address the problem of automatically recognizing linguistically significant non-manual expressions in American Sign Language from video. Develop a fully automatic system that can track facial expressions and head movements, detect and recognize facial events continuously from video. The main contributions of the proposed framework are the following:

- Built a stochastic and adaptive ensemble of face trackers to address factors resulting in lost face track.
- Combine 2D and 3D deformable face models to warp input frames, thus correcting for any variation in facial appearance resulting from changes in 3D head pose.
- Use a combination of geometric features and texture features extracted from a canonical frontal representation. The proposed new framework makes it possible to detect grammatically significant non-manual expressions from continuous signing and to differentiate successfully among linguistically significant expressions that involve subtle differences in appearance [12].

Most of these systems and devices are only focused on a one side communication. But in this application, both focused on text to sign language and sign language to text. The specialty of this system is there is no such a system invented and not for Sinhala language.

Observation from the Literature Review,

- There are very less number of systems have been introduced for Sinhala language.

- The systems which are using image processing techniques are hard to implement and cannot reach the higher accuracy levels of detection when it comes to rotational of gestures.
- Some systems are high cost and technology level is not tally with our country.
- Lacks the expertise and the capacity to deal with deaf people to train them.
- Not having enough existing systems to use for the deaf users with well based manner and remains drawbacks of them.

1.3. Research Gap

There is a communication gap between Hearing-impairers and the ordinary people. Most of the time that is being filled through an Interpreter. It would be a problem when there is no Interpreter. By now, there are some solutions to cover this problem. But those solutions couldn't reach the Sri Lankan Deaf community. Most of them are not flexible with the Deaf users and they are not casing all the extents they need. So, by today Hearing-impairers have challenged with a huge communication gap in their day to day life. Our proposed application would be the finest solution for this gap.

1.3.1. Research gap in Creating chat application

The purpose of this project is to design and implement a multi featured chat application among ordinary people and hearing impairers. This chat application would be included by different means of communication other than the conventional text to text keyboard conversation. Things such as interpreting sign language signs to text and voice to text will be the most useful features of the system. Ordinary user could be more comfortable with Sinhala and Singlish texting. Moreover, this application can use with mobile data and if there are no mobile data, such a case user can use offline message feature.

1.3.2. Research gap in Voice Recognition

There has been a significant amount of research done in voice recognition where a system can be trained to identify a variety of accents based on various voice models which are trained to identify voice. A drawback found is the problem to recognize voice in a noisy

environment. This of course cannot be eliminated 100% and specialized have been created to avoid the above-mentioned problem. But a perfect software solution has not been invented yet. Another problem unique to Sri Lankan users is because Sri Lankans have a unique accent when speaking English. Voice recognition systems fail to detect some words pronounced by Sri Lankans. Along with that there is a need to address this problem with our research. Voice recognition systems also take high processing power and the motive to reduce processing power is another area of concern.

1.3.3. Research gap in Creating 2D Hand Model

This propose a real-time model-based 2D hand tracker that combines image regions 2-axis accelerometer placed on the user's hand. The accelerometer and tracker are synchronized by casting the calibration problem as one of principal component analysis. Based on the assumption that often, the number of possible hand configurations is limited by the activity the hand is engaging in. Use a multiclass pose classifier to distinguish between a few activity dependent articulated hand configurations [9].

1.3.4. Research gap in Semantic Analysis

Identifying Semantic analysis would get the meaning of a set of words and convert that meaning into a GIF. Enable the user get the core idea of the message without having nonsense words [17].

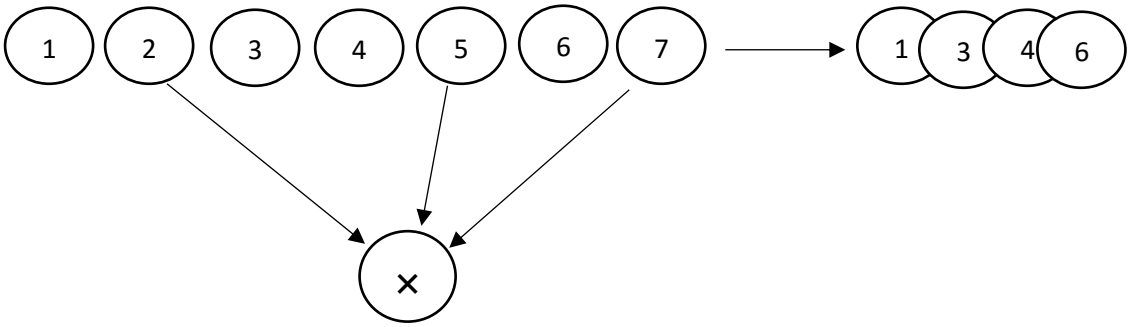

Figure 1.1: Semantic Analysis procedure

1.3.5. Drawbacks of current solutions available

Drawbacks of the solutions available today can be summarized as follows

Deaf chat

Deaf Chat facilitates communication between Deaf and Hearing individuals. It replaces the pencil and paper that is frequently used, plus you can communicate over moderate distances.

A network connection is established between two devices (phones or tablets). The first individual can input text via voice recognition or the keyboard into his Local text area and send this to the second device. On the second device, the text will appear in the Remote text area. The second individual can respond back to the first by entering text into his Local text area, again using either voice recognition or the keyboard.

Using a network connection rather than Bluetooth allows the individuals to be near each other or separated by a large distance. The network connection will most likely be Wi-Fi, but it could be an Intranet or even a connection via the Internet [13].

Deaf - Hearing chat

DH Chat is a system for face-to-face communication between deaf and hearing people without a sign interpreter. If you are a hearing person, you can communicate with your deaf relatives, friends, clients, employees and so on. If you are a deaf person, you can make a face-to-face conversation with hearing people without sign interpreter. You can use the system everywhere: at home, at your work, at restaurants, during your education and so on [14].

Nihanda System

This system used for children who are diagnoses with hearing impaired. Used leap motion controller to track signs and convert them to voice. They implemented game based learning system to hearing impaired children to learn sign language easily. System demonstrate how to identify individual signs and phonetics though videos and images. Mind teaser games uses to self-motivate children to improve their learning abilities. This system capture voice and gives 2D images.

Ahanna System

"Ahanna" is mainly focused on teaching the Sinhala sign language to the users who uses that system. It is web based online application.

The main intention of the "Ahanna" is to spread the pure Buddhism to the deaf community of Sri Lanka through Sri Lankan Sign Language (SLSL) while gifting many more valuable activities, innovative products & new ideas to improve the knowledge, education & quality of Sri Lankan Deaf Community [15].

KATHANA Sinhala speech recognition system

"KATHANA" is a solution for recognizing and interpreting voice. Application converts an acoustic signal which represents human speech done in Sinhala language captured by a microphone, to a set of words. Emphasis is that this acoustic wave represents a human speech done in Sinhala language. The recognized words which are the results can be used for applications as commands, data entries or could be served as the input to further linguistic processing to achieve speech understanding [16].

Features	**Deaf chat**	**Deaf hearing chat**	**Nihanda**	**Ahanna**	**Kathana**	**Sanwada**
Speech to sign translation-Sinhala	✗	✗	✗	✗	✗	✓
Text to Sign language – Sinhala & Singlish	✗	✗	✗	✗	✓	✓
Translated sign language to GIF	✗	✗	✗	✗	✗	✓
Sign language using 2D modeling	✗	✓	✗	✗	✗	✓
Price/Open source	$ 0.99	$ 2.99	FREE	FREE	FREE	--
Stickers and animated stickers	✓	✗	✗	✗	✗	✓
Interaction with Facebook messenger	✗	✗	✗	✗	✗	✓
Mobile application	✓	✓	✗	✗	✗	✓

Table 1.1: Comparison with Available system

1.4. Research Problem

- Communication between each other is one of the most essential thing to every human being but unfortunately hearing impaired people are having difficulties in communicating with day to day life in the society.
- Subsequently it is essential to bridge the communication gap between hearing-impaired people and the ordinary people.
- Deaf people communicate visually and physically rather than audibly. Many deaf people feel awkward or become frustrated trying to communicate with ordinary people, especially when no interpreter is available.
- When consider about deaf people in distance; there's no way to share emotions and feelings unless they meet each other.
- Deaf community discourage to be social. They do not have any desire to meet each other and share ideas.
- Due to having communication problem; there are many concerns faced by deaf people in day to day travel once that person does not know how to go.
- When following the day to day scenarios; deaf people unable to get any support from ordinary people since there isn't any common communication mode.

This is the problem addressed in our research. Several researches have tried to address this issue, although none of them could not grasp the achievement successfully.

2. OBJECTIVES

2.1. Main Objectives

- The main intention of the investigation is to deliver excessive support by enabling hearing impaired people to communicate with others, share feelings and ideas, actively interact with the society and help that they require with minimum amount of effort and time. And, allowing the hearing impairs to play the role by way of ordinary people without having desertions.
- To influence the Deaf community with the highest technology evolution to make hearing-impairers more comfortable in the global world.

2.2. Specific Objectives

- To identify many Hearing-impairers prefer to communicate with Sign languages which leads to the communication barrier with ordinary people. Subsequently Deaf people become frustrated to interact with the society.
- To establish the pathway for investigation, research papers and documents were surveyed mostly. Furthermore, the real obligation was discovered through the interviews conducted with students of Deaf School.
- To determine the use of mobile applications for deaf people can be observed as a diligence that allows them regardless to utilize to any need of learning and communication at any time anywhere.
- To emerge the application in Sinhala language to reach the Sri Lankan deaf community in an effective way.
- To advance the text message to a Graphic Interchange Format (GIF) to get the message in sign language with more accurate and attractive manner.
- To allow the generation of own sign language using 2D model provided which makes hearing impairers more comprehend about the message they want to direct.
- To enhance Sinhala voice recognition algorithm.
- To interact with the most popular social media like Facebook Messenger.

- To verify that the product is reliable for Hearing-impaired community to lead to a sociable life.

2.3. Research Questions

- What are the features that hearing-impaired person expects from a mobile application?
- What are the social media services that are connected?
- What are the languages that used for the input text?
- How to deliver the GIF message to the user?
- What are the technologies worked out?
- What are the techniques that can make the best performance?

3. RESEARCH METHODOLOGY

This chapter illustrates the methodology for handling the project. It's a methodical approach to the research, gathering requirements, designing and implementation to create effective solution to an existing problem an area where improvement is required.

Proposed solution presents an intelligent assistant for hearing impairers to interact with the society.

The project has a very significant research areas like, Natural Language Processing (NLP), Voice Detection, Machine learning, Artificial Intelligence, Graphic Interchange Format (GIF) conversion and Mobile platform development. Machine Learning and GIF conversion is important for the identification of individual words in each Text and converted sign language send via compressed GIF files. Research conducted further study on above mentioned research areas then the information can be used to achieve the objectives [26].

3.1. System Overview

Considering the outcome of the literature review, it is conceivable to decide the most appropriate tools, technologies and software solutions for the implementation phase. In some cases of design conclusions, study more than one possible technologies and take performance and dependencies into deliberation.

The projected solution can be divided to following key components:

- 2D Model creation
- Text Conversion Mechanism
- GIF file Compression and Extraction Mechanism
- Voice Recognition Module

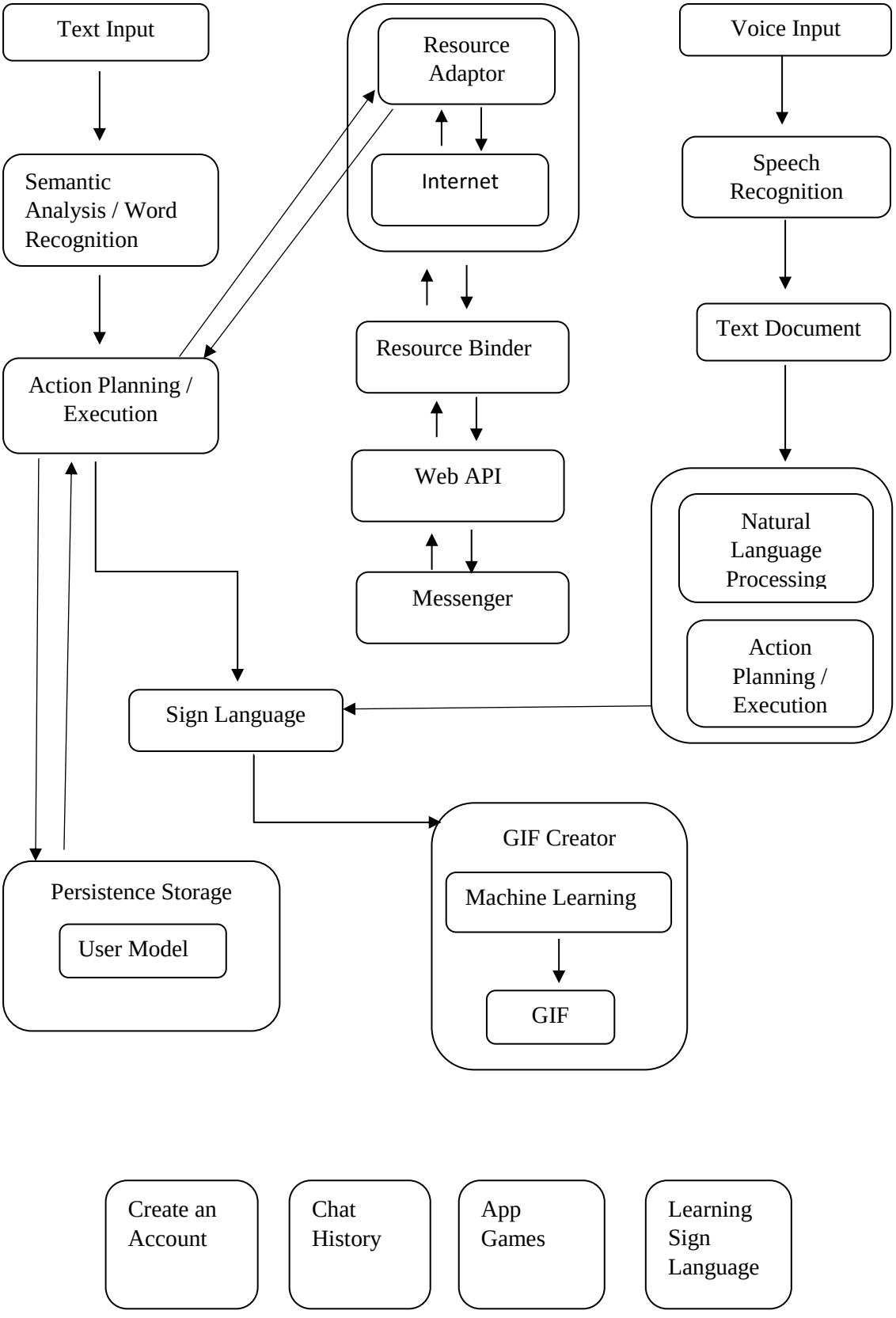

Figure 3.1: System overview of Proposed solution

3.1.1. 2D Model Creation

2D model with high flexibility is introduced in delivering the message or idea by hearing impaired user to other users. Generating the sign can be referred in 2D Hand Model procedure. (Figure 3.2: 2D Hand Model procedure)

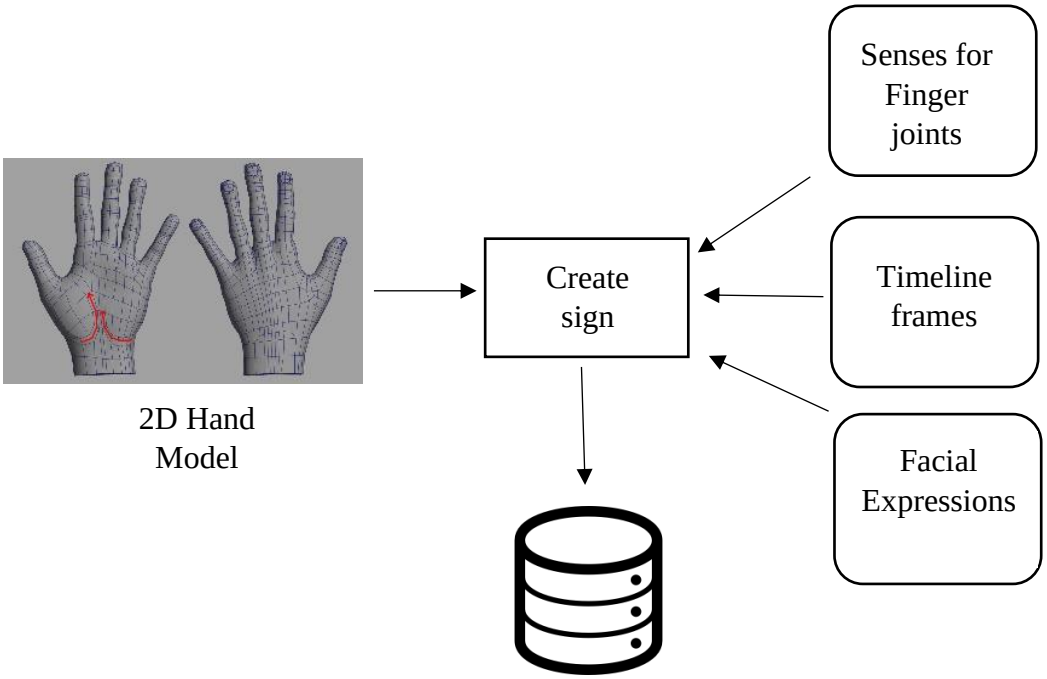

Figure 3.2: 2D Hand Model procedure

Basically, the 2D hand model is having Senses for each Finger joints with high flexibility. Hearing impaired user can bend or stretch very easily from each sense to create the user's sign [18], [36].

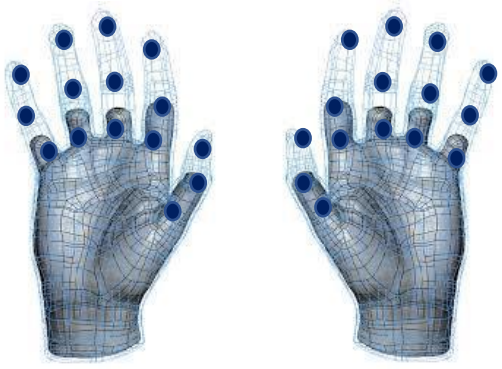

Figure 3.3: 2D Hand Model

Also, user can enhance the sign by adding Time frames, Facial expressions (Happy, Angry, Sad) where the sign creation makes more effective [33], [41].

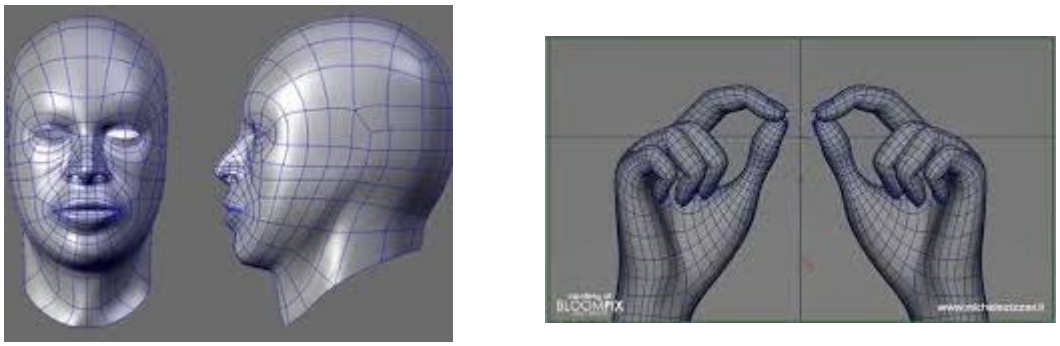

Figure 3.4: Design Models

3.1.2. Text Conversion Mechanism

Text conversion is a set of events that occurs between the input text and GIF response. This arrangement of events referred as Text adaptation. (Figure 3.1: Text Adaption)

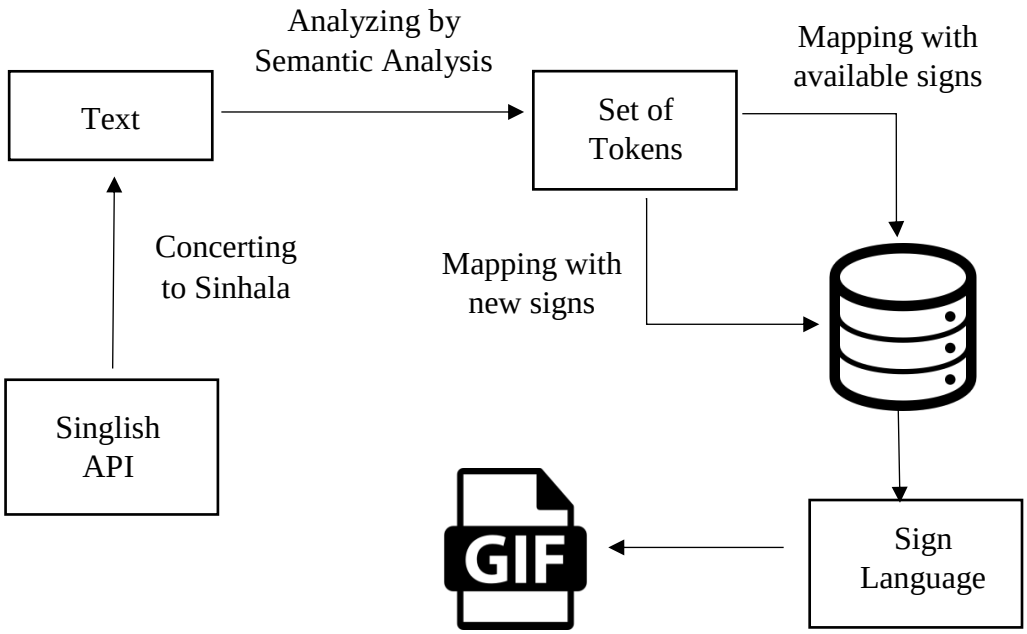

Figure 3.5: Text Adaption

The text input by the user is sent to a module which tries to recognize word by word through Semantic Analysis. Semantic Analysis concerns the procedure of involving syntactic structures, in the levels of phrases, clauses and sentences to the level of the writing as a whole, to their language independent sense. The set of tokens will be mapped by checking either available sign or new sign. Finally, the output will contract in a Graphic Interchange Format (GIF) [27], [28], [29], [30], [31].

3.1.3. Voice Recognition

In voice recognition, there is a cycle of events that occurs between a voice utterance and the response to that utterance from the machine. This sequence of events referred as voice dialog circle.

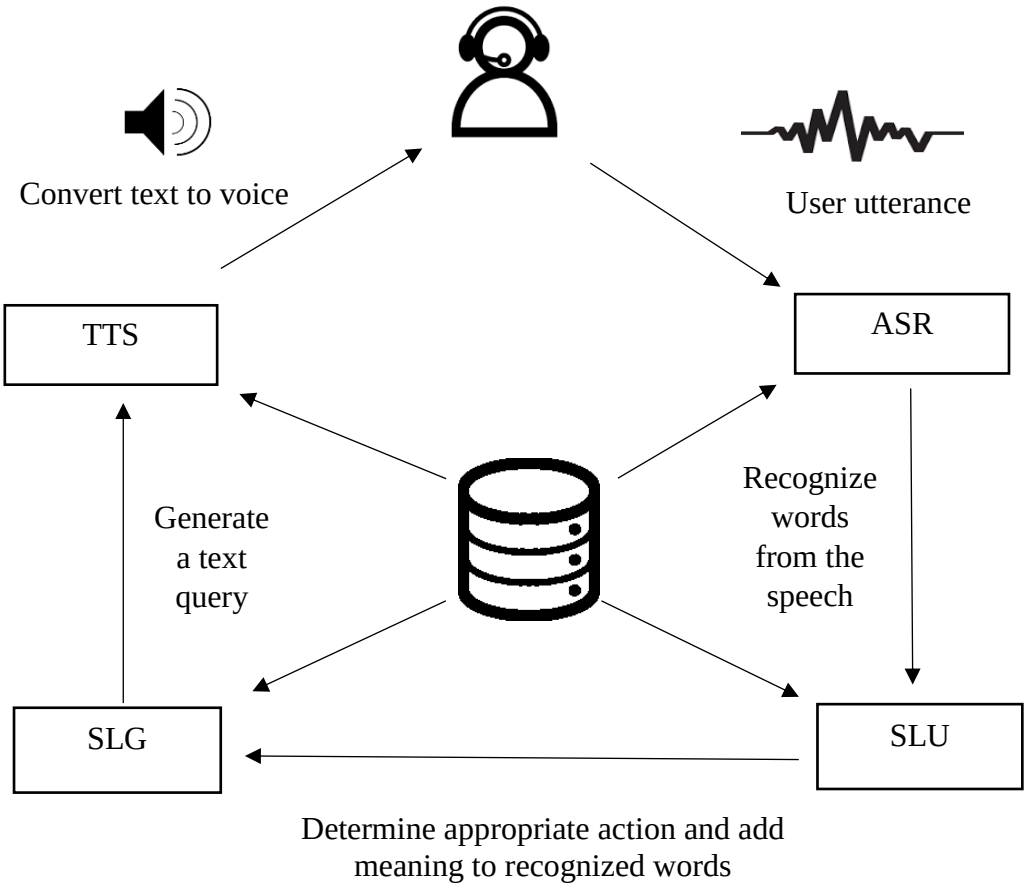

Figure 3.6: Voice Dialog circle

The supporter (ordinary man) makes a reply by speaking that is sent to a module, which attempts to recognize, fully sentence basis, the spoken speech. The process of recognizing the words in the speech is called Automatic Speech Recognition (ASR). ASR will recognize the words from the given speech. ASR can be considered as the most important part of the voice dialog circle. To gain accurate results, the system must train to recognize factors associated with the user's voice. After this training, the user must speak in a clear and partially modified manner for his spoken words to be both recognized and correctly translated [19], [20], [32], [34].

Next the spoken words are analyzed by a Spoken Language Understanding (SLU) module, which attempts to attribute meaning to the verify words. The meaning that is attributed is in the context of the task being handled by the voice dialog system. Once meaning has been determined, examines the state of the dialog per a prescribed operational workflow and determines the course of action that would be most appropriate to take. A text query would be generated by the Spoken Language Generation (SLG) module to clarify the meaning and help determine what to do next [23], [24].

The query text is then sent to the final module, the text-to-speech synthesis (TTS) module, and then converted into intelligible and highly natural speech, which is sent to the user [25], [35].

3.1.4. GIF file Compression and Extraction Mechanism

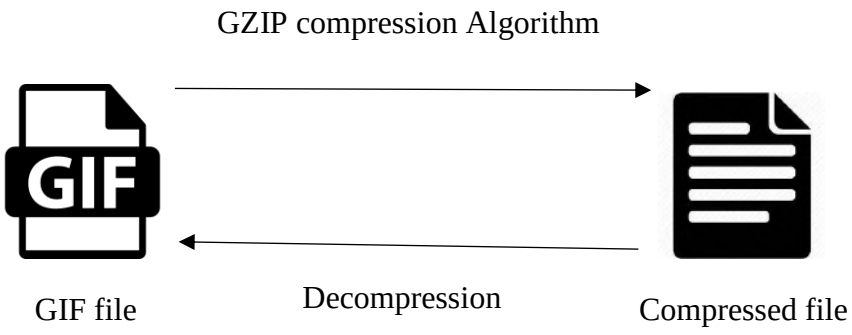

Figure 3.7: GIF Algorithm

GIF files are send through the networks by compressing. For this procedure, the "GZIP Compression Algorithm" is used where the compression can be done with less period.

GZIP Compression Algorithm is generally based on Abraham Lempel and Jacob Ziv's LZ'77 algorithm and Welch's LZW (Lempel – ZIV – Welch) algorithm [21], [22].

The compressed file can be send via either Facebook messenger or proposed application "Sanwadha". The output GIF is going to be delivered under decompression.

3.2. Resources Needed

- Visual Studion2017
- Xamarin Studio
- Microsoft Azure
- SQLite Database
- MAYA Autodesk
- Photoshop CC
- CorelDraw X7
- Singlish API
- MS Office Package (2016)

3.3. Flow of the project

3.3.1. Feasibility Study

Purpose of this phase is to recognize Limitations, Estimate & Analyze of the probable of a planned project. Govern the financial viability, operational probability, technical possibility & organizationally valued. The key constraints recognized are time & possibility of the project.

Financial Viability

Financial feasibility assessment is to govern the positive financial assistances the planned application will provide. Presented a cost/benefits analysis based on significant facts are like Essential Technologies, Transportation and other resources and assistances.

After reviewing all the expenditures against the benefits, the benefits of the application over weighted the expenditures. So, the planned project can be measured as a financially achievable project.

Technical Possibility

The Technical Possibility is emphasis on gaining a considerate of the present technical resources and their validity to the probable needs of the planned application. It is an estimation whether the development can convey with the current methodical requirements and can be measured as method of verifying that the idea is technically probable. In proposed application mainly focused on Interaction with chat application, relevant APIs & Source codes, Machine Learning Algorithms, Compression & Extraction Algorithms during the Technical reviewing.

Operational Probability

Operational Probability is to govern how strategic application solves the problems & how it fulfils the requirements documented in the requirement gathering and analysis stage in SDLC (Software Development Life Cycle).

In the view of finding well understanding about the problem, planned to propose solution, formerly gathered requirements through interviews and questionnaires by met Interpreter who guide in Hearing impairers and get support from Principal, Staff and students in Ragama Deaf school. So, verified that the proposed solution responses of the existing problem an area where improvement is needed.

Therefore, determined that the proposed application is an operationally achievable development.

3.4. Time Frame

Table 3.1: Gantt Chart

4. DESCRITION OF PERSONAL AND FACILITIES

GROUP MEMBR – IT14106866 W. Shenali Tissera

Task	Description
Text to sign language	In creating Text to Sign language conversion, the input text would be converted into Sign language. Input text can be either Sinhala or Singlish.
Handling Sinhala API and Singlish API	Identifying the input text as Sinhala or Singlish with the use of Sinhala API and Singlish API.
Interaction with Chat Application - Sanwadha	Enable the user to interact with our application Sanwadha in sending the GIF message to another user with a level of high accuracy.
Creating Stickers and GIFs	Creating basic stickers and GIFs for day to day life communication. Categorizing these stickers would be more user friendly. E.g.: - education, transport, foods, letters (Sinhala), numbers.

GROUP MEMBER – IT14114618 J.P.C.N. Jayalath

Task	Description
Sign language to Graphic Interchange Format (GIF) conversion	In creating Sign language to GIF conversion, the converted sign would be again convert into GIF. Creating GIF enables hearing impairers to identify the message more simply and effortlessly.

Semantic Analysis and Machine Learning	Identifying Semantic analysis would get the meaning of a set of words and convert that meaning into a GIF. Enable the user get the core idea of the message without having nonsense words.
Interaction with Messenger API	Enable the user to interact with Facebook Messenger in sending the GIF messages to another user with a level of high accuracy. Messenger is another most popular application by today.
Creating Stickers and GIFs	Creating basic stickers and GIFs for day to day life communication. Categorizing these stickers would be more user friendly. E.g.: - education, transport, foods, letters (Sinhala), numbers.

GROUP MEMBER- IT14029264 S. Y. M. Perera

Task	Description
Speech Recognition	Creating the speech recognition module to identify the user's voice input/output (Sinhala) with maximum accuracy and convert it to a text file.
Machine Learning Algorithm	Creating adaptive speech recognition engine can evolve with the user interactions to increase the accuracy of the results.
Speaker Recognition	Identifying the user on the user's voices and authenticate or verify the identity of a speaker as part of a security process.

Creating Stickers and GIFs	Creating basic stickers and GIFs for day to day life communication. Categorizing these stickers would be more user friendly. E.g.: - education, transport, foods, letters (Sinhala), numbers.

GROUP MEMBER- IT14076176 A.M.O.P. Bandara

Task	Description
Creating 2D Model	Creating 2D model with animations enable the user to create his own signs using "Sanwadha" app and communicate with other side. Each finger having 3 points to finger and the hand would be more flexible in creating sign.
Convert created 2D Model sign to Text	Created signs convert to meaningful text. Get full idea of the whole signs and convert it to a text to make interaction between ordinary people and hearing impairers.
Offline Messages	Sending messages offline using mobile through "Sanwadha" app in the absence of internet facility. This would be another option to sending messages.
Creating Stickers and GIFs	Creating basic stickers and GIFs for day to day life communication. Categorizing these stickers would be more user friendly. E.g.: - education, transport, foods, letters (Sinhala), numbers.
Learn Sign Language	Way to learn sign language to the ordinary people who are not aware with the signs.

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APPENDICES

Following questionnaire is based on our survey to identify the real problems faced by Hearing-impairers. This would measure the level of requirement to ensure research.

Questions

1. What is your level of interaction with the society?

☐ Low

☐ Medium

☐ High

2. How about your willingness to use the new technologies?

☐ Low

☐ Medium

☐ High

3. How about your compatibility towards Mobile phones?

☐ Low

☐ Medium

☐ High

4. What is the way of communication with your colleague?

☐ Talking face to face using sign languages

☐ Video calling

☐ Lip reading

5. Is there any way to communicate with an ordinary person?

☐ Yes

☐ No

6. Are you using any application to have conversation with others?

☐ Yes

☐ No

7. If you are using any mobile application, in which language you would prefer?

☐ Sinhala

☐ English

8. Do you like to have any chat application rather video calling when you are communicating with others in distance?

☐ Yes

☐ No

9. What is the most uncomfortable scenario when you interact with the society?

☐ Transportation

☐ Emergency case

☐ Marketplace

☐ Hospital

10. Do you prefer to make your communication easier, using a mobile application with new technologies?

☐ Yes

☐ No