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SMART VIDEO-BASED SIGN LANGUAGE APP: IMPACTS ON COMMUNICATION FOR DEAF AND DUMB INDIVIDUALS

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Abstract: Life is a blessing from the graces of God that he granted to all His creatures. God has excelled in creating this life in its most beautiful form, making the difference of people and the difference of graces among them a cornerstone for enjoying life. Created nature around him, which fascinates hearts, and some enjoy hearing the melody of nature and the chirping of birds and the chants of the seas. The situation regarding the deaf and dumb category is different, because life on a daily basis faces the deaf and dumb category with various difficulties, some of which are similar to what other natural individuals face, Some of the others are his own, that is, they are caused by the problems he suffers because of his disability, and the deaf-dumb tries to continue living relying on his attempt to be able to adapt to the conditions of his life, so they succeed and fail at times. The greater challenge for the deaf-dumb is to strive all possible ways to communicate with the society easily and confidently. They face many problems because most of the individuals they interact may lack knowledge of communicating using sign language. This research aims to reach solutions to overcome this problem by proposing an application to communicate for the Deaf and dumb. This application will help the public to understand the sign language used by deaf and dumb individuals. Therefore, the deaf and dumb group can communicate with people who do not know sign language without feeling embarrassed.

Keywords: Speech recognition, Gesture recognition, Assistive technology, Natural language, Sign language

I. INTRODUCTION

A. Background of the Study

The importance of communication with people increases day by day due to external openness, political and economic relations, and other things that led to the necessity of communication between individuals. It also helps to strengthen the personality of the individual, by making him master the art of talking, and arranging ideas, phrases, and sentences frequently, and that makes him able to establish relationships with those around him, whether they are relationships at work, school, or university. It also helps to identify and open on all cultures and customs, in addition to obtaining information from others. According to the World Health Organization, over 5% of the total populace or 466 million individuals has handicapping hearing misfortune (432 million grown-ups and 34 million youngsters). It is assessed that by 2050 more than 900 million individuals or one in each ten individuals will have crippling hearing misfortune.

Incapacitating hearing misfortune alludes to hearing misfortune more prominent than 40 decibels (dB) in the better hearing ear in grown-ups and a consultation misfortune more noteworthy than 30 DB in the better hearing ear in youngsters. Most of individuals with incapacitating hearing misfortune live in low-and centre pay nations. Roughly 33% of individuals more than 65 years old are influenced by handicapping hearing misfortune. The commonness right now is most noteworthy in South Asia, Asia Pacific, and sub-Saharan Africa. This research seeks to facilitate the process of social communication of the deaf and dumb with their external environment and to eliminate barriers between them.

B. Problem Statement

Difficulty in communicating is one of major challenge faced by people with hearing difficulty is a global issue. Also, they cannot express well their opinions and share the joys and sorrows with others. They sometimes feel inferior and isolated from the world around. In fact, these things are not considered an obstacle that causes them to be cut off from the outside world and involve them from people. The only means of communication for these people to communicate with other people is the sign language. So, they face serious problems in their daily lives. For example: in restaurants, transportation, hospitals, government offices, etc most people they meet may not be skilled to communicate with sign language. Fear of contact with people, integration into society, difficulty in production and participation, and the inability to communicate their needs and ideas to people are the problems that must be addressed by efficient use of Information Technology to make their life as normal and easy as with the society they live with.

Therefore, this study seeks to study and create a smart phone application that would ease deaf and dumb to communicate.

C. Objectives of the Study

Objectives of the research are:

- To carryout extensive study of various challenges faced by deaf and dumb community.
- To discover and learn about the talents and innovations that exist with the deaf and dumb.
- To propose and implement an application in smart phone to facilitate easy communication with the deaf and dumb.

D. Scope and Limitation

As an outcome of this research, an application in smartphone will be designed and implemented. This application will ease the life for deaf, dumb people especially in communication. Despite the problem is global, the study and analysis concerns only with Omani association for the hearing impaired and Al-Amal school for deaf in Muscat.

II. LITERATURE REVIEW

Despite numerous social media applications, only fewer applications focus on the deaf and dumb people use. There is a smart glove that translates signals for the deaf and dumb, but, it is not practical. Deaf and dumb people need a technological leap that would cause them to communicate naturally with outside world. There are many theories that explain several programs and applications that can solve the problem of communication between the deaf and dumb.

In November 2019, a device that can convert sign language when deaf and dumb to sound was proposed. As this research aims to translate the reference into several languages, the most important of which is English. This is by translating the sign language used into an audible voice and in the desired language. One of the commonest of which used in speech recognition systems is Mel-Frequency Cepstral Coefficients (MFCCs). The algorithm starts with preprocessing and signal conditioning. Next extracting feature form speech using Cepstral coefficients will be done. Then the result of this process sends to segmentation part. [1]

Another idea, by Suthagar S., K. S. Tamilselvan, P. Balakumar, B. Rajalakshmi, C. Roshini (2020), Deaf and dumb people find it difficult to find an experienced and always educated translator to acknowledge the transmission of their messages. The only and effective way in which they can communicate is sign language, so a natural, modern, and innovative way of non-verbal communication was achieved using the manual gesture recognition system. The system setup consists of a camera used to capture the gesture provided by the user and capture the image created as input to the proposed algorithm. The algorithm is divided into four steps which divide it, discover the direction, extract, and classify features. This algorithm does not need any trained model data because it is independent of user characteristics. [2] A third writer, according to Amal S. Eldesoky, Kamel Eid, and Aboubakr M. Abdullah (2019), They have worked to demonstrate the efficient use of a glove equipped with sensors that transmit hand movements and gestures to wirelessly transmit to the laptop computer to translate the movements into a picture or paragraph, and it can also translate the sound to pictures or paragraph through the database stored in them, but it is inaccurate due to the different sizes of hands; Where they notice that the efficiency of the glove decreases if it is smaller or larger than the hand, it should be appropriate to the size of the hand.[3]

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A study about A Novel Communication System For Deaf And Dumb People using gesture (2020) Pritesh Ambavane, Rahul Karjavkar, Hemant Pathare, Shubham Relekar, Bhavana Alte, and Neeraj Kumar Sharma 1Dept. of Computer Engineering Ramrao Adik Institute of Technology, Nerul, India.

In today's world, deaf and dumb people face many difficulties in their daily life to communicate with ordinary people; they design and develop a communication system that converts sign language into speech and text. The main motive of the proposed IOT device is to facilitate the daily life of disabled people who have communication problems. They face many difficulties in their daily life due to the communication gap with others. This project will help them communicate easily with others with just their hand gestures. The general idea of the proposed work is described in this paper as in the case of a sensor-based system, in which the values stored in the microcontroller are transmitted to the mobile device wirelessly. After the data stored in the device Matches corresponding values, it displays the spotted text. Converting this text to speech is also done by converting the text to speech. this system gives voice to voiceless i.e., voice is given to the person who is not able to speak. Dumb people use signs to communicate with the people. This sign includes different forms which are made with hand to understand what the person wants to say. This sign language includes different types of hand gestures such as, different facial movements which express the feelings of the persons. In our proposed system flex sensors (mounted on gloves) plays an important role. These flex sensors are attached to the gloves using a thread. Flex sensors are those which carry a certain amount of current which flows through the flex sensors. Further, AVR (Alf and Vegard's RISC processor) controller (mounted on gloves) takes the input signal in analog form from the flex sensors which is further converted into digital form by using inbuilt micro-controller.
Further, digitally converted data is transferred to the android device from microcontroller to the android device wirelessly using Bluetooth chip. Hence, this digital signal (user instruction) is sensed by the android device and will speak according to the character generated.

The existing system dealt with similar problems has some drawbacks and used video devices such as camera for processing data. But the key limitations of the existing system are lack of feasibility (not robust for the use), portability, and accuracy. Further, in the existing system author used contact sensors, image processing are used which makes the project complex in nature. The other limitations of the existing project were limited number of letters can be implemented (American sign language only) [1], unable to display or recognize the sentences, special gestures/patterns are not included, and help message is not implemented. [4]

A study about An Android Application to Aid Uneducated Deaf-Dumb People (2014) was proposed by Dalia Nashat, Abeer Shoker, Fowzyah Al-Swat and Reem Al-Ebailan. One of the most common disabilities is the deaf and dumb type, which prevents a person from listening and speaking. The number of deaf and dumb people in the world is constantly increasing and they are closed off to society. Therefore, ordinary characters are not learned. Uneducated Deaf - Dumb people have a serious problem communicating with the normal people in their community. However, most applications are only available to learn or recognize the signal. In this paper, an integrated Android application is presented to integrate deaf-mutes into society and help them communicate with ordinary people. The translator app suggests a translator in the form of an example keyboard to translate the sign word into Arabic or English and vice versa. Education This app also provides most daily words to teach deaf and dumb children attractive (colors, pictures, cartoons, quiz ... etc.). Moreover, some games that help with communication and entertainment are good. The motive behind our application is to provide service to the community in general and the deaf-mute. This business is an integrated system that can easily solve most of their problems in one app. Therefore, the present work aims to: Helping the deaf and dumb to interact more with ordinary people Offer a great tool for parents to teach their deaf and dumb children - Sign language keyboard input. Creating competitions and games to train the deaf and dumb to recognize Arabic and English words. There is great hope that this application will help the deaf, dumb, uneducated, who cannot read and write Arabic languages to communicate with others, to learn and entertain.[5]

III. RESEARCH METHODOLOGY

The research will be carried out in TWO (2) Phases:

Phase -1: A complete study will be made by conducting series of questionnaire with the parents or family members of Deaf & Dumb.

Phase -2: Based on the analysis of Phase-1, a smartphone application will be made that would interpret the sign language to voice and or text. This application will be given to the Deaf and Dumb persons and initial level of test will be monitored.

Research methods are specific procedures for collecting and analyzing data. In this research, a questionnaire is prepared to understand the real challenges faced by deaf & dumb individuals. The questionnaire was floated with families that have deaf and dumb children, also an interview was conducted with their parents.

Information will be collected through questionnaire, Internet, books, and from search engines. This is to provide careful study aimed at educating people about how to deal with deaf and dumb people and how to use new and modern systems and methods that enable them to communicate and understand with them.

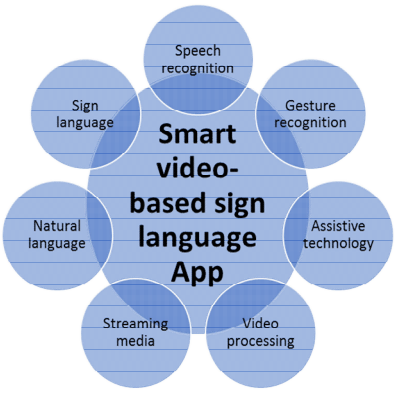

Fig 1 Conceptual Framework of the proposed model

The mobile application can be installed in the mobile phone, the application first will ask the user for registration part by Email-OTP then the application must ask users about their condition (i.e., if he is a normal user or a deaf-mute user) to determine the program interface that will appear to them. If the user is normal people, they will get the program through which they will be able to communicate with people from the deaf and dumb category through the voice/text feedback feature, which in turn will reach the deaf and dumb user in the form of animated sticker/ text. As for the user, if they are from the deaf and dumb category, he will have a user interface through which they can communicate with normal persons using animated stickers/ text/videos, which in turn into a voice/text note when sent to a normal person.

IV. ANALYSIS & INTERPRETATIONS

The responses received from the questionnaire are analysed to find the real challenges those experienced by the deaf and dumb people. The following graphs show some results on the analysis.

Scale Used: 1 Strongly Agree 2 Agree 3 Neutral 4 Disagree 5 Strongly disagree

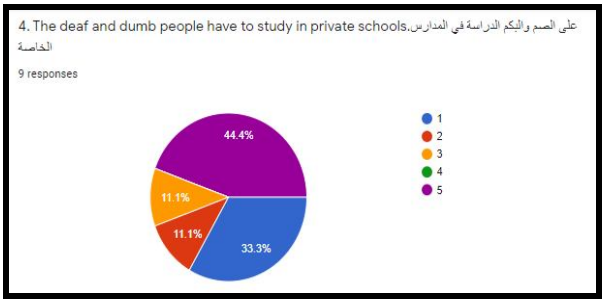

Fig 2 Pie graph showing necessity for dedicated schools

Fig 3 Pie graph showing need for assistance in social events

Fig 4 Pie graph showing need for application

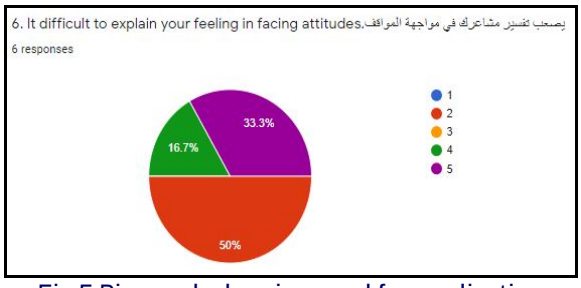

Fig 5 Pie graph showing need for application

Based on the results of the survey, the proposed smartphone application is developed and given to the target group for testing its usage. This chatting application mainly designed for the hearing and talking challenged (Deaf and Dumb) people. The database of chatting application is maintained in Android Studio. The sign language used in the application is American Sign Language (ASL). Some significant screenshots of the application are shown below.

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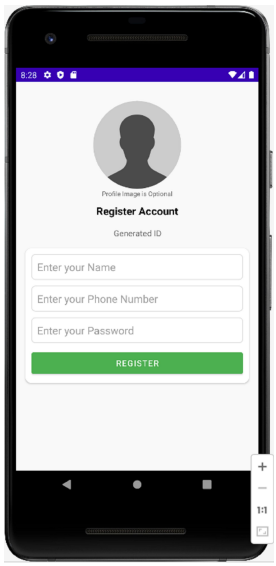

Fig 6 Registration

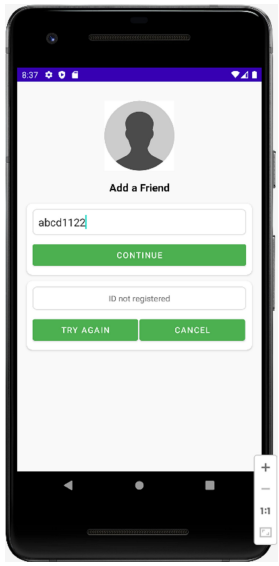

Fig 7 Add Friend

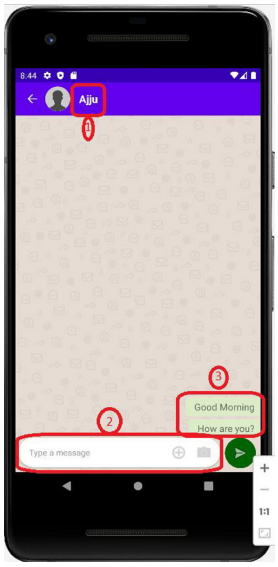

Fig 8 Chat with friend

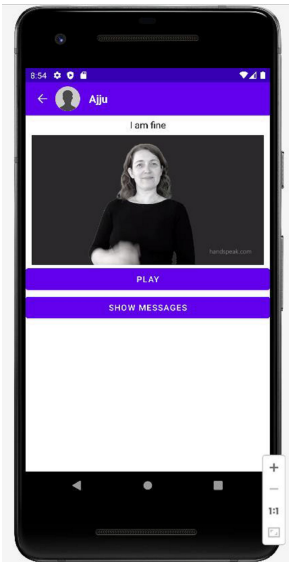

Fig 8 Sign Language

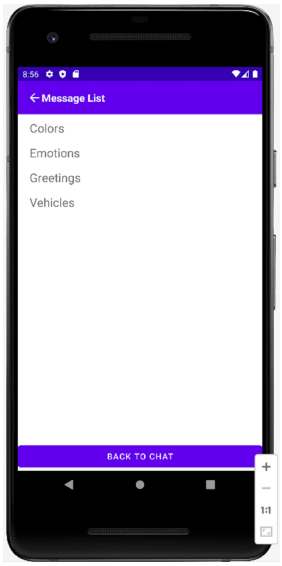

Fig 9 Shortcut Categories

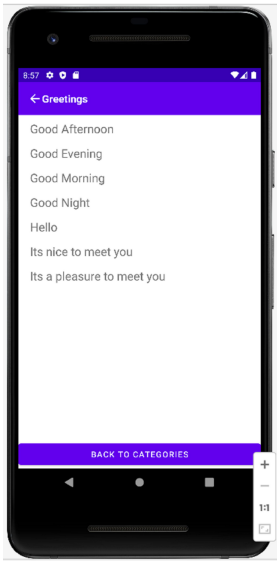

Fig 10 Shortcut greetings

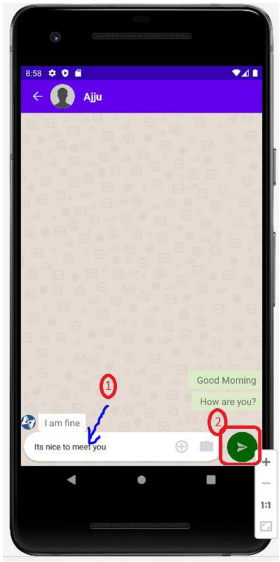

Fig 11 Chatting screen

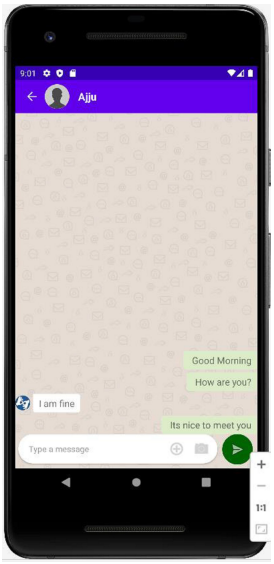

Fig 12 Reply screen

V. CONCLUSIONS

In this research we try to find solutions to the deaf and dumb group, who have talents and creativity, but they cannot share it with people because of the difficulty in communicating. Also, they cannot express well their opinions and share the joys and sorrows of others. It is difficult for them to communicate with people who does not know sign language. Often, the message that they want to communicate to world are misinterpreted. The benefits of application come from all segments of society, including deaf and dumb people who make up a large proportion of society in Oman. So, with this application, it will be easy for the deaf and dumb to study, work and live without the need for anyone.

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