**Introduction**

**1.1 Sign Language**

The World Health Organization (WHO) estimated that, 250 million people in the world are deaf as well as dumb [1]. These group of people of group use symbolic language to communicate with other people. This symbolic language is called sign language. Sign Language is a built for communication used worldwide among hard of hearing and deaf people. Sign language is not a unique language signed consistently in different countries. Sign language is not recent improvement. There is proof that speaking through gestures has been around since the start of human development [20]. Different counties have their own sign language such as American Sign Language, French Sign Language, Indian Sign Language and Puerto Rican Sign Language to a name a few. Table 1 gives information about different sign languages used in western continent. Gesture based communication is dependent on region and has significant differences from other languages. It is very important to understand sign language when we communicate with deaf or young children and their families. Lack of understanding results in significant challenges in understanding this community and may result in miscommunication.

Table 1. Sign Language in the Americas [20]

|  |  |  |
| --- | --- | --- |
| **North America** | **Central America** | **South America** |
| •American Sign Language  •Inuit Sign Language  •Quebec Sign Language  •Puerto Rican Sign Language | •Costa Rican Sign Language  •Guatemalan Sign Language  •Honduras Sign Language  •Mayan Sign Language  •Mexican Sign Language  •Nicaraguan Sign Language  •Panamanian Sign Language  •Salvadorian Sign Language  •Tijuana Sign Language | •Argentine Sign Language  •Bolivian Sign Language  •Brazilian Sign Language  •Chilean Sign Language  •Colombian Sign Language  •Ecaudorian Sign Language  •Paraguayan Sign Language  •Peruvian Sign Language  •Uruaguayan Sign Language  •Venezuelan Sign Language |

Sign Language is a language which is used to convey messages by hand movements, facial expression and body language for communication. It is mainly used by deaf and people who can hear but cannot speak. Sometime family members and relatives must learn sign language to interpret which enables deaf and wider communities to communicate with each other.

**1.2 Mythologies and Misunderstandings about Sign Language**

The Sign language is enclosed by many mythologies and misunderstanding. Most people who are not disable think that sign language is simply a manual representation of the spoken language, which is not true. In fact, our language and sign language of the deaf have little in common. Sign language has the difficulty of the verbal language, but it is self-determining from the alphabets. The best example is British Sign Language and American Sign Language which are meaningless although the facts show that disable people from United States and Britain perfectly understand each other.

Another common misunderstanding about sign language is that it is globally understandable which is of course not true. As explained above, the sign language that is used by the deaf in Unites States and Britain are not the same. The different sign languages might be similar in some alphabets but a deaf person from one country to country cannot communicate as fluently as hearing people from the two countries.

Since sign language is a language of its distinct language, finger spelling or the use of guidebook alphabet cannot be used as an alternative to sign. It is utilized in marking the words with a non-existent sign or when the sign isn't known. In addition, Deaf person would take hours to convey a few minutes of messages through finger spelling.

**1.3 Objective:**

My main objective of my thesis is to help deaf community to increases their self-esteem and IQ level and improve their communication skills. Students who are deaf or have a deaf parent or have a close relative with deaf individual will learn by themselves about sign language alphabets and numbers. Deaf community will learn their first step towards the American sign language. Although correct usage of sign gesture plays very important part in effective communication, deaf students are also encouraged to establish connection to deaf community and to carry their new knowledge and skill beyond the class room and into the community at large. Some important objective is discussed in Chapter 3.

**1.4 Methodology**

In this thesis, Image classification and machine learning have been used for interpreting American sign language. For image classification, computer vision algorithms were used to capture images and to process data set for filtering as well as reducing noise from images. Finally, data set is trained using machine learning algorithm, conventional neural network for measuring accuracy of training data set. Results of the algorithm is explained in chapter 7. The abstract view of the derived approach combining the image classification and machine learning for American sign language is shown in Figure 1.

Feature Vector

Prepare Image

Feature Extraction

Neural Network

Feature Extraction

Edge Detection

Convert RGB to GRAY

Classification

Classified Image

**Figure 1: Project overview for American sign language**

**1.5 Outline:**