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**A Project Report  
On**

**Digit Recognition through Hand Gesture Image**

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## 1. Introduction

Computer being an integral part of today's society and more so for future advanced generations, Human Computer Interface system plays an important role. Digit Recognition through Hand Gesture Image is the vision-based technique of such Interface system.

It is the system developed on python and implemented on Digital Image Processing and Neural Network techniques. It would work on the static captured single hand gesture image of the 10 digits(0-9) which is further processed with the different algorithms to predict the corresponded correct digit.



Fig: The hand shapes corresponding to the digit gestures from 0-9.

## 2. Problem Definition

Gesture is the natural means of communication for the hearing impaired people with the sign language. It would even facilitate communication from a speech-impaired to someone who doesn't understand sign language. It is more applicable in the silent environment where gesture communication is mandatory to maintained. It is even more suitable alternate means of verbal communication where the sound is disturbed or unreachable. Thus, hand gesture can also be the future prominent input tool in different application.

Globally developing trend of digit recognition through hand gesture, can also be utmost use in the technological society of Nepal.

### **3. Objectives**

Some of the basic objectives of this system are mentioned as below:

1. To implement the use of sign language for Human Computer Interface System.
2. To developed the more optimized system with maximum accuracy on testing set.

### **4. Scope**

Digit Recognition through Hand Gesture Image is the system developed from scratch in python programming language using the Jupyter Notebook. Initially, captured image of single-hand gesture which is in RGB of 100\*100 pixel size, is the input to be predicted digit.

Loading datasets holds the 2180 images of 100\*100 pixel size in RGB color space. Different algorithms like Linear Regression, ReLU, SOFTMAX classifier, etc are trained in the layers of forward propagation. Further, backward propagation is used with the Optimization algorithms like Adam, Mini-batch Gradient Descent, etc. Thus, this system is to decipher the correct digit through the input hand gesture image.

### **5. Limitation**

Complexity of the system is a self-evident limitation for itself. There may even be some hardware limitation considering the size of dataset. There may even be high time complexity during the course of training data. Maintaining the high accuracy of predicting the correct result is more challenging of the system.

## **6. Methodology**

Project is implemented through prototyping model: Evolutionary prototype. Initially, a prototype is built after the requirement specification and quick design. Further, it is updated with the different use of algorithms in the neural layers.

### **6.1. Study of Existing System**

System is globally used in different sectors specially as the different other sign language. This system is subset of the sign language recognition system.

However, some of the existing system based on digit recognition system through hand gesture are as follows:

- Coursera-deep-learning: Tensorflow- Digit Recognition from hand Sign using SIGN dataset.

### **6.2. Data Collection**

Datasets is collected from the “Sign Language Digits Dataset” by Turkey Ankara Ayranci Anadolu High School Students.

Details of Datasets:

- Image size: 100\*100 pixels
- Color space: RGB
- Number of classes: 10(Digits: 0-9)
- Number of participant students: 218
- Number of samples per student: 10

### **6.3. Feasibility Study**

System has great impact in the social manners especially for the communication purposes. More, it can be economical to use on an alternative of the gloves based method for Human Computer Interface System. It is adjustable with the time consumption for training datasets(some minutes) but technically user-friendly to use.

## 7. System Planning



Fig. Gantt Chart for Digit Recognition through Hand Gesture Image

## 8. Conclusion

Digit Recognition through Hand Gesture Image is the subset system of the Sign Language Recognition system. It is the best widely used alternative for the Human Computer Interaction(HCI) system. It gives the training accuracy of around 99% with the testing accuracy of 70-75%.