A GESTURE-BASED TOOL FOR STERILE BROWSING OF RADIOLOGY IMAGES

A PROJECT REPORT

Submitted by

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INDEX

A GESTURE-BASED TOOL FOR STERILE BROWSING OF RADIOLOGY IMAGES

CHAPTER-1

INTRODUCTION

1.1 OVERVIEW

In this project we use gestures to browse images obtained during radiology. Gestures refer to nonverbal form of communication made using hands. A major challenge involved in this process is to provide doctors with efficient, intuitive, accurate and safe means of interaction without affecting the quality of their work. Keyboards and pointing devices, such as a mouse, are today's principal method of human-computer interaction. However, the use of computer keyboards and mice by doctors and nurses in intensive care units (ICUs) are a common method for spreading infections. Human can recognize body and sign language easily. This is possible due to the combination of vision and synaptic interactions that were formed along brain development.

In order to replicate this skill in computers, some problems need to be solved: how to separate objects of interest in images and which image capture technology and classification technique are more appropriate, among others. In this project Gesture based Desktop automation, First the model is trained pre trained on the images of different hand gestures, such as a showing number with fingers as 0,1,2,3,4,5. This model uses the integrated webcam to capture the video frame/stored images. The image of the gesture captured in the video frame is compared with the pre-trained model and the gesture is identified.

1.2 PURPOSE

It is used to browse through the images obtained using radiology using hand gestures rather than using mouse, keyboard, etc thereby maintaining sterility.

CHAPTER-2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

2.1.1 TITLE : Indian Sign Language Gesture Recognition using Image Processing and Deep Learning

AUTHOR : Neel Kamal Bhagat, Vishnusai Y, Rathna G N

YEAR : 2019

The data captured by the Microsoft Kinect RGBD camera. Given that there is no one-to-one mapping between the pixels of the depth and the RGB camera, they used computer vision techniques like 3D construction and affine transformation. Convolutional Neural Networks (CNNs) were utilized for training 36 static gestures relating to Indian Sign Language (ISL) alphabets and numbers. Their model achieved an accuracy of 98.81% on training using 45,000 RGB images and 45,000 depth images. Convolutional LSTMs were used for training 10 ISL dynamic word gestures and an accuracy of 99.08% was obtained by training 1080 videos. The model also showed competitive adaptability to American Sign Language (ASL) gestures when the ISL model's weights were transferred learned to ASL and it resulted in giving 97.71% accuracy. Effective real-time background subtraction was done using depth perception techniques. Computer vision techniques were used to achieve one-to-one mapping between the depth and the RGB pixels. The depth and segmented static model achieve an accuracy of 98.81 % and the dynamic model achieves 99.08% on the training set. Further research can be focused on the real-time prediction of more words related to ISL and also on sentence formation.

2.1.2 TITLE : Deep Learning for Sign Language Recognition: Current Techniques Benchmarks, and Open Issues

AUTHOR :Muhammad Al-Qurishi, Thariq Khalid, And Riad Souissi

YEAR : 2021

This paper researcher conducted a comprehensive review of automated sign language recognition based on machine/deep learning methods and techniques. Their study also indicates that input modalities bear great significance in this field; it appears that recognition based on a combination of data sources, including vision-based and sensor-based channels, is superior to a unimodal analysis. In addition, recent advances have allowed researchers to move from simple recognition of sign language characters and words towards the capacity to translate continuous sign language communication with minimal delay. This paper proposes, the convolutional neural network (CNN) model was one of the first to gain major attention. In addition to CNN's, other architectures such as hidden Markov models (HMMs) and recurrent neural networks (RNNs) are frequently applied. The support vector machine (SVM) model is frequently used for this purpose as well while random forest (RF) and K-nearest neighbor (k-NN) are sometimes chosen for the classification task. Some hybrid models are emerging that combine the best characteristics of several types of neural networks, and solutions of this type may represent the most logical path forward with respect to advanced SLR applications. It is reasonable to expect breakthroughs in this field in the future, and many of the research studies may include key elements that eventually become a part of the final solution to automated sign language recognition. Even at this stage, many SLR tools can be practically used to some extent and can provide immediate relief to disabled people as well as point to future directions of research.

2.1.3 TITLE : Sign Language Recognition Using Multiple Kernel

AUTHOR : Farman Shah, Muhammad Saqlain Shah, Waseem Akram, Awai Manzoor, Rasha Orba Mahmoud, And Diaa Salama Abdelminaam

YEAR : 2021

All over the world, deaf people use sign language as the only reliable source of communication with each other as well as with normal people. These communicating signs are made up of the shape of the hand and movement. In Pakistan, deaf people use the Pakistan sign language (PSL) as a means of communication with people. In scientific literature, many studies have been done on PSL recognition and classification. Most of these works focused on colored-based hands while some others are sensors and Kinect-based approaches. These techniques are costly and also avoid user-friendliness. In this paper, a technique is proposed for the recognition of thirty-six static alphabets of PSL using bare hands. The dataset is obtained from the sign language videos. At a later step, four vision-based features are extracted i.e. local binary patterns, a histogram of oriented gradients, an edge-oriented histogram, and speeded-up robust features. The extracted features are individually classified using Multiple kernel learning (MKL) in a support vector machine (SVM). They employed a one-to-all approach for the implementation of basic binary SVM into the multi-class SVM. A voting scheme is adopted for the final recognition of PSL. The performance of the proposed technique is measured in terms of accuracy, precision, recall, and F-score. The simulation results are promising as compared with existing approaches. They suggest the use of other features e.g. maximally stable extremal regions (MSER) features instead of SURF. Also, there is a lot of room to further improve the dataset. The segmentation phase of our methodology follows some constraints which are also needed to be user-friendlier.

2.1.4 TITLE : RNN-Transducer-based Chinese Sign Language Recognition

AUTHOR : Liqing Gao, Haibo Li, Zhijian Liu, Zekang Liu, Liang Wan, Wei Feng

YEAR : 2020

Sign Language Recognition (SLR) targets interpreting sign language video into natural language, which largely facilitates mutual communication between the deaf and the general public. SLR is usually formulated as a sequence alignment problem, wherein connectionist temporal classification (CTC) plays an important role in building effective alignment between video sequence and sentence-level labels. However, CTC-based SLR methods tend to fail if the output label sequence is longer than the input video sequence. Besides, they ignore the interdependencies between output predictions. This paper addresses these two issues and proposes a new RNN-Transducer-based SLR framework, i.e., visual hierarchy to lexical sequence alignment network (H2SNet). In the framework, they design a visual hierarchy transcription network to capture the spatial appearance and temporal motion cues of sign video on multiple levels. Meanwhile, they utilize a lexical prediction network to extract effective contextual information from output predictions. RNN-Transducer is applied to learn the mapping between sequential video features and sentence-level labels. Extensive experiments validate the effectiveness and superiority of our approach over state-of-the-art methods. They recommended it would be interesting to study sign language translation constrained by the dialogue context, to facilitate instant communication between the deaf using sign language to a person using speech.

2.1.5 TITLE: Dataset of Pakistan Sign Language and Automatic Recognition of Hand Configuration of Urdu Alphabet through Machine Learning

AUTHOR: Ali Imrana, Abdul Razzaq, Irfan Ahmad Baig, Aamir Hussaina, Sharaiz Shahida, Tausif-ur Rehmana

YEAR : 2021

Social correspondence is one of the most significant columns that the public is dependent on. Notably, language is the best way to communicate and associate with one another both verbally and nonverbally. There is a persistent communication gap among deaf and non-deaf communities because non-deaf people have less understanding of sign languages. Every region/country has its sign language. In Pakistan, the sign language of Urdu is a visual gesture language that is being used for communication among deaf people. However, the dataset of Pakistan Sign Language (PSL) is not available publicly. The dataset of PSL has been generated by acquiring images of different hand configurations through a webcam. In this work, 40 images of each hand configuration with multiple orientations have been captured. In addition, they developed, an interactive android mobile application based on machine learning that minimized the communication barrier between the deaf and non-deaf communities by using the PSL dataset. The android application recognizes the Urdu alphabet from input hand configuration. This paper proposed a dataset of sign language and android-based communication systems which is a hand configuration acknowledgment framework for Pakistan Sign Language (PSL). The dataset of the PSL is available publicly on the cloud and could be used by anyone and the framework interprets the communication through sign-to text translation by using a mobile camera. The system accomplished 80– 90% accuracy on different tests in various light conditions. They tested their model on different hand configurations.

2.1.6 TITLE: Helping Hearing-Impaired in Emergency Situations: A Deep Learning-Based Approach

AUTHOR: Qazi Mohammad Areeb, Maryam, Mohammad Nadeem, Roobaea Alroobaea, and Faisal Anwer

YEAR: 2021

Hearing-impaired people use sign language to express their thoughts and emotions and reinforce information delivered in daily conversations. Though they make up a significant percentage of any population, the majority of people can't interact with them due to limited or no knowledge of sign languages. Sign language recognition aims to detect the significant motions of the human body, especially the hands, analyze them and understand them. Such systems may become life-saving when hearing challenged people are in desperate situations like heart attacks, accidents, etc. Deep learning-based hand gesture recognition models are developed to accurately predict the emergency signs of Indian Sign Language (ISL). The dataset used contains the videos for eight different emergencies. Several frames were extracted from the videos and are fed to three different models. Two models are designed for classification, while one is an object detection model, applied after annotating the frames. The first model consists of a three-dimensional convolutional neural network (3D CNN), while the second comprises a pre-trained VGG-16 and a recurrent neural network with a long short-term memory (RNN-LSTM) scheme. The last model is based on YOLO (You Only Look Once) v5, an advanced object detection algorithm. The prediction accuracies of the classification models were 82% and 98%, respectively. The YOLO-based model outperformed the rest and achieved an impressive mean average precision of 99.6%.

2.1.7 TITLE: A Comprehensive Study on Deep Learning-based Methods for Sign Language Recognition

AUTHOR: Nikolas Adaloglou, Theocharis Chatzis, Ilias Papastratis, Andreas Stergioulas, Georgios Th. Papadopoulos, Vassia Zacharopoulou, George J. Xydopoulos, Klimnis Atzakas, Dimitris Papazachariou, and Petros Daras

YEAR : 2021

In this paper, a comparative experimental assessment of computer visionbased methods for sign language recognition was conducted. By implementing the most recent deep neural network methods in this field, a thorough evaluation of multiple publicly available datasets is performed. Their present study provides insights into sign language recognition, focusing on mapping non-segmented video streams to glosses. For their work, two new sequence training criteria, known from the fields of speech and scene text recognition, are introduced. Furthermore, a plethora of pretraining schemes are thoroughly discussed. Finally, a new RGBD dataset for the Greek sign language was created. To the best of their knowledge, this is the first sign language dataset where three annotation levels are provided (individual gloss, sentence, and spoken language) for the same set of video captures. In their future work, efficient ways for integrating depth information that would guide the feature extraction training phase can be devised. Moreover, another promising direction is to investigate the incorporation of more sequence learning modules, like attention-based approaches, to adequately model inter-gloss dependencies. Future SLR architectures may be enhanced by fusing highly semantic representations that correspond to the manual and non-manual features of SL, similar to humans. Finally, it would be of great importance for Deafnon Deaf communication to bridge the gap between SLR and SL translation. Advancements in this domain will drive research into SL translation as well as SL-to-SL translation, which has not yet been thoroughly studied.

2.1.8 TITLE: American Sign Language alphabet recognition using Convolutional Neural Networks with multiview augmentation and inference fusion

AUTHOR: Wenjin Taoa, Ming C. Leua, Zhaozheng Yinb

YEAR: 2021

American Sign Language (ASL) alphabet recognition by computer vision is a challenging task due to the complexity of ASL signs, high interclass similarities, large intraclass variations, and constant occlusions. This paper describes a method for ASL alphabet recognition using Convolutional Neural Networks (CNN) with multiview augmentation and inference fusion, from depth images captured by Microsoft Kinect. Their approach augments the original data by generating more perspective views, which makes the training more effective and reduces the potential overfitting. During the inference step, their approach comprehends information from multiple views for the final prediction to address the confusing cases caused by orientational variations and partial occlusions. On two public benchmark datasets, our method outperforms the state-of-the-art. The confusion matrix and the most confusing pairs of the leave-one-out evaluation on the ASL benchmark dataset were tested on the 5th subject. evaluated on two public datasets, the ASL benchmark dataset, and the NTUdigit dataset. The experimental results have demonstrated that our method makes significant improvement compared to the previous work, achieving recognition accuracies of 100% and 93% in the half-half and the leave-one-out experiments, respectively, on the ASL benchmark dataset, and achieving recognition accuracies of 100% for both the half-half and the leave-one-out experiments on the NTU digit dataset.

2.1.9 TITLE : Image Processing based on Deep Neural Networks for Detecting Quality Problems in Paper Bag Production

AUTHOR : Anna Syberfeldt and Fredric Vuolutera

YEAR : 2021

The use of deep neural networks to perform automatic quality inspections based on image processing to eliminate the current manual inspection. Manufacturers must identify quality issues in production and prevent defective products from being delivered to customers. They investigate deep neural network was implemented in a real-world industrial case study, and its ability to detect quality problems was evaluated through the use of deep neural networks to perform automatic quality inspections based on image processing to eliminate the current manual inspection and analysis. Their results show that the network has an accuracy of 94.5%, which is considered good in comparison to the 70–80% accuracy of a deep neural network implemented in a real-world industrial case study, and its ability to detect quality problems was evaluated, and trained human inspector to analyzed. Future work could focus on improving the solution so that it can assess not only the geometry of bags but also faults in print, coloring, and other purely aesthetic defects that are important to customers even though such flaws do not affect the function of the bag. The personnel at the company did indicate that issues with print and color are somewhat predictable, often happening when refilling printing materials or switching between product variants. Although it might not be critical to automatically detect aesthetic defects, doing so would reduce the burden on the operators in the line. It is thus worth investigating adding this capability as an extra feature of the network.

2.1.10 TITLE : Hybrid deep learning for detecting lung diseases from an Xray image

AUTHOR : Subrato Bharati, Prajoy Podder, M. Rubaiyat Hossain Mondal

YEAR : 2020

Different forms of existing deep learning techniques including convolutional neural network (CNN), vanilla neural network, visual geometry group-based neural network (VGG), and capsule network are applied for lung disease prediction. The basic CNN has poor performance for rotated, tilted, or other abnormal image orientations. Therefore, we propose a new hybrid deep learning framework by combining VGG, data augmentation, and spatial transformer network (STN) with CNN. This new hybrid method is termed here as VGG Data STN with CNN (VDSNet). The new model is applied to the NIH chest X-ray image dataset collected from the Kaggle repository. For the case of the full dataset, VDSNet exhibits a validation accuracy of 73%, while vanilla gray, vanilla RGB, hybrid CNN and VGG, and modified capsule network have accuracy values of 67.8%, 69%, 69.5%, and 63.8%, respectively. They recommended for future work, would apply modified VGG or other new transfer learning algorithms to the sample and full datasets and then make a hybrid algorithm with the fusion of Google Net, Alex Net, and ResNet152 architecture and also prepare a dataset by combining two or more chest X-ray datasets and then apply hybrid algorithms on the combined dataset for detecting various lung diseases. Future research scopes will also include the implementation of image data augmentation techniques such as color space augmentations, kernel filters, feature space augmentation, etc., to increase the accuracy of the automated chest X-ray diagnosis system. In the future, the proposed new VDSNet method can be applied to X-ray images of suspected COVID-19 patients to predict whether those patients have COVID-19-related pneumonia, or not.

2.2 REFERENCES

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2.3 PROBLEM STATEMENT DEFINITION

The communication between the speaking and hearing disabled people to normal one is hard and also there is a lack of communication between them. The disabled people use the sign language as a key to communicate with the normal people, but some people cannot understand the sign language. It is a problem that makes them worst and guilty. In our project, we make their communication understandable and easy.

CHAPTER-3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

The empathy map represents a principal user and helps teams better understand their motivations, concerns, and user experience. It can be conducted with a variety of different users in mind, anywhere from stakeholders, individual use cases, or entire teams of people.

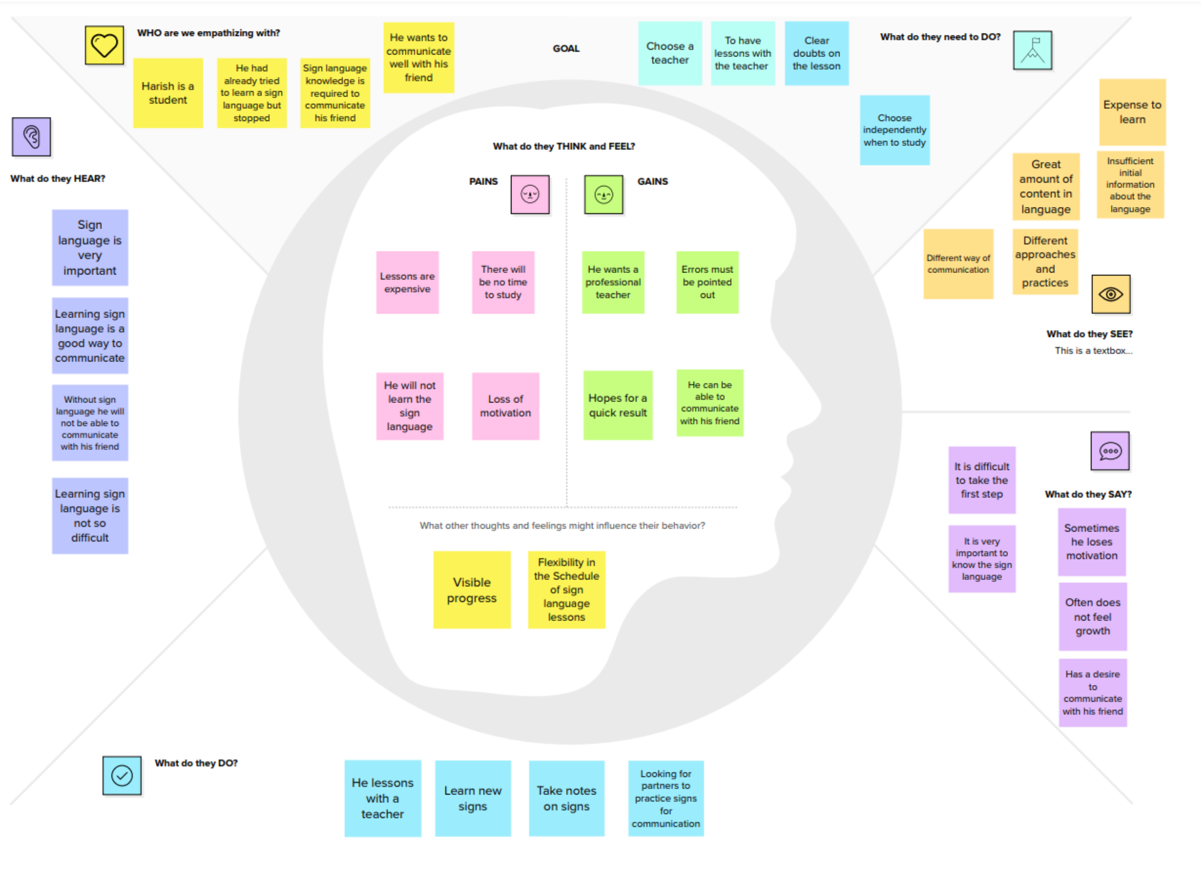

FIG 3.1 EMPATHY MAP CANVAS

The problem statement in the empathy map is a student had already tried to learn sign language but stopped. Sign language knowledge is required to communicate well with his friend. To rectify his problem, he searches for a solution from a different point of view. If he verifies that the solution does not affect his personal thing he moves with the solution or finds the solution which suits him.

3.2 IDEATION & BRAINSTROMING

Brainstorming is a situation where a group of people meet to generate new ideas and solutions around a specific domain of interest by removing inhibitions. People are able to think more freely, and they suggest as many spontaneous new ideas as possible. All the ideas are noted down without criticism and after the brainstorming session the ideas are evaluated.

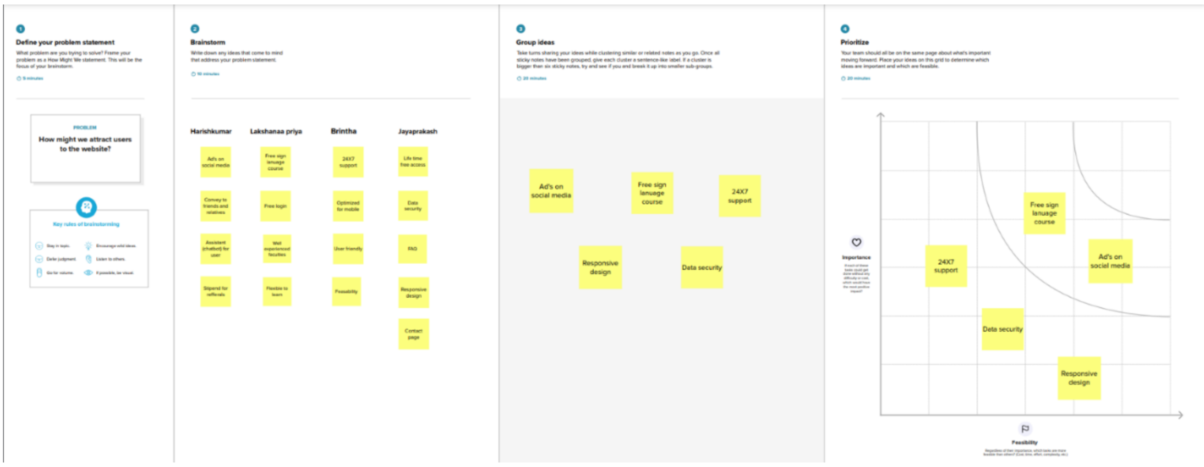

FIG 3.2 IDEATION & BRAINSTROMING

In Brainstorming session our team members are trying to solve the problem [How might we attract users to the website]. The new ideas are shared after the team discussion. Each idea given by the individuals is noted. According to the importance, the ideas are grouped and clustered. Ideas are prioritized which are feasible.

3.3 PROPOSED SOLUTION

Proposed Solution means the technical solution to be provided by the Implementation team in response to the requirements and the objectives of the Project.

S.NO	PARAMETER	DESCRIPTION
1.	**Problem Statement (Problem to be solved**	Hearing and speaking disabled people have a problem to communicate with people.
2.	**Idea / Solution description**	To overcome this problem, sign language is the key to communication.
3.	**Novelty / Uniqueness**	The main feature of the project is to analyze and convert sign language into readable text.
4.	**Social Impact / Customer Satisfaction**	This makes them feel comfortable in public and able to merge with normal people.
5.	**Business Model (Revenue Model)**	Can collaborate with the specially-abled school, health care sectors, and government.
6.	**Scalability of the Solution**	Giving free access and a user-friendly interface increases the scalability

TABLE 3.3 PROPOSED SOLUTION

3.4 PROBLEM SOLUTION FIT

Problem-Solution Fit - this occurs when you have evidence that customers care about certain jobs, pains, and gains. It helps to identify solutions with higher chances of solution adoption, reduce time spent on testing and get a better overview of the current situation.

1.CUSTOMER SEGMENT(S)	6. CUSTOMER CONSTRAINTS	5. AVAILABLE SOLUTIONS
Hearing and speaking disabled people.	• Lack of awareness about sign language. • High cost. • Spending time	1. Learn sign language. 2. Practice sign language. 3. Trying to communicate with normal people.

2.JOBS-TO-BE-DONE/PROBLEMS	9. PROBLEM ROOT CAUSE	7. BEHAVIOUR
Facing difficulties to communicate with normal people.	1. Health issues 2. Genetic problem 3. Accident	• Find the right way to learn sign language. • Practice frequently.

3. TRIGGERS Can’t able to communicate like others. **4.EMOTIONS:** **BEFORE** There is difficulty in communicating which makes them socially isolated. **AFTER** Feeling comfortable in communicating with people.	**10. YOUR SOLUTION** Capturing their sign language as images that analyze and convert into readable text. This makes communication between normal and disabled people easy.	**8. CHANNELS OF BEHAVIOUR ONLINE** Communication is done through mobile and laptop. **OFFLINE** Communication is done directly.

FIG 3.4 PROBLEM SOLUTION FIT

CHAPTER- 4
REQUIRMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Functional requirements may involve calculations, technical details, data manipulation and processing, and other specific functionality supposed to accomplish. Behavioral requirements describe all the cases where that uses the functional requirements, these are used in use cases.

FR No.	**Functional Requirement (Epic)**	**Sub Requirement (Story / Sub-Task)**
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Submitting images	Uploading files using existing images Capturing images through a webcam
FR-4	Output	Readable text

TABLE 4.1 FUNCTIONAL REQUIREMENTS

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-Functional Requirements are the constraints or the requirements imposed on the system. They specify the quality attribute of the software. Non-Functional Requirements deal with issues like scalability, maintainability, performance, portability, security, reliability, and many more. Non-Functional Requirements address vital issues of quality for software systems.

FR No	**Non-Functional Requirement**	**Description**
NFR-1	**Usability**	Users can easily navigate its interface and also can easily determine its feature and processes.
NFR-2	**Security**	The databases can be maintained securely. The security of our databases includes firewalls to prevent unauthorized access.
NFR-3	**Reliability**	It is a highly reliable function with the same or similar efficiency after extensive use.
NFR-4	**Performance**	It can respond quickly to the user’s action and displays output faster

NFR-5	**Availability**	Hearing and speaking disabled people can communicate with normal people easily.
NFR-6	**Scalability**	Giving free access and a user-friendly interface increases the scalability

TABLE 4.2 NON-FUNCTIONAL REQUIREMENTS

CHAPTER- 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

A data-flow diagram is a way of representing a flow of data through a process or a system (usually an information system). The DFD also provides information about the outputs and inputs of each entity and the process itself. A data-flow diagram has no control flow — there are no decision rules and no loops. Specific operations based on the data can be represented by a flowchart.

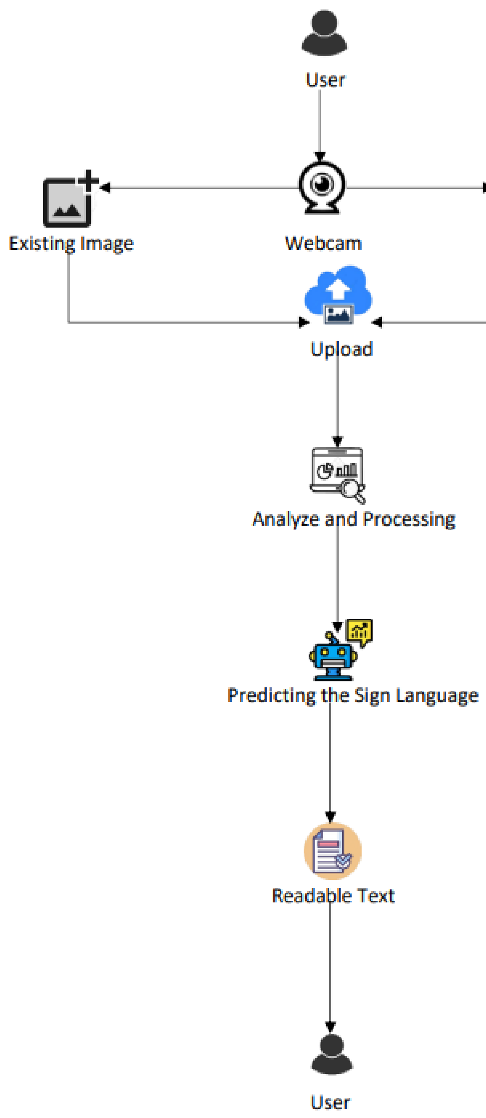

FIG 5.1 DATA FLOW DIAGRAMS

5.2 SOLUTION &TECHNICAL ARCHITECTURE

5.2.1 SOLUTION ARCHITECTURE

Solution architecture is the process of developing solutions based on predefined processes, guidelines and best practices with the objective that the developed solution fits within the enterprise architecture in terms of information architecture, system portfolios, integration requirements and many more.

It can then be viewed as a combination of roles, processes and documentation that are intended to address specific business needs, requirements or problems through the design and development of applications and information systems.

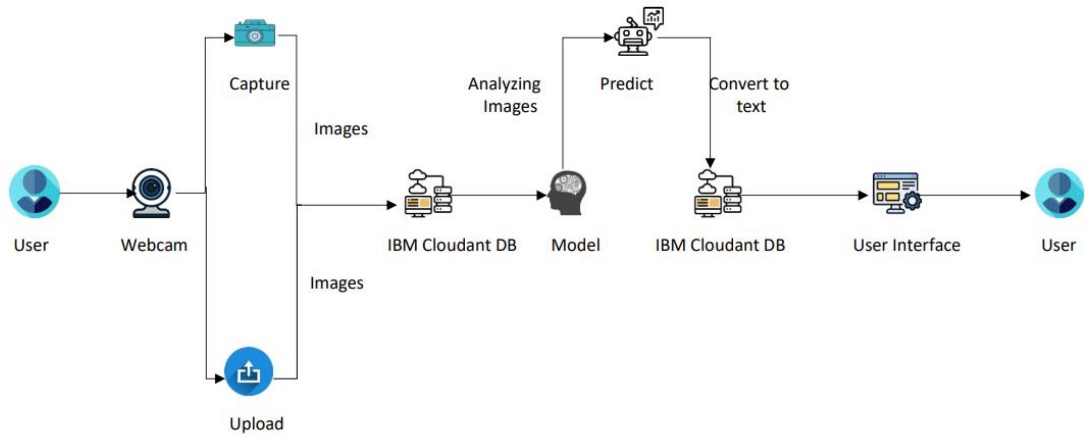

FIG 5.2.1 SOLUTION ARCHITECTURE

5.2.2 TECHNICAL ARCHITECTURE

The process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system.

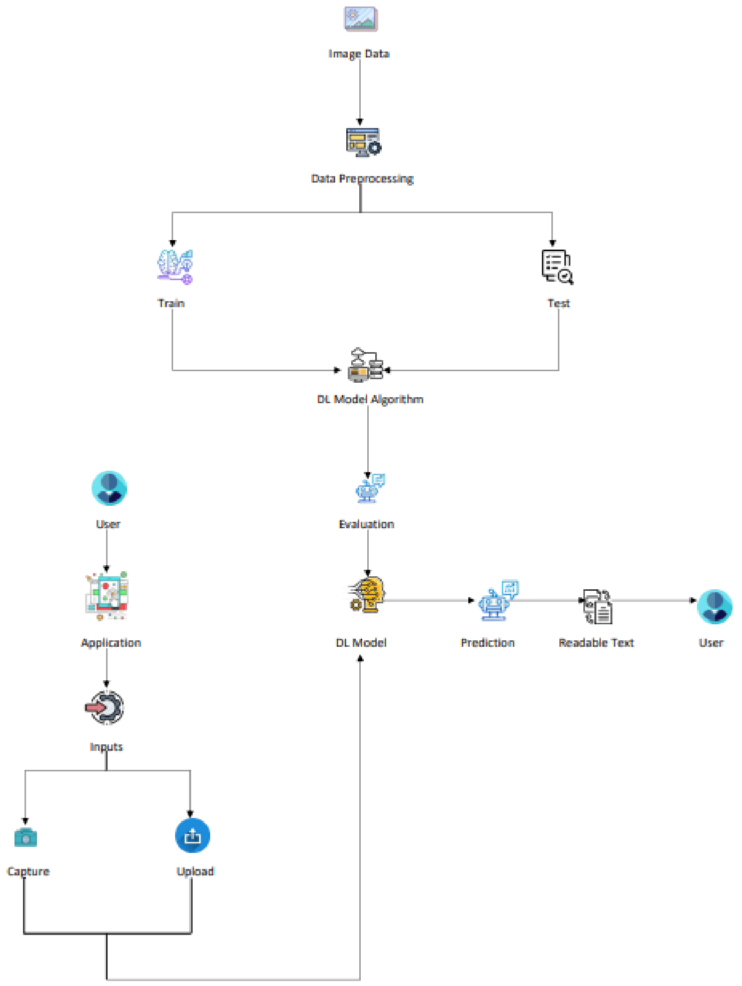

FIG 5.2.2 TECHNICAL ARCHITECTURE

5.3 USER STORIES

A user story is the smallest unit of work in an agile framework. It’s an end goal, not a feature, expressed from the software user’s perspective. A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer.

The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer. Note that "customers" don't have to be external end users in the traditional sense, they can also be internal customers or colleagues within your organization who depend on your team.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	**Registration**	**USN-1**	As a user, I can register for the application by entering my email and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive a confirmation	I can receive a confirmation email &	High	Sprint-1

			email once I have registered for the application	click confirm		
		USN-3	As a user, I can register for the application through Gmail	I can access my account / dashboard sing Gmail	Medium	Sprint-1
	Login	**USN-4**	As a user, I can log into the application by entering email & password	I can log in by entering the correct email & password	High	Sprint-1
	Dashboard	**USN-5**	As a user, I can upload the image either by capturing or existing images	I can communicate if the images are captured or uploaded correctly	High	Sprint-1
		USN-6	As a user, I can get information	I can get the instruction from the	High	Sprint-1

			about the sign language	information page		
		USN-7	As a user, I can know about creditors.	I can get the creator's information	Medium	Sprint-1
Customer (Web user)	**Registration**	**USN-1**	As a user, I can register for the application by entering my email and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive a confirmation email once I have registered for the application	I can receive a confirmation email & click confirm	High	Sprint-1

		USN-3	As a user, I can register for the application through Gmail	I can access my account / dashboard sing Gmail	Medium	Sprint-1
	Login	**USN-4**	As a user, I can log into the application by entering email & password	I can log in by entering the correct email & password	High	Sprint-1
	Dashboard	**USN-5**	As a user, I can upload the image either by capturing or existing images	I can communicate if the images are captured or uploaded correctly	High	Sprint-1
		USN-6	As a user, I can get information about the sign language	I can get the instruction from the information page	High	Sprint-1

		USN-7	As a user, I can know about creditors.	I can get the creator's information	Medium	Sprint-1
Customer Care Executive	**Contact form**	**USN-1**	As a user, I can contact the Customer care executive	I can clear my queries by filling a form	High	Sprint-1
	Email	**USN-2**	As a user, I can mail the Customer care executive	I can solve queries by sending email	High	Sprint-1
	FAQ	**USN-3**	As a user, I can read the frequently asked question	I can solve general queries	Medium	Sprint-1

TABLE 5.3 USER STORIES

CHAPTER-6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING &ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	**Registration**	**USN-1**	As a user, I can register for the application by entering my email and confirming my password.	3	High	4
Sprint-1		**USN-2**	As a user, I will receive a confirmation email once I have registered for the application	3	High	4
Sprint-1		**USN-3**	As a user, I can register for the application through Gmail	3	Medium	4
Sprint-1	**Login**	**USN-4**	As a user, I can log into the application by entering email & password	2	High	4

Sprint-1	**Dashboard**	**USN-5**	As a user, I can upload the image either by capturing or existing images	3	High	4
Sprint-1		**USN-6**	As a user, I can get information about the sign language	3	High	4
Sprint-1		**USN-7**	As a user, I can know about creditors.	3	Medium	4

TABLE 6.1 SPRINT PLANNING &ESTIMATION

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

TABLE 6.2 SPRINT DELIVERY SCHEDULE

6.3 REPORTS FROM JIRA

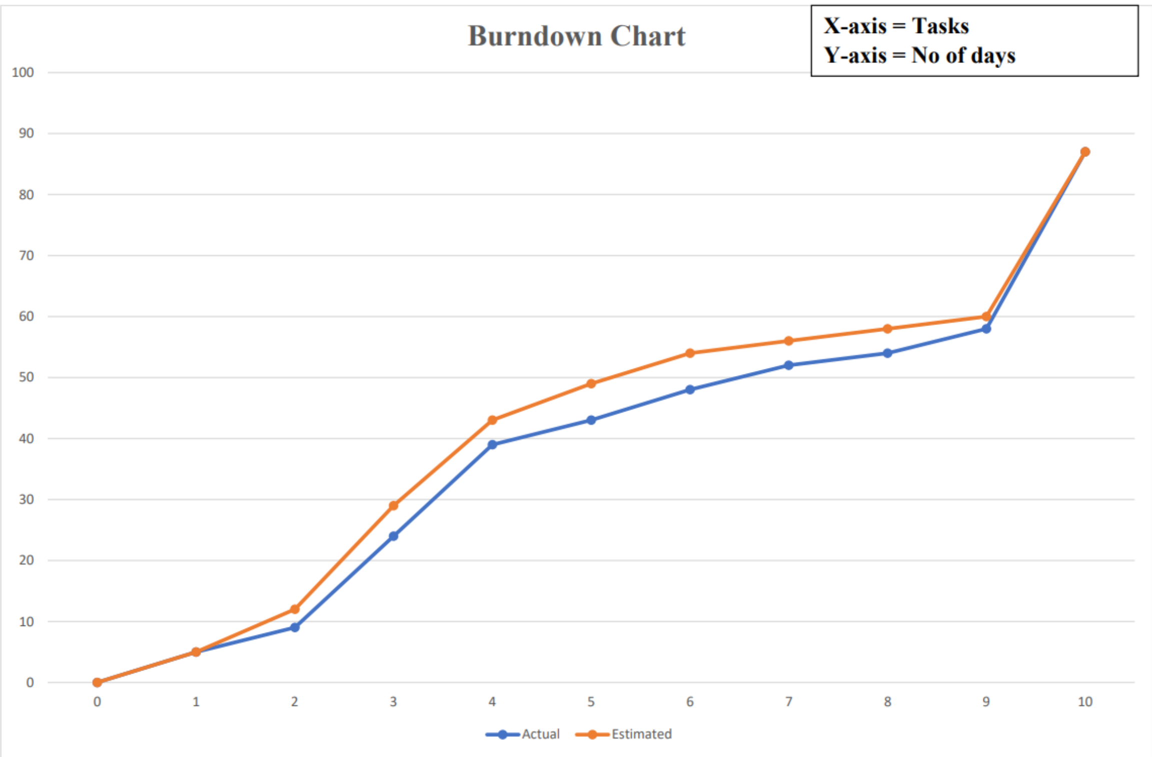

FIG 6.3 REPORTS FROM JIRA

CHAPTER-7

CODING & SOLUTIONING

7.1 FEATURE 1

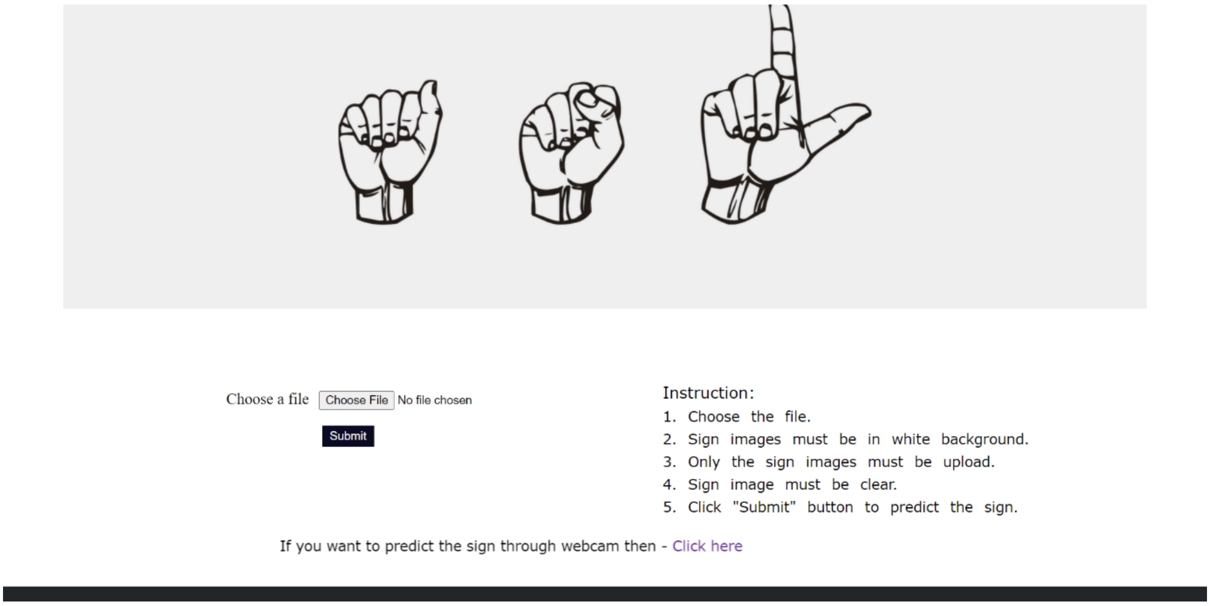

FIG 7.1 FEATURE 1

This is the most important and notable feature of our project where we can upload the existing sign images. Then we can predict the sign after submitting the images. The predicted sign has been displayed below the submit area.

7.2 FEATURE 2

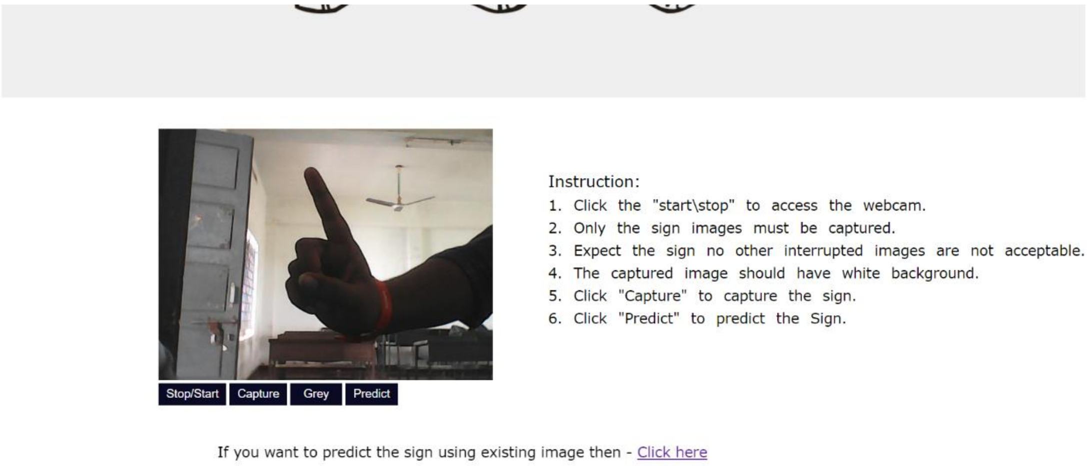

FIG 7.2 FEATURE 2

This is also the most important and notable feature of our project where we can access the webcam for predicting the live sign images. Then we can predict the sign after capturing the images. Then we can get the results by clicking the predict option. The predicted sign has been displayed below the buttons .

7.3 DATABASE SCHEMA

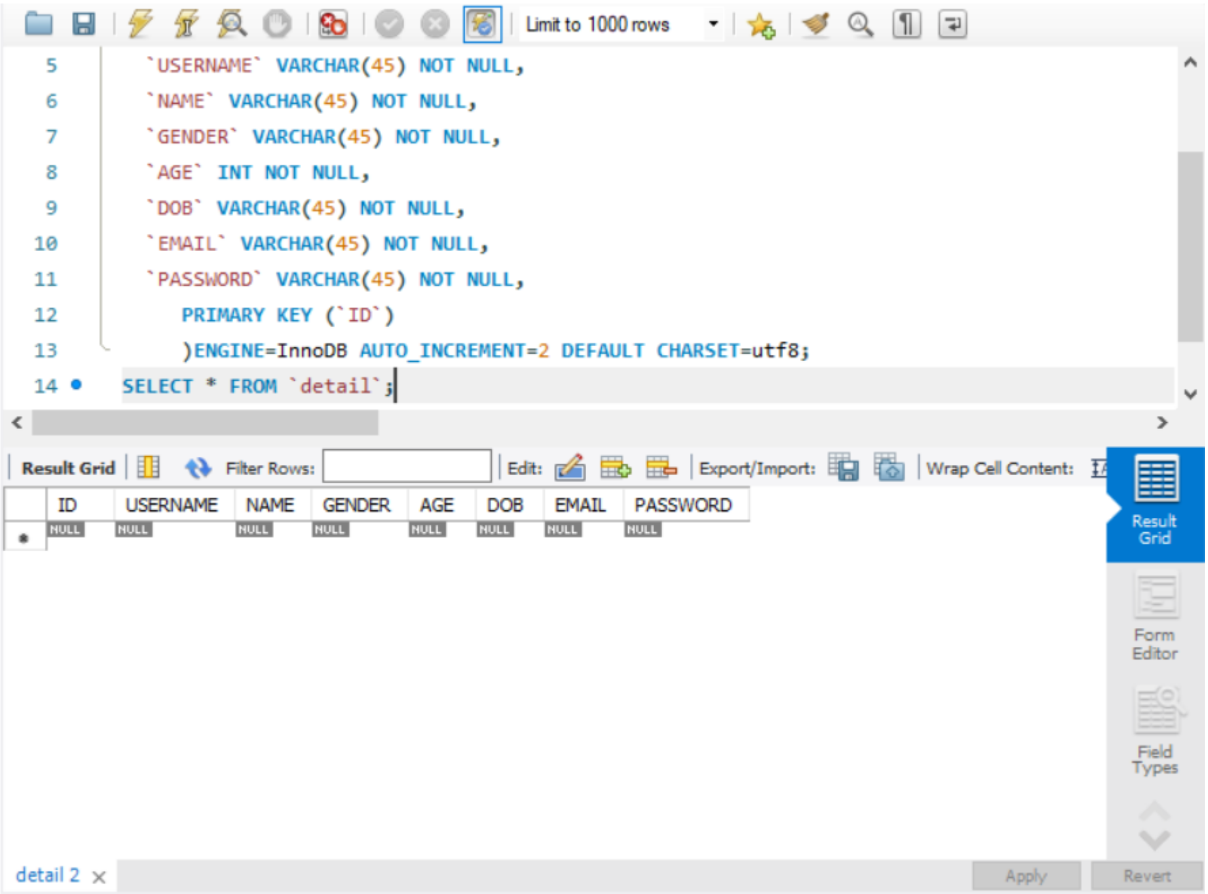

FIG 7.3 DATABASE SCHEMA

We use the MYSQL databases for storing the user register details. Then we retrieve the data's for comparing with signin details.

CHAPTER-8

TESTING

8.1 TEST CASES

SECTION	TOTAL NO OF CASES	PASS	FAIL
Home	5	4	1
Signup	5	3	2
Signin	5	5	0
About	5	5	0
Introduction	5	4	1
Dashboard	5	3	2
Webcam	5	3	2

TABLE 8.1 TEST CASES

8.2 USER ACCEPTANCE TESTING

RESOLUTION	SEVERITY 1	SEVERITY 2	SEVERITY 3	SEVERITY 4	SUB TOTAL
By Design	8	4	3	2	17
Duplicte	1	0	0	0	1
External	2	2	0	0	4
Fixed	15	12	10	5	42
Not Reproduced	0	0	0	0	0
Skipped	0	0	2	0	2
Won't fix	1	1	1	1	4
Totals	27	19	16	8	72

TABLE 8.2 USER ACCEPTANCE TESTING

CHAPTER-9

RESULTS

9.1 PERFORMANCE METRICS

In our project we used RNN Model for predicting the Sign images. The dataset has been splitted for training and tested purpose. Then we build the model using train dataset and the model has been tested through some sign images, it results a good prediction with 96.67% accuracy.

```
In [12]: scores = model.evaluate(x_test, verbose=0)
         print("%s: %.2f%%" % (model.metrics_names[1], scores[1]*100))

         accuracy: 96.67%
```

FIG 9.1 PERFORMANCE METRICS

CHAPTER-10

ADVANTAGES & DISADVANTAGES

10.1 ADVANTAGES

- Gesture are easier representation, makes the presentation attractive, Quick expressing of message, etc.
- Gestures are non-verbal communications.
- It can make the information to be presented easily via audio, visual, or even through silent.
- It is usually a substitute of verbal based communication.
- People can easily interpret the gesture of another person.
- Gestures are the main mode of communication hearing impaired persons.

10.2 DISADVANTAGES

- The tool can be quite expensive as it required camera and other expensive devices to capture image and process it.

CHAPTER-11

CONCLUSION

In this project sign language is recognized using Recurrent Neural Network techniques in Deep learning . The proposed techniques takes the bare hand images as input and analyse them using RNN model. Then the model predicts the results with 96.67% accuracy. After developing the model we developed a tool which recognises hand gestures and enables users to browse through sign images using these gestures. This tool is also easy to use and is quicker than the regular method of using mouse/keyboard. It can be used regardless of the users location since they don't have to be in contact with any device. It also does not require the user to have any device on them to use it. Further this technology can be extended to other industries like it can be used by presenters, by teachers for show images in the classroom, etc.

CHAPTER-12

FUTURE SCOPE

- The tool can be made quicker by increasing the recognition speed.
- More number of gestures can be added thereby increasing this tool's functionality and useability for a different purposes.
- Tracking of both hands can be added to increase the set of commands.
- Voice commands can also be added to further increase the functionality.

CHAPTER-13

APPENDIX

SOURCE CODE

https://github.com/IBM-EPBL/IBM-Project-48113-1660804618

DEMO LINK

https://drive.google.com/file/d/1o7LzFvXN0sea960AN0tdyEvYPcmk5dAs/view?usp=sharing