VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI-590018

An
Internship Report

"ML WITH PYTHON ON HAND SIGN GESTURE RECOGNITION"

COMPUTER SCIENCE AND ENGINEERING

Submitted by
C AKSHAY
USN: 3VC18CS027

Internal Guide **External Guide**

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
ACCREDITED BY NATIONAL BOARD OF ACCREDITATION
RAO BAHADUR Y MAHABALESWARAPPA ENGINEERING COLLEGE
ACCREDITED BY NAAC WITH B++
CANTONMENT, BALLARI-583104, KARNATAKA

2021 – 2022

VEERASHAIVA VIDYAVARDAHKA SANGHA 'S
RAO BAHADUR Y MAHABALESWARAPPA ENGINEERING COLLEGE
ACCREDITED BY NAAC WITH B++
CANTONMENT, BALLARI-583104, KARNATAKA
2021 – 2022

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

Certified that Internship work entitled **"HAND SIGN GESTURE RECOGNITION"** carried out by **C AKSHAY** bearing USN: **3VC18SCS027**, in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2021-2022. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the library. The internship report has been approved as it satisfies the academic requirements in respect of internship work prescribed for the said Degree.

…….. ……

Signature of internship Guide Signature of Co-coordinator

……

Signature of HOD

VEERASHAIVA VIDYAVARDAHKA SANGHA 'S
RAO BAHADUR Y MAHABALESWARAPPA ENGINEERING COLLEGE
CANTONMENT, BALLARI-583104, KARNATAKA
2021 – 2022

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

DECLARATION

I, **C AKSHAY**, student of Bachelor of Engineering in Computer Science and Engineering, Rao Bahadur Y. Mahabaleshwarappa Engineering College, Ballari hereby declare that the dissertation entitled **"ML WITH PYTHON ON HAND SIGN GESTURE RECOGNITION"** embodies the report of my internship work carried out independently by me during 7thsemester B.E, in Computer science and Engineering under the Supervision and guidance of **K.S.RAGHU KUMAR**, Computer Science and Engineering Department, RYMEC Ballari and **Technofly Solutions,** Project Manager, Bangalore. This work has been submitted in the partial fulfillment for the award of Bachelor of Engineering in Computer Science and Engineering by Visvesvaraya University, Belgaum during the academic year 2021-2022.

Date: C AKSHAY

PLACE: Ballari USN: 3VC18CS027

CO-PO Mapping

CO No.	Students are able to
C413.A3.1	Apply existing engineering knowledge in similar or new situations for industrial application of computer science.
C413.A3.2	Demonstrate effective communication, effective work practices in a multi-disciplinary team, and sound judgment to achieve defined internship objectives.
C413.A3.3	Practice ethical standards appropriate to the internship site and adapt to changing industry needs.
C413.A3.4	Understanding of lifelong learning processes through critical reflection of internship experiences.

CO-PO MAPPING														
CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3						2				2		
CO2		2						2	3	3	3	2		
CO3		2						3	3	2	2	2		
CO4		3							3	3	1	3		
Average		2.5						2.3	3	2.6	2	3		

JUSTIFICATION WITH RESPECT TO CO-PO MAPPING

- C413.A3.1, C413. A3.2, C413. A3.3 and C413. A3.4 are mapped to PO2 (Problem Analysis) as 3, 2, 2 and 3 because relevancy is moderate.
- C413. A3.1, C413. A3.2 and C413. A3.3 is mapped to PO8 (Ethics) as 2, 2 and 3 since report are written moderately ethical.
- C413. A3.2, C413. A3.3 and C413. A3.4 is mapped to PO9 (Individual and team work) as3, 3 and 3 as coordination among team mates was efficient.
- C413. A3.2, C413. A3.3 and C413.A3.4 is mapped to PO10 (Communication) as 3, 2 and 3 since oral communication was needed during demonstration of the project.
- C413. A3.2, C413. A3.3 and C413. A3.4 is mapped to PO11 (Project management and finance) as 3, 2 and 1 because complication of the project was within the budget.
- C413. A3.1, C413. A3.2, C413. A3.3 and C413. A3.4 is mapped to PO12 (Lifelong learning) as 2, 2, 2 and 3 because it involves in continuous learning.

TABLE OF CONTENTS:

1. ORGANIAZTION

1.1 ABOUT DEPARTMENT

- Technofly Solutions is a leading electronics product design, development and services company. The professionals with industrial experience in embedded technology, real time software, process control and industrial electronics held the company.
- The company is the pioneers in design and development of Single Board Computers, Compilers for micro-controllers within India. Talented professional in the field of embedded hardware, software design and development toil to reach its excellence.
- Technofly Solutions & Consulting was found in year 2017 by a team with 14+ years of experience in embedded systems domain. Technofly Solutions focuses globally on automotive embedded technologies and VLSI Design, Corporate Training & Consulting. Till now we have delivered more than 15+ Corporate Trainings for companies working in Embedded Automotive Technologies in India.
- Initially, the company Developed system software tools; these include C Compilers for micro-controllers and other supporting tools such as assembler, linker, simulator and Integrated Development Environment. Later Single Board Computers (SBCs) – were developed and are still manufactured. Such hardware boards support a broad range of processors – including 8-bit, 16- and 32-bit processor.
- Since 2015, company also started offering design and development services. This includes a complete spectrum of activities in product

development life cycle that is idea generation, requirement gathering to prototype making, testing and manufacturing. Company has so far provided product design services for various sectors which include the Industrial automation, Instrumentation, Automotive, Consumer and Defence sector.

1.2 RESEARCH ACTIVITIES

- Microcontroller Drivers
- Boot loader and System software
- CAN, LIN and other serial communication software
- On Board Diagnostics services [ISO-14229 and ISO-15765]
- Model based software development: Modeling, Simulation, Auto coding and Reverse Engineering
- Application software development compliant with MISRA-C
- UTOSAR Configuration and generation.

1.3 PROJECT ROLES

- Developing client / server applications to run on Windows / Linux.
- Develop / Test Internet based applications Test suite development for applications and network protocols.
- Developing Networking tools for the enterprises Verification & Validation of Enterprise applications.
- Software maintenance of enterprise applications.

1.4 OBJECTIVE AND SCOPE

- Technofly solution has a dedicated group specializing in providing productivity tools for work group collaboration, which also handles software projects for small and medium scale enterprises.
- Our Work group productivity software suite Smart Works consists of software applications which can help you plan and track your projects, manage meetings and track various issues to its closures.
- Smart Works is affordably priced and uses TCP/IP based client server architecture at its core.
- Smart Works server runs on all the windows platforms. Efforts are on to make Smart works available on other platforms as well.

1.5 ANALYSIS

- The department is actively involved in acquiring latest technologies related projects in Low power VLSI, wireless domain and these projects are well thought out and detailed implementations are carried out. Projects are mainly done on Verilog, MATLAB platform (from math works) and may also depend on NS2, NetSim and Xilinx platforms as per the requirements of the project in progress.
- Current internship involves study implementation and analysis of High speed and Energy Efficient Carry Skip adder (CSKA) with Hybrid model for achieving high speed and reducing the power consumption.

2. TASK PERFORMED

2.1 INTRODUCTION

- With regard to the hearing and vocally impaired individuals' communication with others is a way longer struggle. They tend to find it difficult to communicate duly with traditional individuals and have been facing difficulties in getting job and live a normalized life as the traditional individuals.
- Addressing these issues of people who have hearing and vocal impairment through a single system is a tough job, as these individuals find it difficult in communicating with others who don't understand sign language.
- Sign language is a linguistic and gesture related communication which helps the hearing and vocally impaired individuals with the traditional individuals.
- The main reason to choose this topic is to perspective of creating a world where there can be no differentiation between the traditional and hearing and vocally impaired individuals.

2.2 OVERVIEW

- Hand gesture recognition is to classify the given hand gesture data represented by some features into some predefined number of gesture classes
- Main objective of this effort is to explore the utility of two features extraction methods, namely hand contour and complex moments to solve the hand gesture recognition.

- The objective of this thesis is to develop an algorithm for recognition of hand gestures with reasonable accuracy. The main advantage of this system being proposed over the former system is that in the former system the signs can be detected by the camera only when the hands are covered in white gloves whereas in this system, we have tried our swish to overcome that disadvantage handed by the former system.

2.3 PROBLEM STATEMENT

- Hearing and vocally impaired individuals use hand signs to communicate, hence normal people face problem in recognizing their language by signs made. Hence there is a need of the systems which recognizes the different signs and conveys the information to the normal people.
- Dumb people are usually deprived of normal communication with other people in the society. Also, normal people find it difficult to understand and communicate with them. These people have to rely on an interpreter or on some sort of visual communication.
- The aim is to design a real time software system that will be able to recognize hand-gestures using machine learning techniques.
- This Project Recognizes hand gestures and convert it to speech. The device can act as a communication aid for them.

2.4 REQUIREMENTS

2.4.1 HARDWARE REQUIREMENTS

- Minimum of 2GB RAM.
- Minimum Rom of 64GB HDD.
- Processor of intel i3 4th gen with 2.0GHz speed.

2.4.2 SOFTWARE REQUIREMENTS

- Operating system of windows 7 or Linux Ubuntu or macOS.
- Graphics card.

2.5 LITERATURE SURVEY

- Mostly sign language recognition is done by two approaches image based and sensor-based approach. Currently Image-based method is studied in research area. Sign language translator smoothly implemented on the smartphone platform with the help of image-based method, due to its flexibility, mobility and ease of use.
- In this sign language, gestures captured by camera are translated into text. Developing a system without hand gloves which is a major drawback of the present system.
- Gesture recognition was first proposed by **Myron W. Krueger** as a new form of interaction between human and computer in the middle of seventies. The research has gained more and more attention in the field of human machine interaction. Currently, there are several available techniques

that are applicable for hand gesture recognition, which are either based on sensing devices or computer vision.

- A typical widespread device-based example is data glove, which is developed by **Zimmerman** in 1987. In this system, user wears a data glove that is linked to the computer. The glove can measure the bending of fingers, the position and orientation of the hand in 3D space. Data glove is able to capture the richness of a hand's gesture. Its successful example is real-time American Sign Language Recognition.

2.6 EXISTING SYSTEM

- Sign language is a linguistic process which is employed for communication among the normal people and differently abled people using gestures.
- Traditionally, gesture recognition method was divided into two categories namely vision-based and sensor-based method.
- In sensor-based systems, gloves are used which can achieve the accurate positions of hand gesture. But wearing them continuously is not possible and even the system becomes expensive due to them.

2.7 PROPOSED SYSTEM

- The proposed system consists of:
- Input – Camera to capture image of hand.
- Output – Speaker to give out voice and display screen to display the text.

- The user can give reply as text message and the device does gesture to speech and text conversion, the output is obtained from a small and powerful speaker.
- The device also recognises the gestures of the users and will displays the words related to it. And the device will also give out speech when something is typed onto it.

3. DETIALED DESIGN

3.1 USER INTERFACE DESIGN

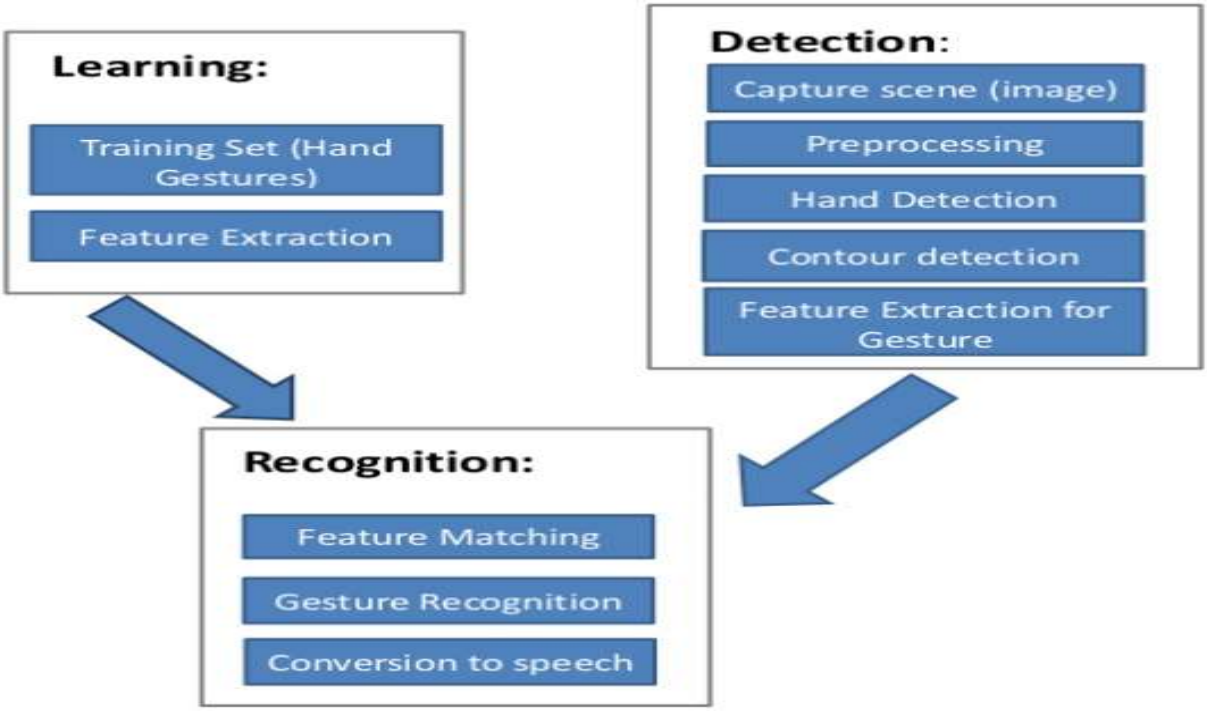
- The UI of the system is designed in such a way that the people would not face complexity while using the software.
- The UI of the system is easy to use because when the software is executed, it activates the camera and reads the hand gesture and shows the meaning of that particular gesture on the UI and speaks out loudly about the recognized hand gesture.

3.2 MODULES

- As mentioned earlier python programming language is used for developing this project, since python has finite set of modules which eases the project development.
- Modules used are:
    - cv2, numpy, mediapipe, tensorflow, pygame, time, sys, os, gTTS, pytesseract

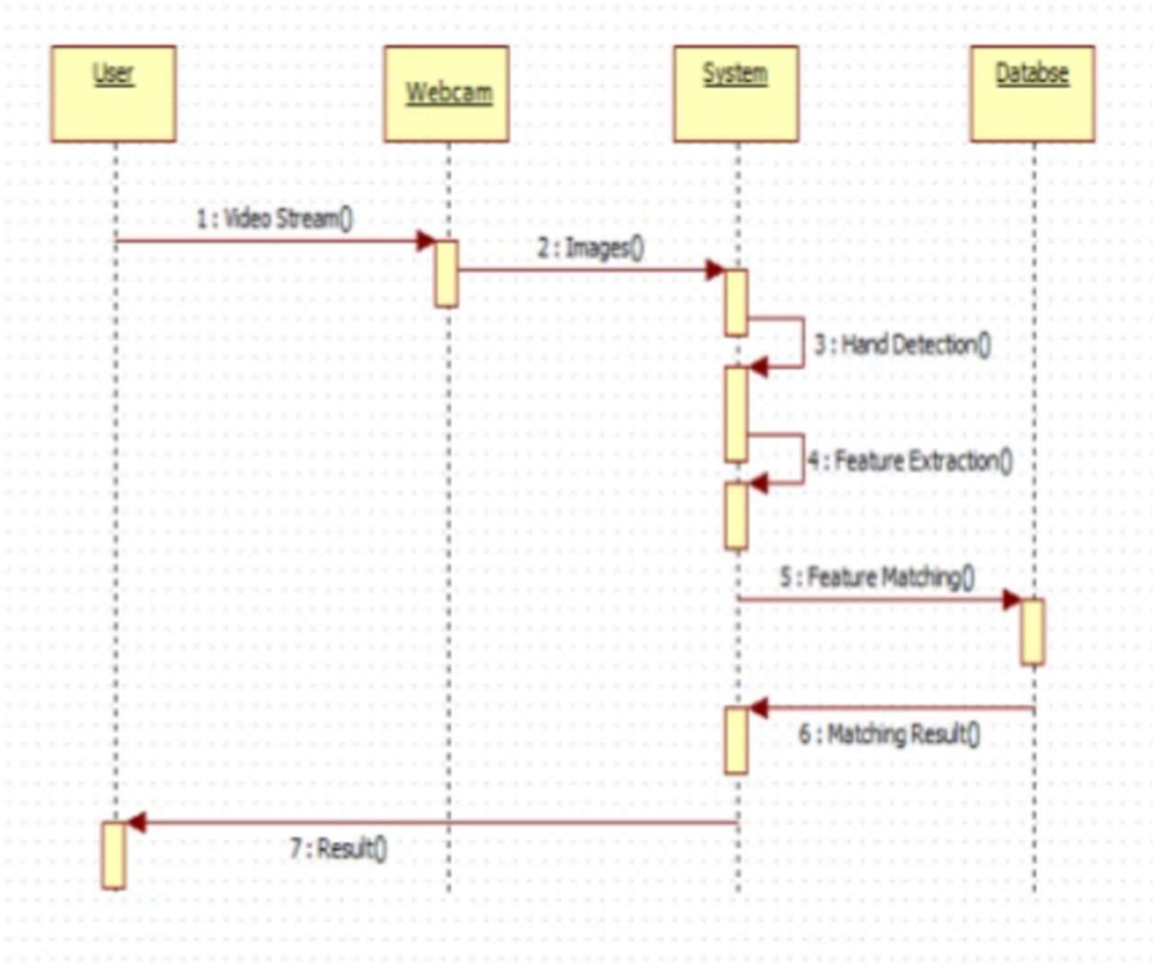
3.3 IMPLEMENTATION

3.3.1 SYSTEM ARCHITECTURE



- The framework provides a helping-hand for speech-impaired to communicate with rest of the world using sign language. This leads to the elimination of the middle person who generally acts as a medium of translation. This would contain a user-friendly environment for the user by providing speech/text output for a sign gesture input.

3.3.2 SUB-SYSTEM ARCHITECTURE



- Although sign language is the main communication medium of the hearing impaired, in terms of automatic recognition, gestures have the advantage of using limited number of finger signs, corresponding to the letters/sounds in the alphabet. Although the ultimate aim is to have a system that translates the sign language to speech.
- The main function that is being performed by the sub-system is that it will recognize the number of fingers and will tend to compute the value in order to give a precise value which in turn makes the implemented system to capture the

movements that are being done by the palm and the fingers for the accuracy of the results.

3.4 TECHNOLOGIES

- Python programming language.
- Supervised machine learning model.

3.5 TOOLS

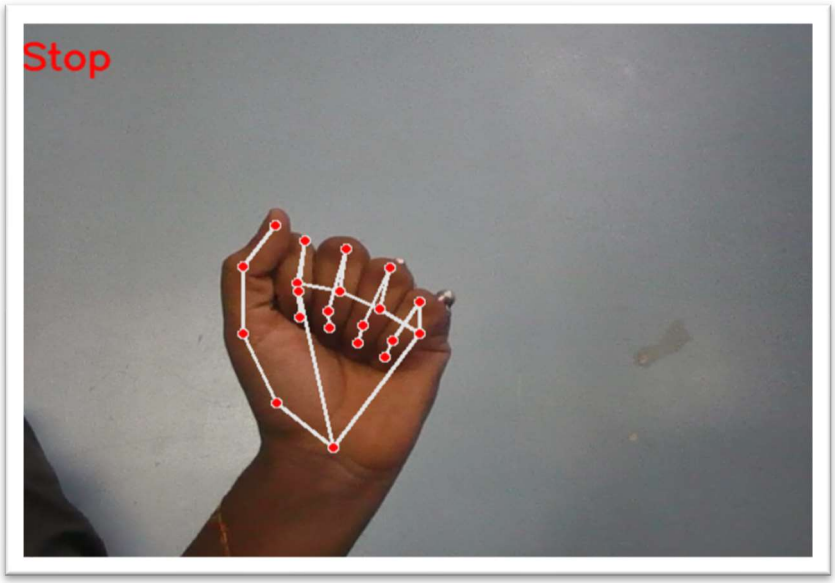
- Visual Studio Code IDE.
- Python IDLE 3.9.10

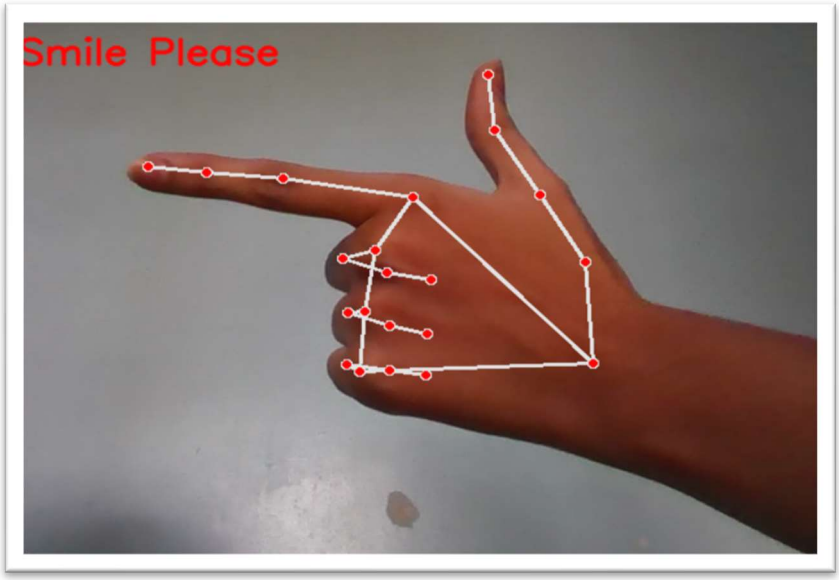
3.6 FUTURE ENHANCEMENTS

- The system can be made handy by incorporating it into a mobile phone.
- The input can be also taken in the form of videos and they are divided into frames and then it is converted into text.
- The system can be designed in the exact opposite of this system i.e., taking the voice as input from user and converting it into sign language.

4. TEST RESULTS

4.1 SNAPSHOTS





4.2 CONCLUSION

- In conclusion, this system mainly tends to focus on the sign language which can be used to communicate with the hearing and vocally impaired individuals, the main barrier for these individuals to lead a normalized life like other traditional individuals is that not all the normal people will have the complete knowledge of this sign language.
- Hence, this system is mainly designed to bridge the gap between the traditional individuals and the hearing and visually impaired individuals. Basically, it acts as an artificial ear, tongue to a hearing and vocally impaired individual.
- This system will be effectively useful and will minimize the gap which will help the hearing and vocally impaired individuals to get jobs, to communicate with traditional beings and make their life normalized in the society, so that they need not be looked upon because of the impairments they have and live their life confidently.

BIBLOGRAPHY

- https://scholar.google.com
- https://ieeeexplore.org
- https://kaggle.com
- https://w3schools.com
- Shraddha R. Ghorpade, Surendra K. Waghamare, "Full Duplex Communication System for Deaf & Dumb People" International Journal of Emerging Technology and Advanced Engineering (IJETAE), Volume 5, Issue 5, May 2015, ISSN 2250-2459.
- Mandeep Kaur Ahuja, Amardeep Singh, Hand Gesture Recognition Using PCA, International Journal of Computer Science Engineering and Technology (IJCSET), Volume 5, Issue 7, pp. 267-27, July 2015.
- Anusha L, Usha Devi Y (2016) Implementation of Gesture Based Voice and Language Translator for Dumb People. International Conference on Communication and Electronic Systems (ICCES) ISBN:978-1-5090-1066-0.
- Pratibha Pandey, Vinay Jain, Hand Gesture Recognition for Sign Language Recognition: A Review, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 3, March 2015.