ABC enhancement system using Machine Learning

Submitted by:

(101603043) Ankur Sharma

(101610010) Anmol Dhawan

(101603044) Ankush Karara

(101783048) Ankit Sinha

BE Third Year, COE

CPG No. 12

Under the Mentorship of

Dr. Anjali Anand

Lecturer

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

Computer Science and Engineering Department

Thapar Institute of Engineering and Technology, Patiala

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Mentor Consent Form

I hereby agree to be the mentor of the following Capstone Project Team

Project Title:		
Roll No	**Name**	**Signatures**
101603043	Ankur Sharma	
101610010	Anmol Dhawan	
101603044	Ankush Karara	
101783048	Ankit Sinha	

NAME of Mentor: Dr. Anjali Anand

SIGNATURE of Mentor: . . . . . .

Project Overview

ABC enhancement system is a ABC enhancer/practice system for children (2-3 years). The idea of the project is to fully convert the manual teaching system into a digital one. This is a prototype project as no such thing has been invented yet. We also plan to add digits along with alphabets in our data so that it can detect numbers too.

The goal of this project is to make the learning process easy and interesting for kids. As we know, paper and pen process has always been a dull technique and every digital and technical advanced approach is a center of attraction for small kids. Furthermore, man work is also sort of reduced as everything in the project will be handled by autonomous means.

We have decided to build a web app using a laptop as an interface. We will use the object tracking technique in machine learning that will help us to track the object held by the user(kid) and tracks and creates whatever user will make and displays on the laptop screen. The tracked outline will be fed further to neural system and corresponding results will be provided to user.

Need Analysis

The project mainly revolves around enhancement of fundamentals (alphabets) of the kid. Although, there are traditional ways of practicing and enhancing fundamentals but there exists some limitations in the traditional ways. So, this project fills gaps for these limitations in a smart way by using modern technology.

A lot of paper is used as it is required to do practice. This project removes this shortcoming. As user can draw anything that he/she wants without the use of a single paper. So, this project follows sustainable goal that is to save trees. Moreover, user will gets motivated with the use of system towards smart learning which will inculcates the habit of using technology in the personal development.

This project saves time for the parents and kid. All they have to do is just login in our web app and start practicing. Cost saving as they do not have to buy copies and pencils etc. This project provides detailed performance report for their child. So, they can see which area their kid has to work upon.

Due to the interactive nature of this project, kids will be motivated to do more practice which will definitely be beneficial for them.

This project is a great step towards making "SMART INDIA "at an early age of Indians which will be great push for them.

Literature Survey

This project mainly uses the following uses the following concepts:

- Object detection and tracking.
- Image Processing.
- Deep Learning.

1. **Object detection and tracking:** Object detection and tracking are important and challenging tasks in many computer vision applications such as surveillance, vehicle navigation, and autonomous robot navigation. Video surveillance in a dynamic environment, especially for humans and vehicles, is one of the current challenging research topics in computer vision. s. Object tracking based techniques is the most popular choice to detect stationary foreground objects because they work reasonably well when the camera is stationary and the change in ambient lighting is gradual, and they also represent the most popular choice to separate foreground objects from the current frame. Every tracking method requires an object detection mechanism either in every frame or when the object first appears in the video. Object tracking is the process of locating an object or multiple objects over time using a camera. The high powered computers, the availability of high quality and inexpensive video cameras and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. There are three key steps in video analysis, detection interesting moving objects, tracking of such objects from each and every frame to frame, and analysis of object tracks to recognize their behavior. Therefore, the use of object tracking is pertinent in the tasks of, motion based recognition.

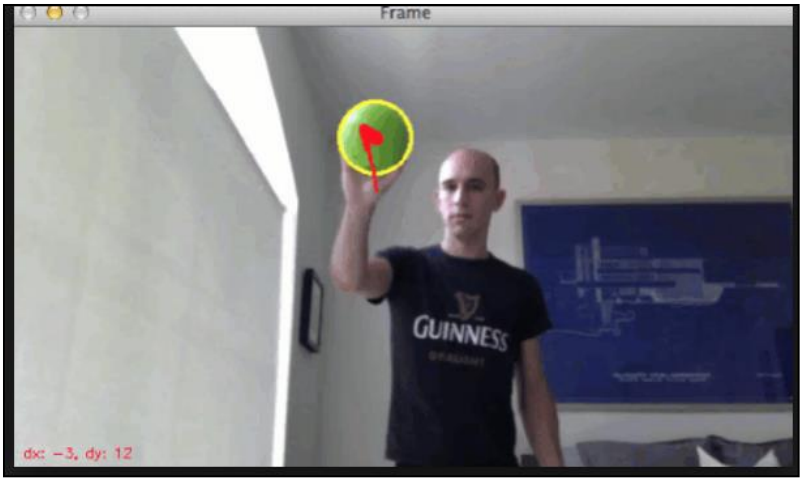

Figure 1: Object tracking

2. **Image Processing:** Apparently, digital image processing is an important aspect of photography considering that technology keeps changing. There are a host of digital image processing techniques that provides a wide application variety in feature extraction and classification. Artificial neural networks are frequently used to undertake character recognition because of their high tolerance to noise. The systems have the capability to realize perfect results. Apparently, the feature extraction stage of OCR is the most significant. Survey represents a study of feature extraction methods with different classifiers implemented in OCR systems for different Indian scripts .Variance between the features should be clearly discriminative and specific so that system can classify the characters with maximum efficiency and minimum error rate.

3. **Deep Learning:** Handwriting recognition has gained a lot of attention in the field of pattern recognition and machine learning due to its application in various fields. Optical Character Recognition (OCR) and Handwritten Character Recognition (HCR) has specific domain to apply. Various techniques have been proposed to for character recognition in handwriting recognition system. Even though, sufficient studies and papers describe the techniques for converting textual content from a paper document into machine readable form. In coming days, character recognition system might serve as a

key factor to create a paperless environment by digitizing and processing existing paper documents.

WORKING PRINCIPLE:

Normally handwritten recognition is divided into six phases which are image acquisition, pre-processing, segmentation, feature extraction, classification and post processing. The block diagram of the basic character recognition is shown in fig1.

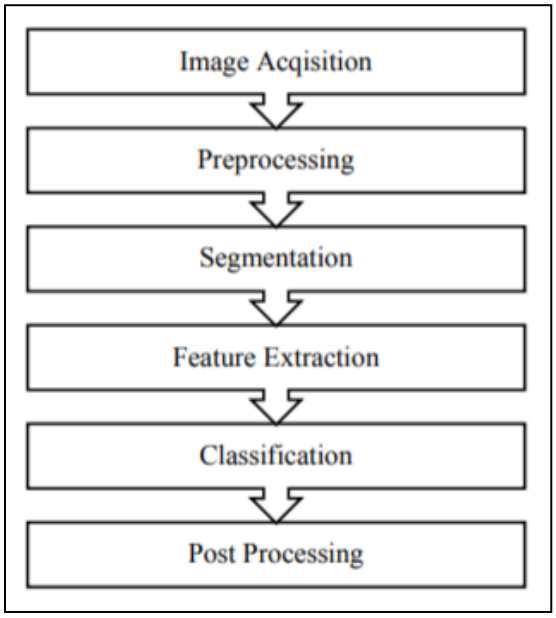

Figure 2: Phases of handwritten character recognisition

In today's market, there is no product matching to this project yet but the technologies that we are going to use exists from a long time.

Assumptions and Constraints

1. We assume the children that will be learning from our project are of age falling in the range of 2.5-4 yrs.

2. At one time, our project can detect only one alphabet. No word i.e., combination of 2 or more alphabets can't be given as input.

Standards

- **Industry 4.0:** An era of automation for nowdays.This project has its attributes.
- **Web 2.0:** An interactive website that will allow user to use draw using webcam.
- **Emnist dataset:** High Quality dataset extended-MNIST is used for model training in machine learning.

Objectives

1. The sensor that is camera should be configured properly with the object held by user.
2. The letter/digit tracked by user should be displayed on screen correctly.
3. The delay between the object motion and tracking on screen should be minimum.
4. Corresponding output in form of audio and images will be displayed.

Methodology

- User will wear an object on finger which is used for drawing on screen.
- Object detection and tracking using webcam to know the position of fingers.
- Showing path drawn by user on screen using image processing.

- The figure drawn will be recognized by using suitable Deep Learning model that is whether user draws alphabet/digit correctly.
- Displaying result of drawing in the form of corresponding audio and images by using Simple Python logic.

Work Plan

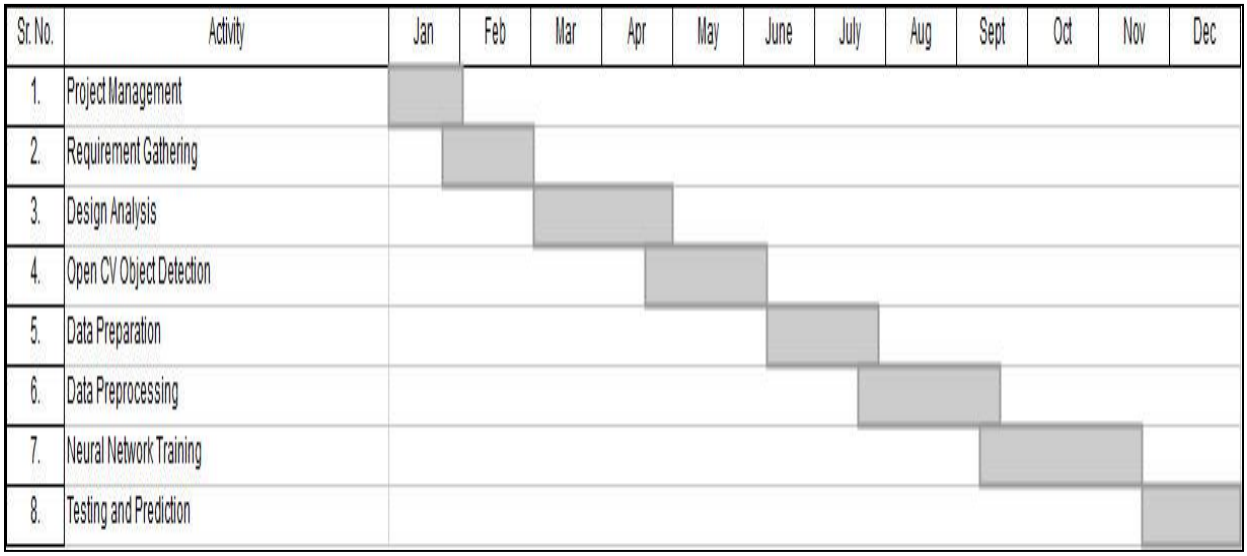

Figure 3: Work Plan

Project Outcomes & Individual Roles

Project Outcomes:

1. A web application which will act as a platform for the kids to enhance their fundamentals (alphabets) by drawing on screen by moving finger in air.

Individual Roles:

- **Anmol Dhawan:** Implementation and optimization of opencv's object detection and tracking algorithm, Image processing and to build the system for realizing drawing by moving fingers in air.
- **Anki Sinha:** Selection, optimization, training and testing of Deep Learning models to recognize alphabet/digit correctly.
- **Ankur Sharma:** Web app designing, interfacing frontend and backend and maintaining user base of our website.
- **Ankush Karara:** Web app designing and making the website interactive by designing questions for the user.

Course Subjects

1. Computer Vision.
2. Image Processing.
3. Machine Learning.
4. Software Engineering.

References

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