Educate Elevate Enlighten

JSS Mahavidyapeetha

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JSS SCIENCE AND TECHNOLOGY UNIVERSITY MYSURU

PROGRESS REPORT FOR FINAL YEAR PROJECT

Title of the project:

"Learning can be fun: A web-based application for kids using deep learning"

Under the guidance of:

Prof Swetha P M

Project Team No: 36

Project Team:

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1. Introduction

1.1 Purpose

The main purpose of this document is to describe the characteristics of our project "Learning can be fun", Which is an web based application that will achieve an activity based learning and focuses on using real-world objects to facilitate pre-school learning of the English alphabets, spellings, counting of numbers, recognition and drawing of real world objects.

1.2 Document Conventions

This documentation is strictly within the guidelines and as per the standards of IEEE template for System Requirement Specification.

1.3 Intended Audience and Reading Suggestions

Target audiences:

- Pre-school kids : To develop cognitive and psychomotor skills.
- Parents and teachers : To observe the child's progress after a certain period of time.

1.4 Product Scope

- Preschool age is critical for kid's development. A good reading ability and understanding of any child depends on the training he/she receives. This requires the parents to invest more time and money on materials and tools. With the rapid growth in technology today, learning and teaching materials has shifted from the black board to more sophisticated gadgets that support teaching and learning at any level of learning, starting from the preschool to the higher learning. With time, a kid's way of learning also has changed and demand more interactive and a playful environment to learn.
- Hence, we have come up with a Machine learning model to-
  - design and develop a web based application that will achieve an activity based learning and focuses on using real-world objects to facilitate pre-school learning.
  - improve the efficiency of teaching and learning at the pre-school level and maximizing the speed of learning in growing kids.

1.5 References

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[3] Olisah Kingsley S and Mohamed Ismail Z "web-based E-learning for system for pre-school kids https://www.researchgate.net/publication/319360301_Web_Based_E-learning_System_for_Preschool_Kids

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[5] Kristine Guo, James WoMa, Eric Xu "Quick, Draw! Doodle Recognition" http://cs229.stanford.edu/proj2018/report/98.pdf

2. Overall Description

2.1 Project Perspective

The project tries to identify alternate and effective ways for learning and education for children of age group below 5.The main aim is to enable children to become active and take full advantage of the online learning platform available today.

2.2 Product Functionality

- Train the model to identify and classify scribbled alphabets, digits and simple drawings.
- Enable 2 categories: Learning, Drawing.
- In the learning section, provide different images / drawings to the user online and wait for the user to draw the same on the plain canvas space available.
- Based on the image drawn by the user, determine, using machine learning algorithm and a huge dataset, whether it matches the original object.
- A similar approach is taken in the Drawing section: The user is provided with only the name of the object (not the image), and the user has to correctly draw the object in the canvas space available in a simple manner.
- Over time, the progress of the user is stored and a report is given periodically.

2.3 User Classes and Characteristics

- Students – This will help children of age below 5 years to develop intellectual and creative knowledge of objects and other elements essential in day-to-day life.
- Parents and teachers – This will help them to observe the child's progress after a certain period of time.

2.4 Operating Environment

- Full connection to the internet.
- Good quality hardware for accurate drawing and prediction.

2.5 Design and Implementation Constraints

- Improper internet connection.
- Improper AI prediction due to data anomaly.

2.6 User Documentation

It provides an introductory as well as a future reference to the user on how to use the application to your fullest advantage. It is used to assist users to use the product or service for self-development.
User documentation is important because it provides an avenue for users to learn:

a. How to use your web application.
b. Features of your web application.
c. How to resolve common problems with your software

Training the model :

The machine learning program is written using deep learning concepts to identify the images.
The algorithms are implemented using various Convolutional Neural Networks and choosing the best one Which gives the best accuracy and results for our data-set.
The training data set consists of thousands of images in .png format which are used to train our model with the doodles.
We make use of a canvas element to capture the drawing drawn by the user.
This is converted to an image and later to a 28×28 pixel format matrix.
This image is tested and the model predicts the drawing's label with a threshold of 60% accuracy.
It also predicts what other object it resembles to, to give the user a better learning experience.

As soon as the user logs in with their registered id and a password, they will be directed to their profile which will contain their points, progress chart, rank in the leader board, and also two sections, namely: Learning and Drawing.

Learning section: The user gets to choose what he/she wants to learn from the given options and will be directed to a drawing area where they will be shown how to draw what they have chosen. Later they will be asked to draw the same. If correctly drawn, a success message will be shown, and that section will be marked as "DONE". And they can learn more or come back to their profile.

Drawing section: The user will be shown three levels: Easy, medium, hard. Based on the level the user chooses, challenges will be given to them. If they draw it correctly a certain amount of points based on the level will be added to their profile. If wrong, they can try again or go back.
The model uses image processing and machine learning algorithms to get trained and recognize and classify the drawing drawn by the kid.

Troubleshooting:

In this section, we help users fix common issues that may arise which are as follows:

- You need a stable internet connection for the frames to be processed and predicted.

2.7 Assumptions and Dependencies

This model is developed in Python and uses various packages relevant to machine learning. It uses a modular design where every feature is wrapped into a separate module and the modules depend on each other through well-written program. There are several linkable programs available to make user interface easy.

3. External Interface Requirements

3.1 User Interface

- The user interface for the software shall be compatible to any browser such as Internet Explorer, Mozilla by which user can access the system.
- The user interface shall be implemented using any tool or software package like Java Applet, MS Front Page, EJB etc.

3.2 Hardware Interfaces

The minimum hardware requirements for this are:

- Processor: Dual Core

- RAM: Min 2GB
- Hard Disk: 20mb
- A browser which supports HTML, JavaScript
- Since the application must run over the internet, all the hardware shall require to connect internet will be hardware interface for the system. As for e.g. Modem, WAN – LAN, Ethernet Cross-Cable.

3.3 Software Interfaces

- Operating System: Windows
- Programming Language: Python, HTML, CSS, JavaScript, NodeJS, ReactJS
- Back End:
    - Software: Jupyter Notebook
    - Server: Xampp

3.4 Communication Interfaces

The system shall use the HTTP protocol for communication over the internet and for the intranet communication will be through TCP/IP protocol suite.

4. System Features

- Processor: Dual Core
- RAM: Min 2GB
- Hard Disk: 200mb
- Speed: Min 1.1 GHz+
- Operating System: Windows
- Programming Language: Python, Html, CSS, ReactJS, NodeJS, Javascript
- Database: MySQL
- Software: Jupyter Notebook
- Server:

Neural Networks and image processing techniques are implemented to recognize the sketched images.

5. Other Non-functional Requirements

5.1 Performance Requirements

- Our website, to predict properly requires a stable internet connection for transferring sketched images to the server.
- The application should minimize the start-up and response time and application should not display scrolling jerks longer than 200ms.
- Powerful servers to manage the data efficiently.
- We need a powerful processor to train the neural network model with large data-sets.
- Latest version of Google Chrome or Mozilla Firefox for better results.
- The performance shall depend upon hardware components of the client/user.

5.2 Safety Requirements

- Information transmission should be securely transmitted to server without any changes in information.
- If there is extensive damage to wide portion of the database due to failure such as disk crash, the recovery method restores a past copy of the databases that was backed up to archival storage and reconstructs a more current state bu reapplying or redoing the operations of committed transactions from the backed up log, up to the time of failure.

5.3 Security Requirements

- The system shall use secure sockets in all transactions that include any confidential customer information.
- The system shall automatically log out all customers after a period of inactivity.
- The system shall not leave any cookies on the customer's computer containing any of the user's confidential information.
- The system's back-end servers shall only be accessible to authenticated administrators.
- The system's back-end databases shall be encrypted.

5.4 Software Quality Attributes

- AVAILABILITY: The software should be available to all the users who are interested to learn.
- CORRECTNESS: The software should detect correctly the pictures drawn by kids with maximum accuracy.
- MAINTAINABILITY: The administrators should maintain the software correctly so that they get most out of it.
- USABILITY: The software should satisfy a maximum number of user's needs.

5.5 Business Rules

- Our organization does not charge any fee in the name of commission for the service offered.