INTERACTIVE LEARNING SYSTEM FOR KIDS

2022-254

Final Report

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B.Sc. (Hons) Degree in Software Engineering

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Declaration of the Candidate & Supervisor

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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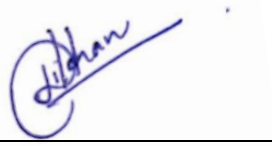
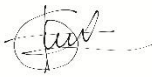
Ekanayaka M.G.D.D.B	IT19138732	
Wijesinghe S.A.S.D	IT19167206	
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The supervisor/s should certify the proposal report with the following declaration.

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor: Date

Abstract

The younger generation is much more interested in learning through activities based on either an interactive computer program or mobile application. The utilization of tools that are based on information technology as a medium for educational purposes has resulted in a paradigm shift in the field of education. The purpose of this paper is to introduce an interactive learning system that can improve the knowledge and abilities of students in early childhood and primary school. Children have the opportunity to engage in key primary level activities such as letters, images, shapes, and color-based activities when using this learning system, which allows for interactive participation. This mobile solution for Android is predominately based on the Flutter and Dart programming languages, both of which are associated with the convolution neural networks used in deep learning.

Acknowledgement

Throughout the entirety of this research project, our research supervisor, Ms. Namalie Walgampaya, who is a Senior Lecturer in the Faculty of Computing, provided us with invaluable guidance, direction, and encouragement. I would like to take this opportunity to express our most heartfelt gratitude to her. Working and learning under her tutelage was an extremely prestigious and honorable opportunity. We would like to offer a special thanks to her for being so helpful and having such a wonderful sense of humor. In addition, we would like to extend our gratitude to Ms. Hansi De Silva, who is a Lecturer in the Faculty of Computing and served as the Co-supervisor for this research project.

In addition, we would like to give special thanks to Mr. Jagath Wikramarathne, the leader of our module and a senior lecturer in the Faculty of Computing, for the specialized advice and direction that he provided in order for us to successfully complete our research. We are grateful for the direction and inspiration that was provided to us throughout the course of the study. The authors would like to express their appreciation to Mr. Malika Liyanage for his help in assembling the real-world dataset necessary for this study.

Last but not least, we would like to express our gratitude to our families, our friends, and everyone at the SLIIT faculty of computing, Sri Lanka Institute of Information Technology, who prayed for us and helped us finish this research project successfully..

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1. Introduction

1.1 Background and Literature Review

The rate at which children are beginning to use sophisticated devices, most commonly to play mobile games, has increased in tandem with the technological advancements of the present age, which is commonly referred to as the "jet age." These children have a propensity to pick up new skills and behaviors from the video and graphic content they consume. In addition to this, the children have a significant amount of homework to complete, which makes it impossible for them to organize their work. Learning in a classroom setting is typically dull for children, and they have difficulty retaining information while they are being taught using this method. This raises the question of why children learn faster through the viewing of video and graphics content rather than through the more conventional teaching methods used in the classroom. The answer to this question is that in this day and age, everyone is digitalized. in addition to that, there is a wide variety of software for working with media to be learned. Therefore, these applications provided some learning materials to children, which increased their capacity to learn and supported them in doing so.

It appears that today's youth are no longer interested in learning through the more conventional methods used in the classroom. Up until this point, there have been many educators, young people, and other people who are not interested in learning and making use of the conventional instructional approach found in classrooms. The goal of this project is to create an application for mobile devices that will make learning the alphabet more engaging for children. Therefore, in order to provide a superior experience, this application utilizes real-time processing.

Izzat Fauzi Bin Hamidi et al, In this research, aimed to develop a mobile application as an exciting and interactive way of learning the basic Jawi alphabet for kids using augmented reality technology. This application enables AR technology, which is different than a regular application. Using this method, can makes AR beneficial for education. And this combing with the narrator and sound will provide a better understanding of the kids that want to learn Jawi [1].

Ammar H. Safar et al, In this experimental research study, scrutinized the effectiveness of using augmented reality (AR) applications (apps) as a teaching and learning tool when instructing kindergarten children in the English alphabet in the State of Kuwait. and also, This study compared two groups: experimental, taught using AR apps, and control, taught using traditional face-to-face methods [2]. In addition, this study concludes with relevant proposals and recommendations regarding the implementation of AR technology in education and suggests undertaking further studies on this interesting topic.

Besides, **Vikram Kamath et al,** have been carried out the behavioral prediction of a person through automated handwriting analysis. In this study handwriting is analyzed through Image Processing in MATLAB [3]. The behavioral pattern of the person is predicted from the above traits of handwriting. The developed system identifies handwriting closely with real-time processing and involves less image preprocessing. And the system is in good agreement with more than 80%. In addition, a new method is proposed for automated behavioral analysis using Automated Handwriting Analysis System (AHWAS).

1.2 Research Gap

A closer look at the literature reveals that several mobile applications for learning Alphabet for kids are available worldwide, with slightly similar functionalities and features. Nonetheless, most previously developed applications allow children to draw a letter on a provided letter-shaped image or recognize handwriting. The majority of prior applications have provided alphabet letter images first and then instructed children to draw the letter on the provided image.

However, according to the present author's perspective, those types of methods did not allow children to attain proper knowledge about letters. Hence, drawing on the previously provided image will not allow children to learn for themselves. Overcoming

the above limitations, the current study aims to explore new methods for teaching and enhancing kids' writing skills on the alphabet by themselves.

Based on that, the present author intends to cover an unstudied area by developing an alphabet hand drawing learning application that provides significantly different learning outcomes than previously developed applications. In this study, innovative methods will be used by concentrating on each stage of kids' alphabet learning methods to give the best accurate result.

Furthermore, this application expands its innovative hand-drawn procedure, which includes predicting whatsoever kids are drawing on the screen and identifying mistakes in the basic drawing, in order to show the correct way to draw the letter by the software itself. Not only that, but the proposed application will also show kids the way of writing a good professional letter with the intention of providing kids with a better understanding.

According to that, this study will make a novel contribution by investigating a new alphabet learning system based on electronic hand-drawn procedures, which will provide an opportunity for kids to learn about the alphabet in a magnificent memorable way.

2. Research Problem

A good education should be provided for every single child. To ensure that a child's physical health continues to be in good shape throughout their primary education, it is essential that they receive instruction on basic topics like hygiene and cleanliness. Both active play and structured play can help a child develop the social skills and participation abilities necessary for school and life.

A young child's time spent in elementary and primary education is the most formative period of their education because the majority of the skills and information they acquire during this time will shape the rest of their lives. Because of this, teachers in elementary schools need to exercise extreme caution. If they do not provide the developing child with support in order for them to develop their skills and identify

their values, it will result in the misguidance of a genius. According to what we discovered, the most important aspects of a developing child are recognizing the most important objects (building a robust vocabulary), improving writing skills, recognizing patterns, and developing drawing skills. It is necessary to acquire this knowledge while being properly supervised. Children may not learn some fundamental concepts that are necessary for their continued education if there is no adult supervision.

In the midst of a pandemic, there is no effective way to instruct children in the previously mentioned facts and fundamentals. This is due to the fact that children's mothers typically lack knowledge regarding specific facts and theories, and as was previously stated, any error in instruction will have an impact on the child's future. Therefore, it is our intention to propose an effective method of education for children in elementary and primary schools.

3. Research Objectives

This research was conducted on the topic of Interactive Learning System for Kids which was designed to increase the learning efficiency of Kids. The end users of this application are primary age students. Existing systems and applications in this field have a number of drawbacks. As a result, our research provides a method for overcoming these obstacles and developing a system that allows users to use the services on offer in a comfortable manner. Therefore, current research is divided into four main components.

1. Identify hand-drawn letters, predict the letter if it is incomplete, and suggest corrections if the drawn letter is wrong.
2. Identify and classify hand drawn shapes and arts that drawn using shapes and give grades for those sketches.
3. Identify and classify hand drawing objects with colors

4. Generate image captions using image context

3.1 Main objectives

The primary goal of this research is to develop an interactive learning system to improve the knowledge and skills of primary-level students. Along with that, the authors expected to create an interactive learning platform that provides teaching aids to primary-level students without the need for manual supervision. Therefore, The researchers' goal is to effectively integrate advanced information technologies and early key childhood education activities such as letters, images, and shape-based activities.

3.2 Specific objectives

In order to reach the main objective, the four specific objectives stated in the present research.

01) **To develop an application that can correctly identify and predict hand-drawn English letter in order to demonstrate a professional writing style from each letter in the alphabet.**

According to this component, giving focus to several approaches to identify the hand-drawn alphabet and this sub objective has a combination of different features. Identifying the hand-drawn alphabet letters is very helpful to give the knowledge of letters. The DL powered platform with Transfer Learning needs to identify the letters after the drawing is done. Normally we are looking to get the best result by predicting the letter if the letter is incomplete and checking the mistakes.

The accurate detection of hand-drawn letters is very important for improving the kid’s skills and knowledge. However, nowadays automatic learning methods are needed to improve the knowledge of the kids. So, we need to identify the hand-drawn letters very accurately to get the best result. This component will take real-time processing to identify the letters.

02) Identify and classify hand drawn shapes and arts that drawn using shapes and give grades for those sketches.

Using this specific objective, the shape knowledge of primary ages students has been tried to improve. In this component a surface has provided for students to draw shapes. After finishing the drawing student will be able to see the drawn

sketch is correct or not. If the drawn sketch in correct, student will be able to see a grade for the drawing. If the drawn shape is incorrect the correct shape is displayed for students. Not only this, from this component art skills of students also are being developed. Students can draw flowers, houses and stars using basic shapes. After completes the drawing students will be able to see correctness of the drawing. If the drawing is not complete, the system will provide a "Need to be Improved" message. Then students can easily correct those mistakes and learn fast.

03) Identify and classify hand drawing objects with colors

Using this specific objective, the drawing and painting skills of primary ages students have been tried to improve. In this component a surface has been provided for students to draw some objects (Apple, Banana, carrot) and color them. After finishing the drawing student will be able to see if the drawn sketch is correct or not. If the drawn shape is incorrect the correct shape is displayed for students. In this component color knowledge of students also is being improved. As an example, when drawing an apple after drawing an apple, the student should color that drawn apple from red color. Therefore, drawing skills and color knowledge both are improving from this application.

04) Generate image captions using image context

In this component when an image provides to application a caption will generate according to the features and objects that existing on the image. The student must write a simple sentence watching that image. After that, Written

sentence by the student is matching with the generated sentence by the system. If both are matching, the student has written the sentence correctly. If both did not match, the written sentence by the students is incorrect. From this component students can improve their sentence writing knowledge rapidly.

4. Methodology

This chapter explains the special steps of actions and methodologies that were used to develop the mobile application and its features. The methodology chapter for this study consists of the following key components: system architecture, application design, model creation, software solution, requirement gathering and analysis, and finally commercialization.

4.1 System Architecture

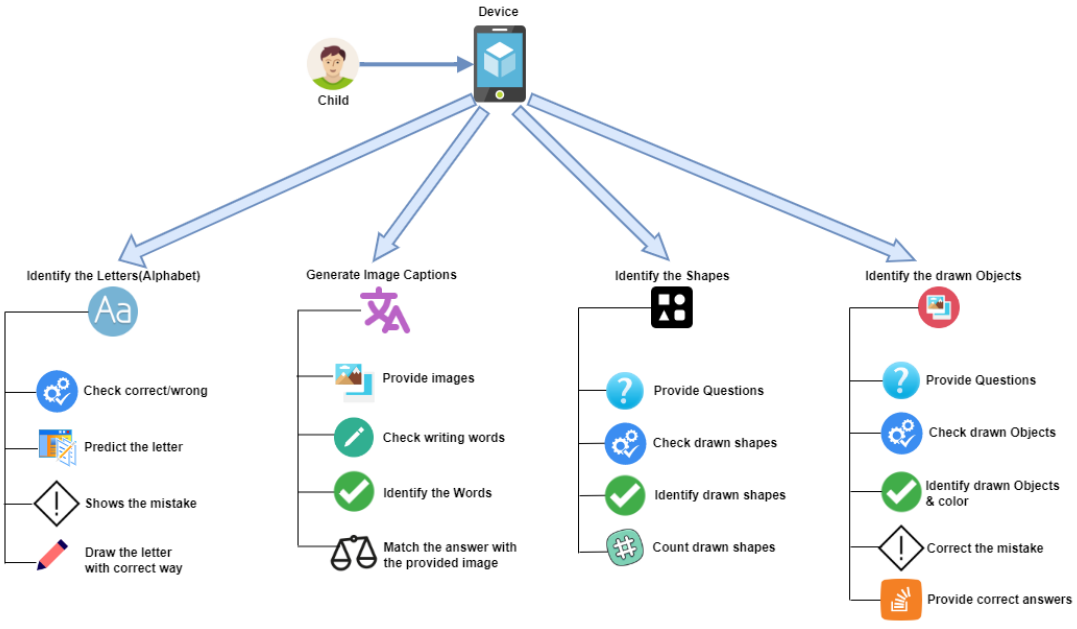


Figure 4.1.1 The overall system diagram

This interactive learning system for kids incorporated four distinct categories of primary activities to create and design this application. As a consequence of this, the key features of this program are designed to provide assistance with the following activities: writing letters, drawing shapes, drawing images, and recognizing images. As per Figure 4.1.1 it has illustrated the main components of this entire study with key functions of each component briefly.

The component known as hand drawn alphabet letters begins by giving users the opportunity to draw the alphabet's characters. After that, a space will be provided for you to draw a letter. It is expected that the system will recognize as a prediction any time a student draws an alphabet letter. The system then made a comparison between the letter that was drawn and the correct letter. The system will make an educated guess as to the letter of the alphabet that a student was trying to draw, even if the letter is drawn incorrectly or incompletely by the student. The drawn letter will be checked by the system to ensure that there are no errors in it. The suggestions provided by the system in order to rectify those errors and produce an appropriate letter for the system's mistakes.

the component that asks children to identify shapes provides them with a surface on which they can draw a variety of shapes. When they have finished drawing, the kids will be able to determine whether or not the sketch that they drew is an accurate representation. The grade that they were given for the drawing they had submitted was then shown to them if the sketch that they had drawn was accurate. When a child has drawn a shape incorrectly, the correct shape should be displayed next to it. In addition to this, the children are able to draw fundamental shapes, which they can then use to draw things such as flowers, houses, and stars. After you have completed the drawing, you should look it over and determine whether or not it is accurate. If the drawing is lacking in any way, the system will prompt the user with the message "Need to be Improved," which will appear on the screen.

Students will be able to draw and color some objects on a surface that has been provided for them as part of the component involving hand-drawn objects using colors (Apple, Banana, Carrot). When they have finished drawing, the kids evaluate whether

or not the sketch that they have drawn is accurate. The children are able to see the correct shape even if the shape they have drawn is incorrect. In addition, children's color knowledge is enhanced through participation in this component.

When an image is provided to the application by means of the generate image caption using image context component, a caption will be generated automatically in accordance with the qualities and objects that are present on the image. This will be done in accordance with the image's context. During the time that they are looking at that picture, the student needs to formulate a brief sentence. After that, the sentence that was written by the children is compared to the sentence that was generated by the system to determine whether or not there are any differences. If they are in agreement with one another, then the sentence that the Kids wrote is correct. If they did not concur with one another, then the sentence that was written by the Kids has a mistake in it. By putting their attention on this aspect, children can see significant improvement in their capacity to write sentences that are clear and concise.

In below we will discussed the each component methodology separately.

1) Identify and predict Hand drawn alphabet letters

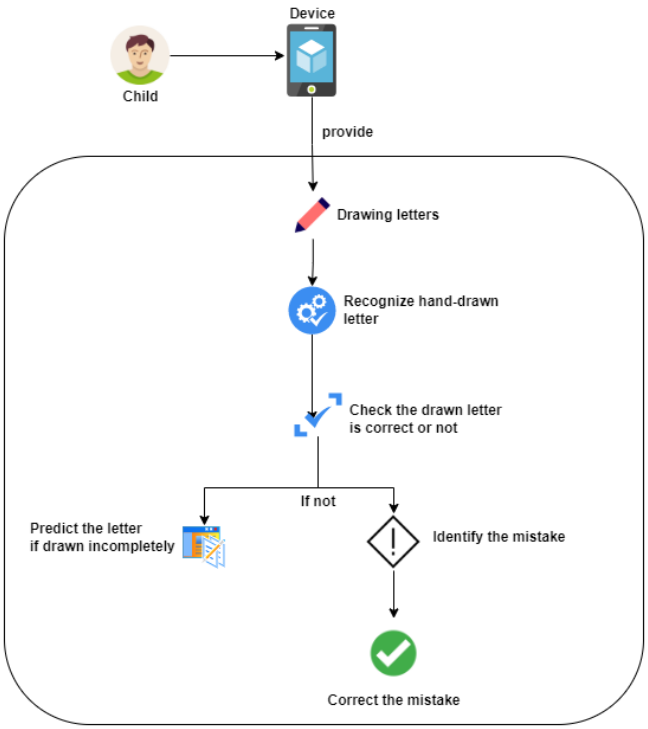


Figure 4.1.2: The overall system diagram for Draw Letters is shown

Figure 4.1.2 illustrates the system architecture of one of the main components of this project, which is related to hand-drawn letters. Furthermore, it has primarily demonstrated how the functions of the hand-drawn alphabet work. This component mainly aimed to identify and predict hand-drawn letters in order to provide suggestions to re-correct the letter in a professional manner.

When it comes to the functionality of the present application, it enables children to freely write letters on a specific area of the screen, it recognizes the drawing as a letter in the English alphabet, it points out any errors in the fundamental letter drawing, and it provides the correct way to draw the letter all by itself. The steps that need to be completed by the user in order to get the desired result are outlined below.

Step 01: Kids need to draw the provided alphabet letters in the given area.

Step 02: After the system automatically detects the hand-drawn letter.

Step 3: If the hand-drawn letter is correct, kids can move on to the next letter.

Step 4: If a hand-drawn letter is wrong, the system automatically identifies the mistake and displays the correct letter in the correct way as a gif video.

The below figure shows how the front-end (UI) side works.

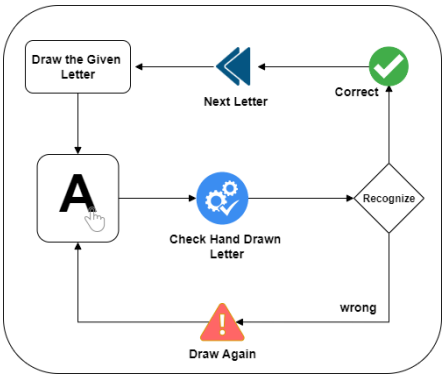
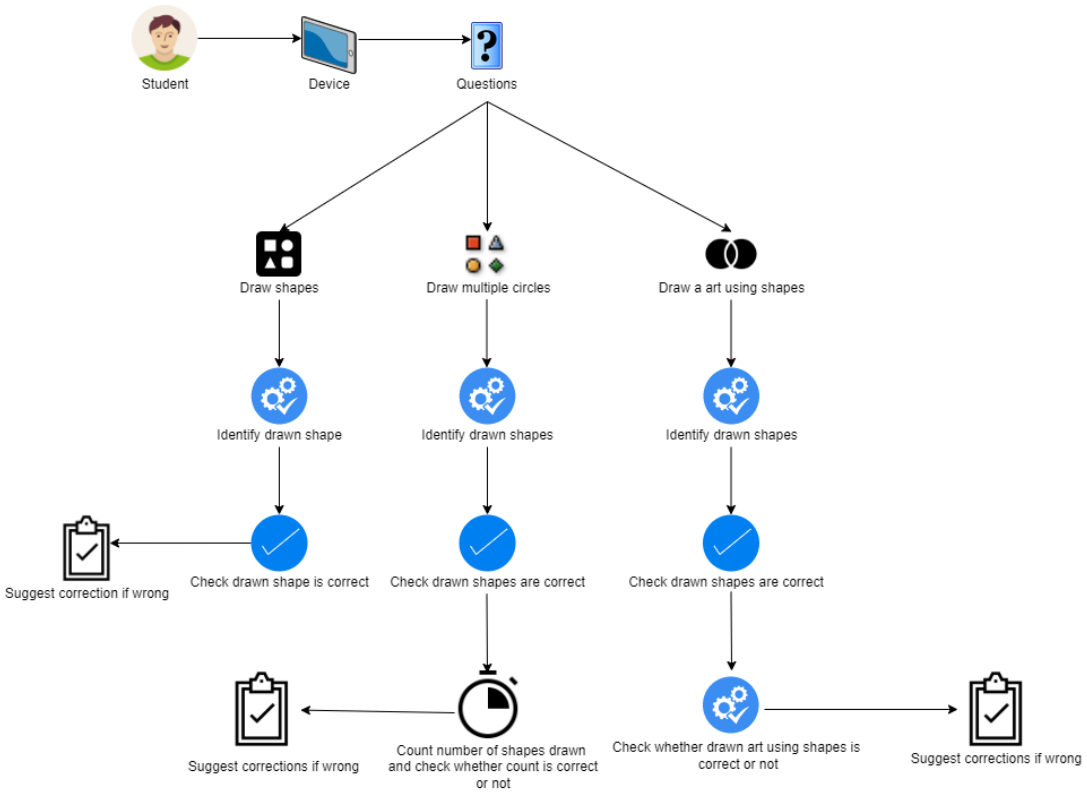
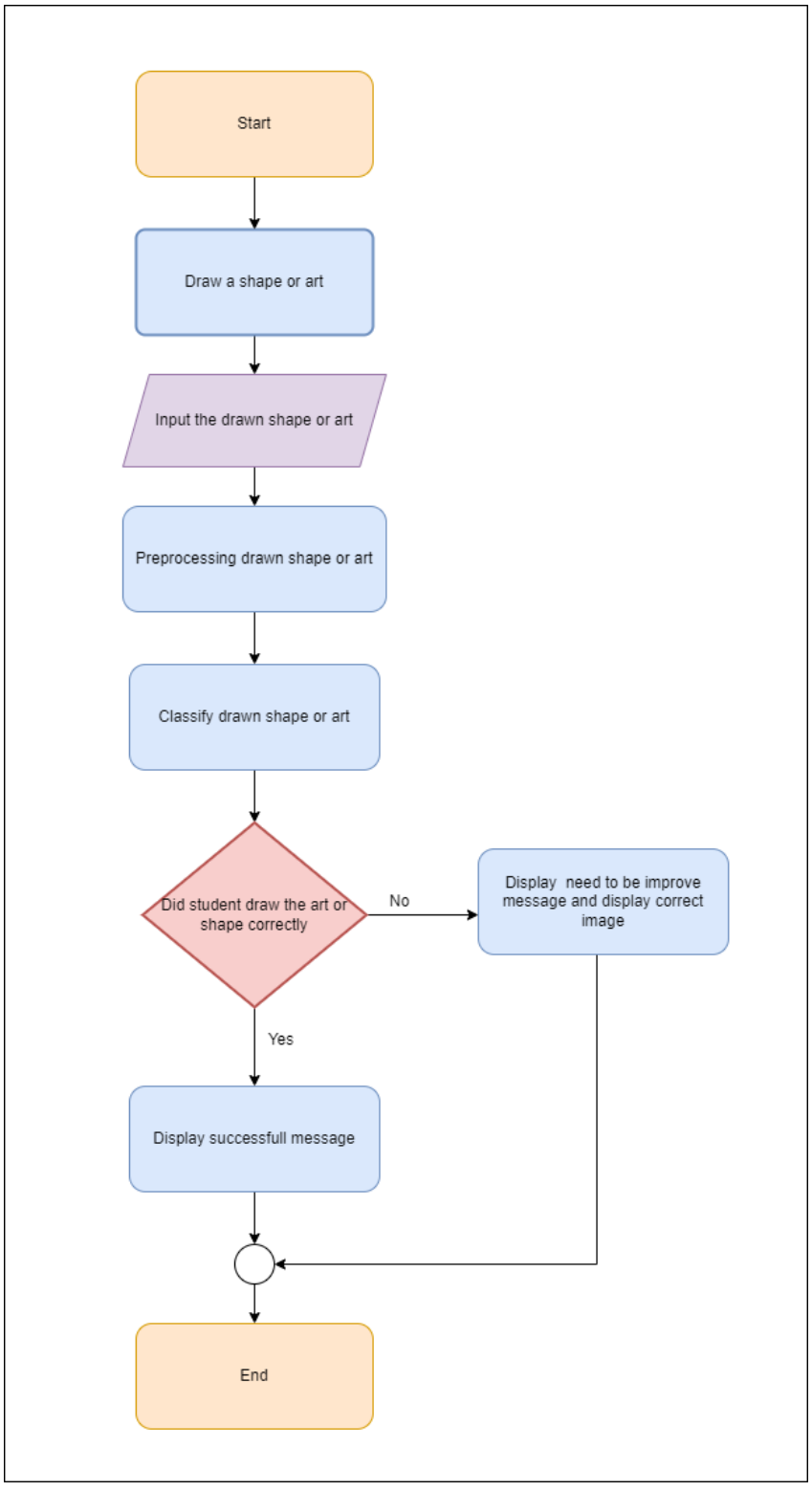


Figure 4.1.3: System Diagram for Frontend

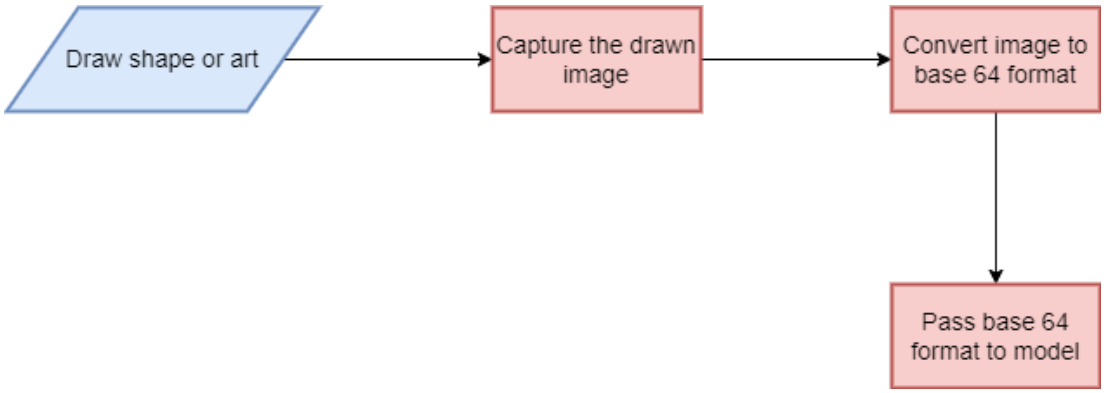
2) Identify and classify hand drawn shapes & arts




Start
Draw a shape or art
Input the drawn shape or art
Preprocessing drawn shape or art
Classify drawn shape or art
Did student draw the art or shape correctly
No
Display need to be improve message and display correct image
Yes
Display successfull message
End

System Description.

This system procedure starts when user select shape category. The system is providing three basic shapes and three basic arts that can be drawn using shapes for user. After user selecting a shape or art, a surface is providing to user to draw that specific shape or art. When user finish the drawing, “Done” button should be tapped. Then, an image of the shape or art is capturing by the system. After capture the image, the image will be encoded to a base 64 format.



Then the encoded image is passing to model for the classification purpose. After receiving the base 64 format image, the model will identify and classify the type of image that student drawn. After classification a response is passing to front end with the answer of drawn shape or art. The way of displaying answers will show below.

- Circle = 0
- Rectangle = 1
- Triangle = 2
- Flower = 3
- House = 4
- Star = 5

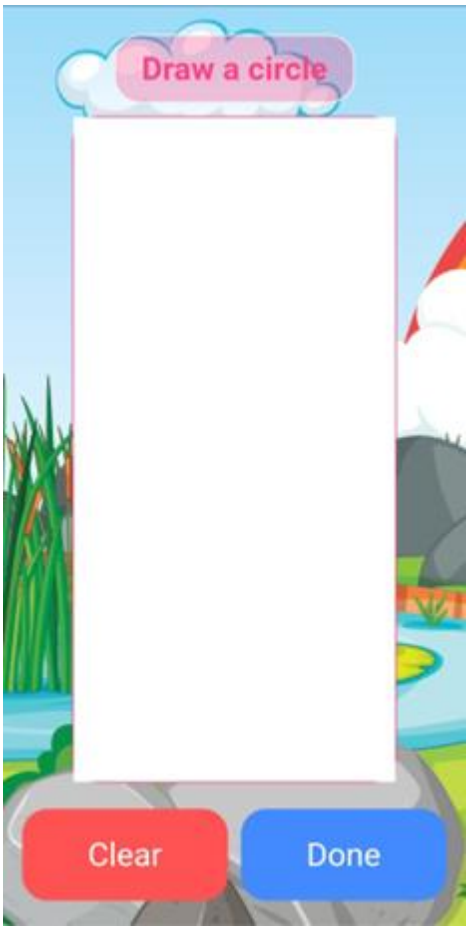
After getting the response from model, front end is checking whether the drawn image is correct or not with the drawing shape name. As an example,

- if (x['result'] == 0 && shape == "circle")

If a user draws a wrong shape or art system is showing the correct image to user. If the user draws the correct image system shows the correct status with the drawn image.

Development Process.

First, the user needs a surface to draw a shape or art. Using the flutter library, the necessity has been fulfilled. To create a whiteboard flutter whiteboard library has been used. After drawing a shape or art user must tap the “Done” button.



As soon as the button is clicked an image of the drawn image will be captured from the system. There is a button to clear the whiteboard also. Clicking the “Clear” button user can erase all the content that is drawn.

Encode and decode the image to a base 64 format

After capturing the image, the image should be transferred to the model for classification purposes. After better research about transferring images, Base 64 format was found. Comparing this finding with another method, the Efficiency of the base 64 formats was found. Transferring using base 64 formats was identified as a better way to transfer images than transferring images as it is. To do this image should be encoded to base 64 formats from the front-end side. There are more web applications to encode images to base 64 formats. First, when building the model API, a method was built to decode the base 64 images.

```
def base_64_cv2(string_64):
    img = imread(io.BytesIO(base64.b64decode(string_64)))
    cv2_img = cv2.cvtColor(img, cv2.COLOR_RGB2BGR)
    return cv2_img
```

After that, using web applications, images were converted to base 64 formats and tested the classification model. After that, using flutter the image had to convert into base 64 format with the purpose of connecting the model and frontend.

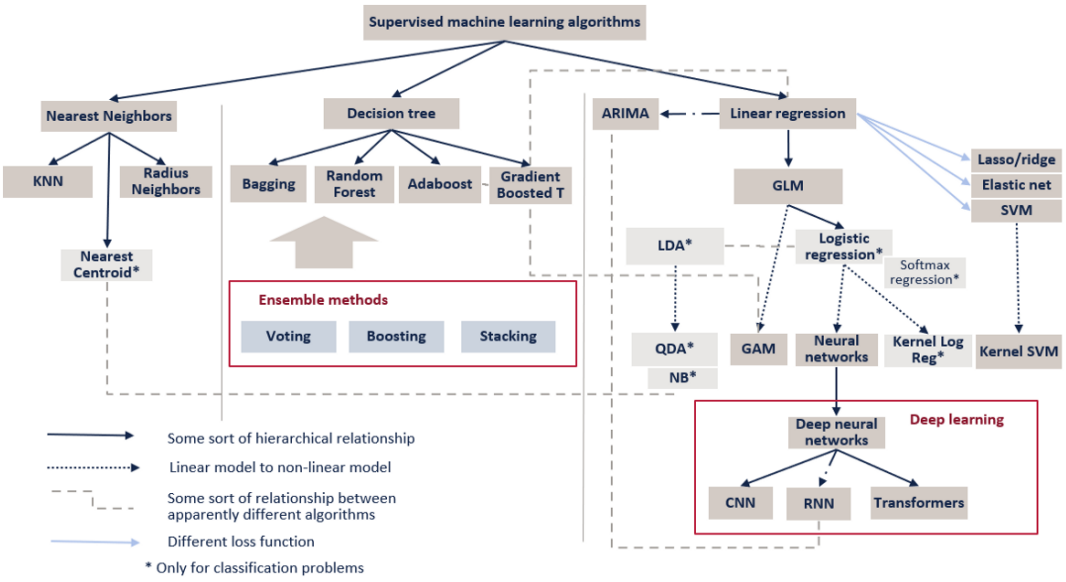
```
onConvertImage: (imageData) {
  setState(() {
    drawImage = base64Encode(imageData);
  });

  imageTempSave(imageData);
}, // Draw
```

Create the image classification model

Model creation for image classification the algorithms for supervised machine learning were selected. Under supervised machine learning algorithms, linear regression was selected for model creation. Following a few studies under linear regression under Logistic regression Neural Networks were selected to construct the model. Finlay,

CNN was selected to construct the model that contains a deep learning neural network component.



When creating this model 11 layers were used. Among these layers RELU Activation, SoftMax Activation and ADAM Optimizer were used. After the training of the model, model was saved locally. The created model was able to identify and classify hand drawn images and arts successfully. This classification model got around 90% accuracy rate.

```
def cn_model():
    no_of_filters = 60
    size_of_filter_1 = (5, 5)
    size_of_filter_2 = (3, 3)
    size_of_pool = (2, 2)
    no_of_node = 500

    model = Sequential()
    model.add((Conv2D(no_of_filters, size_of_filter_1, input_shape=(image_dimension[0],
                                                                    image_dimension[1], 1), activation='relu')))
    model.add((Conv2D(no_of_filters, size_of_filter_1, activation='relu')))
    model.add(MaxPooling2D(pool_size=size_of_pool))
    model.add((Conv2D(no_of_filters // 2, size_of_filter_2, activation='relu')))
    model.add((Conv2D(no_of_filters // 2, size_of_filter_2, activation='relu')))
    model.add(MaxPooling2D(pool_size=size_of_pool))
    model.add(Dropout(0.5))

    model.add(Flatten())
    model.add(Dense(no_of_node, activation='relu'))
    model.add(Dropout(0.5))
    model.add(Dense(no_of_data_category, activation='softmax'))

    model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
    return model
```

Passing images from the front end to model

For connecting front-end with the model an API was used. To create this API FLAS was used which is a framework that written in python. From this API class the model has imported, and the receiving image has redirect to the mode. After classification the API providing a response to front-end.

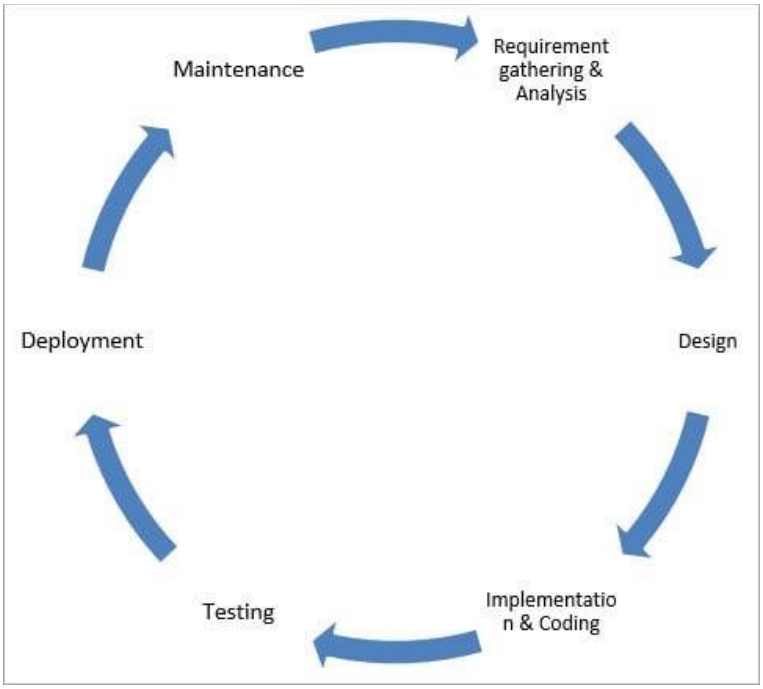
```
model = lm('Part_01/train_models/main_model.h5')


@app.route('/part_01', methods=['GET', 'POST'])
def part_01():

    string_64 = request.json['image']
    img = base_64_cv2(string_64)
    cv2.imwrite('upload/base64.jpg', img)
    img = Image.open('upload/base64.jpg')
    img = np.asarray(img)
    img = cv2.resize(img, (32, 32))
    img = preProcessing(img)
    img = img.reshape(1, 32, 32, 1)
    predict_x = model.predict(img)
    classes_x = np.argmax(predict_x, axis=1)

    return json.loads('{ "result" : ' + str(classes_x[0]) + '}')  # 1 correct 0 need to develop
```

Software Development Life Cycle (SDLC).



- Requirement Analysis

  In the requirement analysis please, user requirements, functional/non-functional requirements were gathered. Sharing a google form among parents of primary age students and reviewing previous finding about research scope most of the requirements and ideas were gathered.

- Designing

  In this stage gathered requirements and details were finalized to create an application. Together with team members application was design in this stage.

- Implementation and coding

  In this stage according to the design implementation and coding were started. Shape identification and classification component was created in this step. A python machine learning model and a flutter front end were developed. Every member of the team ware built their own functionalities in this stage.

- Testing

  In this stage, testing was done for created application. Functional testing, Nonfunctional testing, smoke testing, Reaggregation testing were done in this stage. From the testing some bugs also were found and fixed those bugs. End of the testing application was ready for the launching.

- Deployment

  After the testing fully application was ready to deploy in this stage. After user acceptance testing application was ready to deploy. After completing all the requirements application was deployed in this stage.

- Maintenance

  At this stage we are currently doing some maintenance and updates. These maintenance and updates will be continued in future as well. According to the time and latest technologies this application will be updated in this stage.

4.2 Software Solution

The agile approach will be used to analyze the software development life cycle. And in the agile methodology, Scrum will be the methodology that will be used. Scrum is a simple way to execute agile. Scrum is currently the most common development methodology, not only for software but also for finance and analysis.In addition, authors used MS-teams and WhatsApp to gather the meetings and share the necessary information related to the research works.

4.3 Requirement Gathering and Analysis

To collect requirements for this paper from nursery teachers, parents, and kids. Collected data contained images, books, experiences practical instructions, etc. To collect the data, we will have to meet those references people.

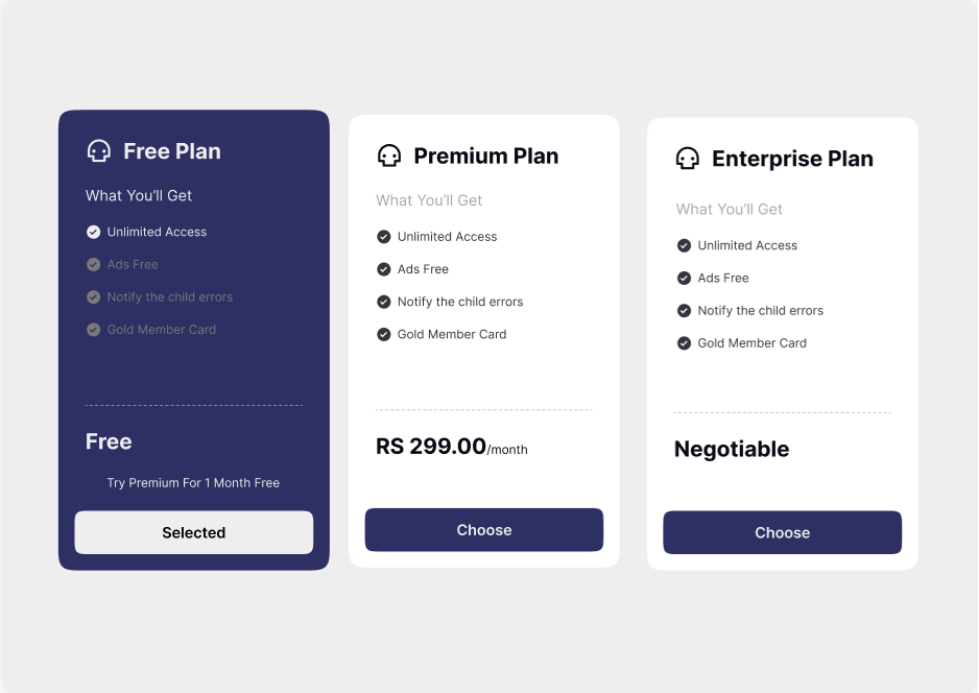
- **User Requirements**
    - User-friendliness.
    - Provide solutions to improve knowledge of writing letters.
    - Facilitate quick response.

- **Functional Requirements**
    - Recognize hand-drawn letters.
    - Predict the letter if the student draws the letter incompletely.
    - Identify mistakes done by the student when drawing the letter and suggest solutions.

4.4 Commercialization

The authors anticipate utilizing a variety of different types of successful marketing strategies in their efforts to commercialize the app. The authors will promote the application through the following methods: the creation of a website, marketing through social media platforms, the production of a teaser video, consideration of alternative app stores, the design of an appealing app icon, and naming the application.

In addition, Authors were anticipated to supply a user subscription plan in addition to partnership opportunities in order to commercialize the application. Figure 4.6.1 presents an example of a subscription plan for your reference.



Example Subscription plan is shown in Figure 4.3.1

Application developers have high hopes of designing and developing a website that is both fully functional and compatible with mobile devices. They will also be able to distribute information about the product to national and international markets as a result of this, which will allow them to increase the number of customers who purchase

the product. In line with this, the developers intend to design an app icon that grabs users' attention and come up with an enticing name for the application that is appropriate for marketing purposes and distribution on the market. It is of the utmost importance to choose the appropriate social media platforms for the promotion of the mobile application from the wide variety of social media channels that are currently available on the market.

5. Implementation

- **Mobile Application**

  The outcome of this paper will be a mobile application that enhances the drawing of letters, shapes, obejcts, arts and knowledge of image captions for primary kids. The main expected outcome of this system is to create an E-Learning application for Children to enhance their learning.

- **Designing**

  In this section discussed the Mobile application UI’s.

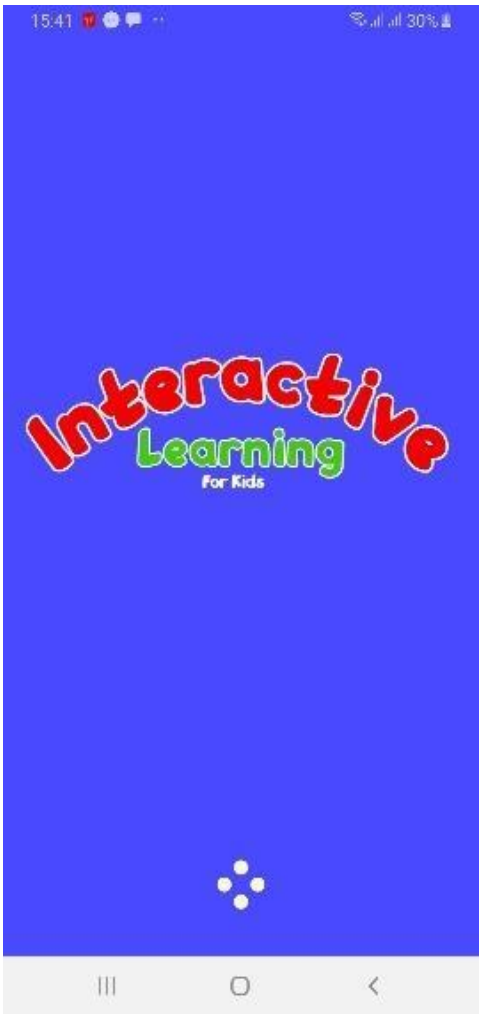


Figure 5.1: Splash Screen

Figure 5.2: Home Screen

Display the splash screen at the beginning of the Interactive Learning System for Kids application whenever it is opened (Figure 5.1). Displaying some loading effects on the splash screen helps make the application more user friendly. The Home Screen is rendered by the application in a matter of a few seconds (Figure 5.2). After that, users are given the opportunity to select the options that are most relevant to them.

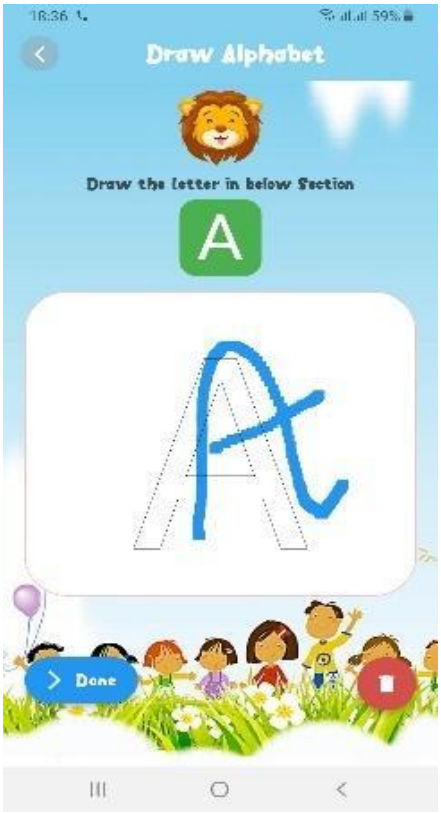


Figure 5.3: Mistake Identification

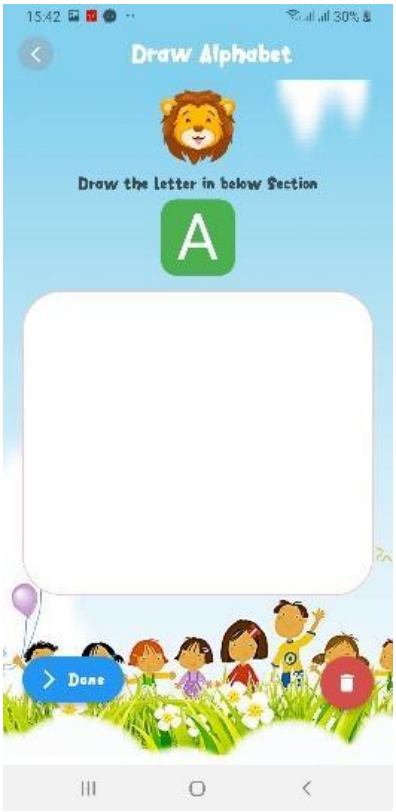


Figure 5.4: Alphabet draw screen

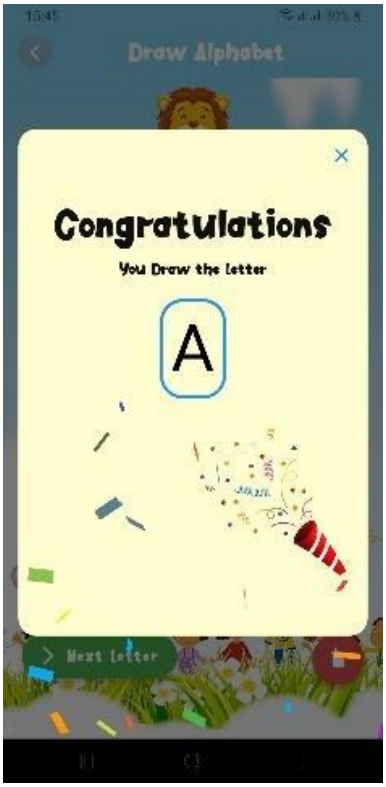


Figure 5.5: Correct Alphabet identification

The alphabet drawing screen is depicted in Figure 5.3. On this screen, users are able to draw the specified letter within the allotted white space. After selecting the finished option in the menu. The system will automatically predict the letter that will be drawn and will identify any mistakes, regardless of whether they have been made or not.

If the letter that was drawn by hand is incorrect, a mistake identification screen will appear (Figure 5.4). However, determine where the error is based on the hand-drawn letter. The appropriate letter is presented here as a gif video depicting it in the appropriate manner.

The Correct Alphabet Identification alert dialog will appear on the screen if the letter that was drawn by hand is the correct one (Figure 5.5). After the warning dialog box has been closed, children can move on to the next letter that is provided.

6. Results & Discussion

1) Identify and predict Hand drawn alphabet letters

A balanced 2 dataset containing 370000+ and 1400+ images has been selected for the prediction and identification of the alphabet letters. This dataset was selected with the help of CNN and Transfer Learning (VGG16) based model. The image compare library was utilized so that the errors could be found. However, when we used all three models, we got three completely different accuracy results. But regardless of the calculation, the primary goal is to improve the Kids' handwriting skills as well as their general knowledge.

In accordance with model 1 accuracy, a score of 98 or more was obtained. The results of the test and train are depicted in Figure 6.1.1, which shows how accuracy improves. It's possible to achieve high levels of accuracy by using 5 epochs in your analysis.

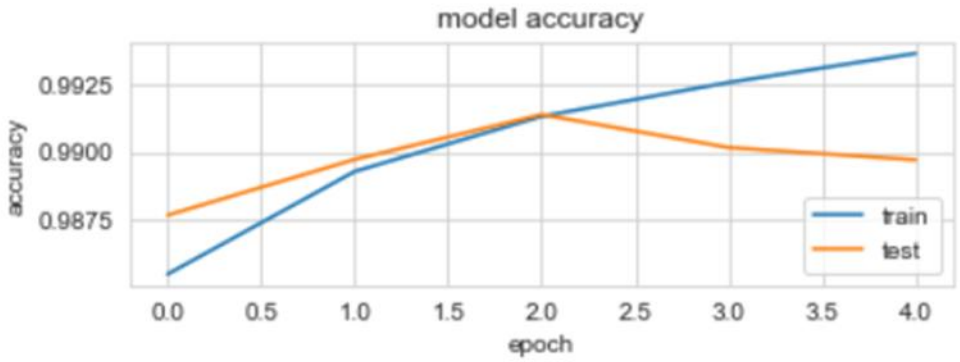


Figure 6.1.1: Model 1 Accuracy Result

The Kaggle.com (Big) dataset was replaced with a new dataset in the 2 Model after it was changed (Small). Following completion of that research, I obtained an accuracy rating of greater than 75%. Figure 6.1.2 illustrates model 2's accuracy as a result of its testing.

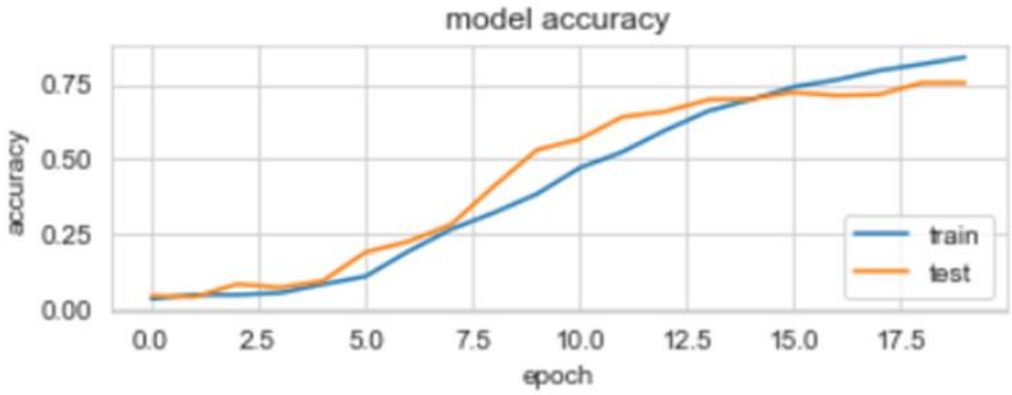


Figure 6.1.2: Model 2 Accuracy Result

The researchers developed the third model with the help of VGG16 and found that it had an accuracy of more than 45%. The availability of only a limited number of datasets in the new data set for use as a pre-trained model was the root cause of the poor accuracy rate. The test accuracy results and the train accuracy results are presented side by side in figure 6.1.3.

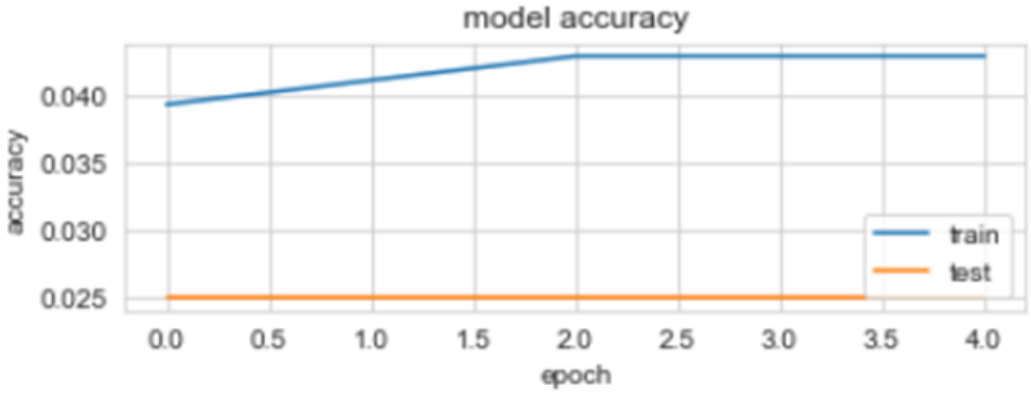


Figure 6.1.3: Model 2 test and train accuracy result

After comparing each model, the author concluded and choosed model 1 as the best accuracy model.

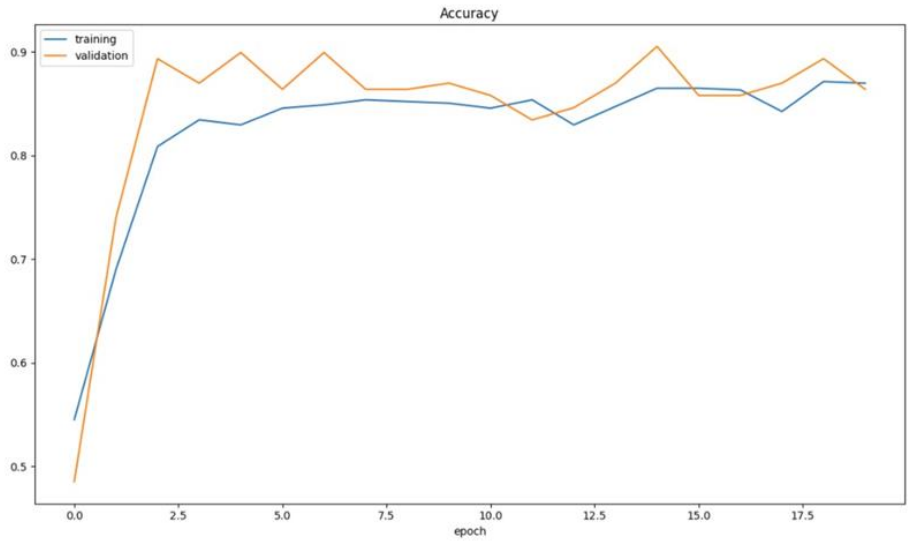
The most important feature of this application is that it can read letters that have been drawn by hand. Because of this, in order for users to effectively utilize the application, they will be required to draw the alphabet letters on the screen that has been presented to them. In order for children to become accustomed to the mobile application, it's possible that adults will need to provide them with some assistance in the beginning stages of the process. The following table 6.3.1 provides a comparison of the most recent research findings with those that have previously been implemented in the relevant subject area. The authors of the current work found that, when compared to earlier studies, it added more comprehensive work by including mistake identifications, predictions, and efforts to correct those mistakes with the correct way.

2) Identify and classify hand drawn shapes & arts

I had two possibilities after conducting the necessary study to create the image classification model. One was the Yolo 5 model, while the other was the own deep learning neural network algorithm. After training the model in both approaches, I determined that a proprietary deep learning algorithm provides the most accurate results. To train the image categorization model, a proprietary deep learning method was selected.

In the proposed system, as a result, three shapes (Circle, Triangle, Rectangle) can be identified and classified successfully. As well as three arts (stars, Flowers, and Houses) also can be identified and classified successfully. For drawn shapes or art, a grade also will be provided.

Using a Deep Learning neural network algorithm, the classification model was taught to recognize and classify hand-drawn shapes and art. The algorithm's percentage of accuracy was more than 93%. Since the Deep learning neural network algorithm provides a higher degree of precision, it was chosen for training the model. To increase the accuracy of the model layers of the model has increased. From that more accuracy was taken by the model. The accuracy diagram has included below.



The classification and identification of shape-drawn artworks were facilitated by this methodology. That was the research gap, and the first time it was addressed. The built model successfully met all functionalities.

7. Conclusions

The education sector is currently being dominated by technology as a result of the rapid development of said technology. Because the majority of today's students learn better when presented with information using modern methods of instruction rather than the more conventional ones. When teaching elementary school students, making use of the most recent technological advancements is of the utmost importance. Because children in elementary school are eager to learn through creative activities. Therefore, the most cutting-edge technologies as well as creative approaches can be used to teach students in an effective manner.

This research paper proposes and implements an advanced interactive learning system for primary students to improve their skills in letter-writing, drawing shapes, and drawing arts that can be drawn using shapes, as well as drawing objects, and writing sentences. The goal of the system is to help students become more proficient in these skills. For the construction of the aforementioned features, machine learning models were utilized. In order to implement the aforementioned features, four distinct CNN models were used. Above 85% accuracy was discovered across the board for all of the models. Students will have the ability to improve their knowledge in a manner that is accurate thanks to the higher accuracy of these models. Students will be able to learn more quickly and effectively with these cutting-edge technologies than they could with traditional learning methods.

8. Reference list

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