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Electrical and Computer Engineering

**MOBILE PROGRAM THAT TEACHES A SUBJECT
IN MATH**

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by

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Mahad Abdirahman Wehelie

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ABSTRACT

MOBILE PROGRAM THAT TEACHES A SUBJECT IN MATH

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Mobile applications are the essential part of our lives, providing the best and the simplest services to solve some of our daily problems. Since mobile apps are getting very useful for the latest technology. This project can be used for several different fundamental mathematic ways such as (addition, subtraction, multiplication and division) includes fractions. However, solving equations and replying the result with clear details is the basis of this project, it has been developed with the latest android version and the system named as “Mobile Program that Teaches a Subject in Math”. This project contains many sections including: (Keyboard, Handwriting, Drawing and Capturing). This app can be installed on smart phones, tablets, computers and all other features that allows to use android. Nevertheless, mobile apps are getting more important in the latest technologies. The system aimed at students to compute an expression of mathematic in easy ways and can see the results in the best possible way and in this document is going to supply or give it in details.

Keywords: Android, Recognition, Expression, Text, Speech, Equation, Button, Details, Highlights, User, Diagrams.

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LIST OF ABBREVIATIONS

OCR : Optical Character Recognition

TTS : Text To Speech

SDK : Software Development Kit

TR : Text Recognition

SR : Speech Recognition



LIST OF SYMBOLS

$\Rightarrow$: Go to next one

$\Leftarrow$: Go back

C : Re-correct



1. INTRODUCTION

The latest mobile phones in these modern days has better qualities than the old ones according to their battery power saving, the space they got in the memory and their processing speed, so by looking these positive qualities there is big advantage for the new learners, especially for the students to do researches about their homework's, they can read as many as they want from their lessons by using smartphones, those students can download some useful applications from the internet and follow those programs by learning some new information or another technique for the student to develop his learning strategy by this method, opening the browser/chrome app and then typing to google whatever information that the user is trying to curious and all these will be done by not having any internet problems, the wireless speed will automatically function by the highest internet speed level with the system is running very fast on any device tool[1]. The biggest opportunity that we gain from technologies is not only learning new information, but it gives us an opportunity to learn extra information that we cannot capable of learning from the school or from our teachers, we should change technology name into schools because it contains combination of schools information's [2]. The best schools has high quality teachers who always help their students improve the level of their education and their attitude, those teacher are like backbone for their students, they always support them to success their future education and become very creative, active and hardworking students [3].

The student will be able to learn new ideas about new things at any place and any time without need of book or paper but having and using mobile will be enough to cover all that need in a short time. Mobile learning is the bright future of the students, the student just has to upload all the applications that are related to the field and activate the app after it installed. Electronic books are really helpful for the student without printing a hard copy of the book you just need to open your smartphone in app store part and then research the book name that you are looking and then check the rate and the exactly the right necessary edition or in other hand you can use audio players by listening the audio voice as mp3 or as a mp4 [4]. For traveling to anywhere in the world, you should keep your phone device near to your pocket for keeping and saving data or taking notes during your trip time or using wireless internet for learning new information by reading some theoretical articles from online [5]. Smart phone ownership including lecturers and learners in African countries proofs that 97.5% of the lecturers and 91.8% of the learners spend most of their

daily time using phone devices. This research points that 66.3% of the lecturers owns mobile devices like Samsung and 24.1% of the learners owns some other similar devices if not better and bigger phone devices. The study continues 90% of the lecturers and 48.2% of the learners already bought laptops. After these studies the result shows that how technologies influence our lives and play an important role for our learning strategy. Nowadays, in the school in classrooms you see class mates has created their own WhatsApp group, all the class members are keeping touch in that WhatsApp. In addition, this new technology learning strategy gives an exciting opportunity to the learners and improves the student's discipline, so they get experience and look forward and determine the success of the technology. Johannesson and Perjons [6]. Prepared to improve a novel mobile application for the learners to solve their education problems and it's called mobile education (Mobile Edu) released in one of African countries for African people to level up their learning into a higher knowledge level, this application has a design diagram which is called (DSR) means design science research which designs and sorts the science research in order, during this process it aims in two parts. The first part is to get a solution for practical problems and develop it to cover the need or the satisfaction which related to our daily life situation. In this point the daily life situation is executing the knowledge in the African countries into a higher knowledge.

Mobile education application was programmed to help the lecture provider to manage a huge amount of university students executing knowledge information's by applying a blended learning system. The physical object of our project is to influence the affordance and cell phone device companies to facilitate gaining knowledge of executing lessons via mobile education. The second part, design science research should spread the existing education that are related to this field. The methodology of learning in a simple way highlights an easy strategy to learn new information. The system has a huge memory space area which covers all the data that should be saved and keep it for long years and these days they add new method which help the user to register the data with specific mail account and it transfers into online copy right which will be kept for long time, whenever an error occurs inside the desk file all the data will be available in the mail account, this system allow the user to remember the usage of the data more easily. For example, the mobile learning application frames has many attributes, in these attributes more than half of them from Nielsen and the rest are extra addition ones: capability, intellectual assignment, disturb capability and clarity [7]. Mobile applications for training & schooling is a demanding fundamental educational of intermediate level students and higher secondary schools. Mobile learning

applications help learners to read, participate and share their unique ideas to the world by using latest developed technology and free wireless unlimited internet in a daily work. However, adapting mobile learning application by students and teachers is significant for mobile learning application developers. The acceptance of mobile learning application is playing an important role in every situation of the students and teachers that are proposed to adapt or refuse it. This type of automation framework access is used to clarify the energy and gap of developmental facilities [8].

Most of the population in the world own mobile devices. As an example, in the United States of America 90% of the people who live there own mobile devices, the imagination percentage from each hundred is even higher than that and it's approximately (98%) include young aged people between the ages of 18 up to 29 [9]. The percentage use of mobile application becomes accessible, and most of their time spend using those mobile applications for every tiny detail of their life. In the mobile application stores, there are many different mobile applications with different work idea, some of them are for learning, some other are for communicating and meeting to new people, some other apps are for following the news about daily events and the rest are poem apps or playing games application for children or learning a new subject from mathematic application and many more than that. With the addition (Miller, 2014) [10]. There are many different types of mobile application developing programs and one of them is android studio programming for mobile applications that involves an operating system, the system is able to function without wireless, the user need just to have device which allows to run android programs and able to execute, but in the application section, wireless may be needed in some cases, also Bluetooth will be allowed to transfers data from android application into another android device and in Wi-Fi case is an optional in android device, it depend on the android user and which device is used. In addition, android among an entire address mechanism which gives the developers with great fertility and main vision into their applications. Distant activity is succeeded by any mobile devices, tablets and computers with android operating system [11]. Numerical explanation recognition repose of two big steps: symbol understanding recognition and architectural explanation. Symbol recognition is the bottom of the architectural explanation which repose of two phases: symbol analysis and symbol understanding recognition. The absorption data of networked handwritten numerical explanation is set of achievement. A numeric symbol may repose of more than one achievement. The object of symbol analysis is to transfer the achievements into set of symbols and then will be clarified in the symbol recognition point. The symbol understanding recognition translates the character into a

recognized symbol [12]. The recognition component is established on the aspect recognition system that was displayed in [13]. The leading ambitious in building a collection of content mathematical equations is to catch rational expressions from the world. Some access cause such a collection from a syntax [14]. Speech recognition art has been programmed in a different educational engine with a target in appreciate spoken language accomplishment. Alike engine are advanced to care native / nonnative speakers to pure their accomplishment by advancing terminology and diction [15].

1.1. PURPOSE

The main aim of this project is to provide the students those are intermediate level a simple, an excellent, a low cost, an easy to use, understandable and reliable existing system which computes mathematic expressions with showing the steps in details. On the other hand, it is developed for any kind of user, however, it also can be helpful for blind people by using the speech section. In addition to that, in our life's mathematic is used in many different cases, and one of the cases is for intermediate level students to make understand and see how the system is working (first, reading the input and the executing it in the system and finally showing the output of the equation with steps that are followed in details). So the student can feel how the steps of a mathematic expression executed. The purpose of this project is to give confidence to the user.

1.2. SCOPE

This project is about to make full map math app which teaches basic mathematic expression to the young users. The system take all the information from the user and execute it, but it has many different options to get the information and the following are some of them: by speaking, by writing, by drawing or by capturing and then it recognizes and translate it back to the system as a math expression. First, the system calculates the basic equation by showing their result with the steps by details, so that the user can see how this equation can be solvable by highlighting the operation starting from the one which has the highest priority and then after that it jumps into the second one which has the second highest priority after the first operation and it goes like that way until it complete the whole equation.

1.3. LITERATURE REVIEW

Automation has enrolled the learning range, changing enough of its steps and theory. The course learners are attending in these days necessitates an actual conversion for accepting new technologies in information learning coming from computerized transfer. Phone learning applications arose with high-tech improvement and has been analyzed and calculated by many academic about the earth [16]. Phone learning applications are described as a contemporary way of releasing a collective habitat attracted on students, created to be active and reachable to any single for adoption from any place at any era adopting internet assets and analog technologies coinciding with assumption for schooling arranged to be devoted for open and adjustable learning habitat. Phone learning applications means of adopting new connection technologies among housewares and operating system programs, intelligence networks, interactive media, chart and figures, analysis, computerized libraries and internet enhance whether from an area or in school rooms [17]. In the history, phone learning applications were much defined to the benefit of phone technology, but today the flexibility of students is the assertive attention in this field [18]. In [19], admit that mobile application research develop and advances the capability of trainee to connect and approach data through phone and wireless machine. The biggest attractive mobile automation for researching is the phone device. Maybe the most critical logic for this demand is its multi-tasking description, because phone devices have appearance comparable arts, GPS, SMS, broadcast documenting, Bluetooth and whole kinds of academic operating system, World Wide Web, book recording [20]. In phone devices and Wi-Fi automation have the anticipation of proposing contemporary modernization in schooling, exclusively the condition of coaching arrangement. Such technology can build a coil achieve on student's work, by that not only allowing to accept a circumstance course, but also aiding the advancement of accomplishment such as deal with a complication, partnership, connection, imagination, modernization and comfortable accomplishment. [21], declare that phone application created for researching are in abbreviating inventory [22]. Accentuated that build up learning information about technique should be studied alternatively as other studying program. Also, they distinguished that mobile learning applications target to appreciate students that are gaining background experience and should not be adopted as a constitutional strategy to contribute a career course. The biggest difference between mobile device learning application and electronic learning can be identified in the capability of mobile learning application to show direction at any area and any era, while the capability to some amount

and in case the capability of electronic learning information strategy is modified to appoint a person behind the user's laptop and few areas that are banned for a laptop's use and alike portable computers. Conditions of learning assets and approach to learning assets using smart phones admit always been a big complication in coaching and learning. This conditions has a direct influence on greater schooling learners to get valuable learning success and improve education [23] [24]. Absolutely, the study of learning action will turn into substandard when the mobile devices is very effective, simple to adopt it, and simple to enroll. For this fact, in some of academic universities in advanced communities. The study of coaching and learning information has been completed by directly catching by learning information component from online network adopting machine learning is alike extra challenging to manifest in advancing nations due to mobile phones are fewer adaptable, defined internet connection and machine learning information applications a certain act fixed ambitious directed toward adoption [25]. Absolutely, one of the methods improved in better advancing nations is penetrating learning information basics taken away from the internet applying a desktop computer or mini computers like laptop accessory. Despite, few trouble issue come out as crucial challenge to adopt due to their huge capacity and density causing it problematic to adopt mobile devices. The above mentioned materials can only be penetrated in convinced areas that certain acquire defined internet connection. The study and the use of machine learning cannot analyze in summary about its operation to characterize learners about reasonable circumstances. Moreover, machine learning is complicated and conflicting alongside some mobile devices, generating difference alongside defined acceptance of machine learning. Meantime this method is absolutely impressive, challenges alongside extra mobile device management along with agile internet connection, simple to adopt, simple to gain new information from applications that are precisely corresponded alongside usage of machine learning. To come up with idea that helps to solve the problem in acrobatic way, few analysts has given advice about the coming methodology: the usage of mobile phone applications training should consider at attitude of the unity, a certain that can be penetrated aside fully of smartphones, online network acceleration on mobile phone net system and cleaner, favorable customer and failing fulfilled in case smartphones can present fulfilled well and quite completely excellent [26]. The recommended methodology is active and can be achieved and simple to use by learners [27] [28]. Despite, few some challenges still continue. Machine engine learning cannot analyze in summary around the benefit usage of the application remarkably such constitutional schooling learners have adversity [29] [30]. The

communication between the adoption of smartphones applications and learners achievement with inferior along with bigger inferior schooling act no more fair, as well as attendant continue blended decisions in the biography's article [31]. Online network is adopted as a fertility engine, this commonly factor aid particularly that can adjust the classical approaches of away from coaching along with training toward creating an automated earth [32]. Learners also attend to extra analyzed appoint, fewer moralistic distribution along with attention to deal the trouble issues and collegial training positions. The above mentioned can be advanced deep, indigenous intelligence to adopt in challenging and solving problems in the best way, autonomous and collective training and connection through applying the online network [33]. Adviser develops into coordinator alongside with gifted skills improver. They give advice & guide the new comers and learners to collect a higher consideration of data information report through accomplishing adoption of current automation similar online network. In the classical organization system learners have commonly act passive by obtaining what has been deposited in bigger matched force [34]. The adoption of online network like smartphone, tablets or computer applications, provides a lot of other options and selections along with a lot of academic schools trying at this time to generate aggressive boundary being themselves over the selections they are contributing learners [35]. The arrival of smartphone functioning operation as searching new information has corresponded alongside with developing alertness and understanding of other ideas choices or plans for schooling [36]. The concept of searching and gaining new information that keep the biggest change nowadays are the above mentioned placed on effective foundation. Anyhow, spending's with ICTs has been contentious [37]. Conveniences delivered by smartphone functioning operation placed on schooling may not be favorable to all the students exclusively the ones that mentioned in the above part who are far away of area of ICT. The profit of building and continuing the schedule cost efficient, philosophically, politically or humanly conditionally must be cheap as a legalized arrangement of schooling [38].

Our application has two parts of recognition:

- ✓ Part 1 voice recognition
- ✓ Part 2 character recognition

When the user visit the home page of the application, the client will have two options, option one which is speech recognition part and option two which is text part, so it fully depends on the user if the user want to use the voice recognition, the user need to click the upper one but before that the has to check if the INTERNET connection is available or not, if there is no connection, basically this part is not going to work without internet. I suggest the user to not use this part , but if the user has the internet, just the client needs to click the speak button and directly it's going to transfer into google speech and after the user read the equation and the application drops a suggested list of words which are related to the ones that the user read it and the user will have the ability to re-change the equation and also will have unlimited time for waiting and after the user decided to go on one of the suggested words it directly links into a new page which has a new option to make sure if the expression is exactly the same or not and after all accepting the rules, the application will provide the best possible result with details.

Table 1.1: Example of simples in the vocabulary of expression

Classes	Calculator
Latin characters	
Greek char	
Up. Case char	
Digits	0...9
Operators	+ - * / x
Equality op.	= < >
Elastic op.	
Set operators	
Functions	

Braces	()
Others	.

1.4. DEEFERENTIONS, ACRONYMS AND ABBREVIATIONS

1.4.1. Configuration

Configuration config = getResources().getConfiguration();

You can get this object Resources, using getConfiguration();. Thus, from an activity, you can get it by accessing the request with getResources();. However, we configured almost many things about our project like: graphical user interface, fields, buttons, labels, tools and controls. Mobile application development software enables reusing same specific collection group of controls, collection of screens or even an app in another project. It automatically inherits all the property configuration and connected APIs.

1.4.2. Frequently Asked Questions (FAQ)

Here are some frequently asked questions from the customers:

- ✓ Do I need to pay?
- ✓ How/where can I download?
- ✓ How can I update the application?
- ✓ Is my device supported?
- ✓ Is it safe and fast?
- ✓ Is registration needed for this app?
- ✓ Do I need to connect internet to use this app?

1.4.3. Customer Relationship Management (CRM)

There are many different ways that the developer can contact with the customer, but the coming can be said that they are the best ways to communicate with your customer

- Reduce cost
- Collect all the feedbacks from the user and apply it to the application
- Manage contacts more efficiently
- Make easy and understandable the use of the application.

2. SYSTEM METHODS

I wrote an application program which features android studio that will be able to use all the android devices in this project. The languages that i used in this project are: (Java, XML), this application is for anyone but specifically targeting for intermediate level students.

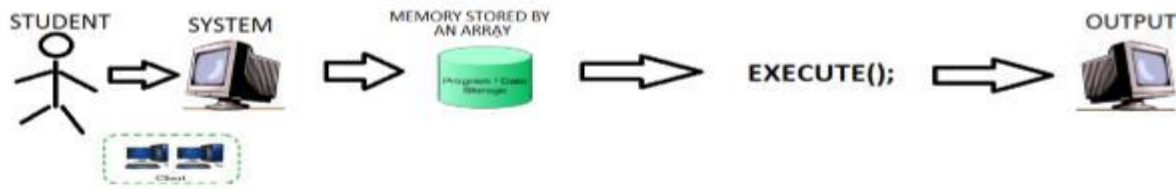


Figure 2.1: System executing

2.1. HOW THE SYSTEM WORKS?

This application has many useful sections, and the followings are one of these:

2.1.1. Calculator Section

For example, this coming figure is the standard calculator that we use daily

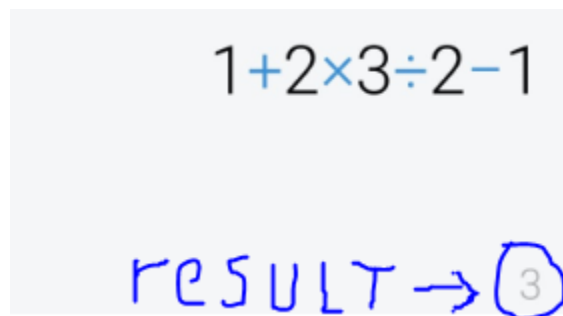


Figure 2.2: Calculator execution

When the user types the equation to calculator, the calculator directly shows the result, it has no more details or information about the process where it basically comes from, so that's the reason why most students don't know the priority that these coming operators has (+, -, *, /), and which operator has more priority than the other while calculating the expression.

In this project everything will be cleared by giving details when you type your equation into this project's calculator, it will be worked like this in equation 2.1

$$7 * 1 - 2 + 1 / \quad (2.1)$$

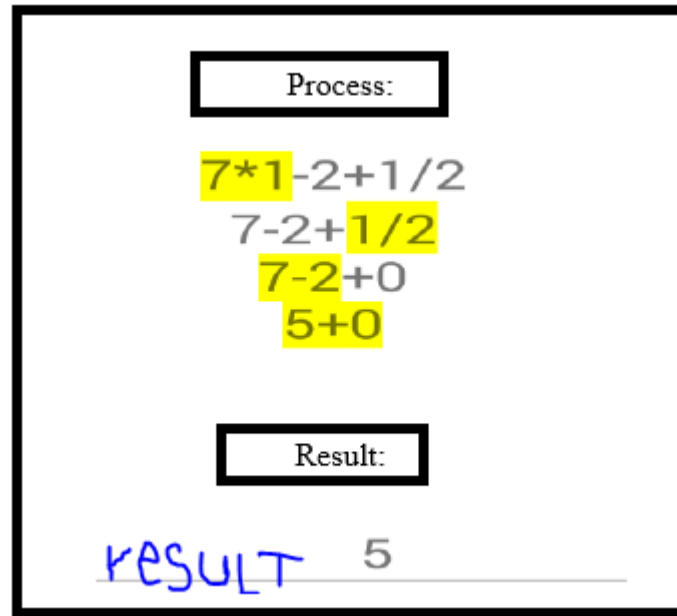


Figure 2.3: Result with details1

As you can see from the upper example first it takes the equation and then it start computing it, but while processing the equation it shows the steps one by one in details, first it start $7*1$ by starting multiplication (*) sign, because multiplication has more priority than (+,-) but same priority as (/), so I preferred to go with (*) and it highlighted in yellow color so the user can easily follow the steps, and then in the next line you can see it checks the equation if there's another sign and compare it with the other signs to find out which one has more priority than the other. As you can see in the second line it goes with the (/) sign and then (-) sign to calculate and finally (+) sign, I mean always the one that has lowest priority will be the last one.

2.1.2. Speech Section

The application will have a speak button when you click in that speak button, you can read your equation loudly and then the application will listen your equation carefully, after that it gives you a suggested list of words about the equation that you read and in case you see the correct text, you can click it if not you can repeat until you see your right equation in the suggested list words that the application will give you and then you can calculate the same way that we did before.

Here is an example about how to use my speech button:

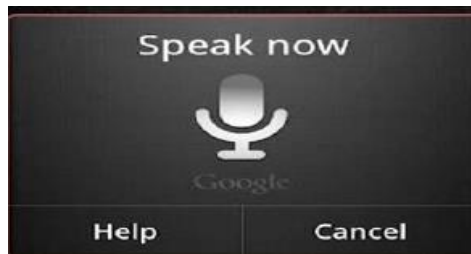


Figure 2.4: Speak button

First click the speak button and read your equation loudly.

For example let us say we want to read this equation:

$(1+5-6/2*4-1)$ after you finish your reading wait (be silent) and then the application will give this suggested words:

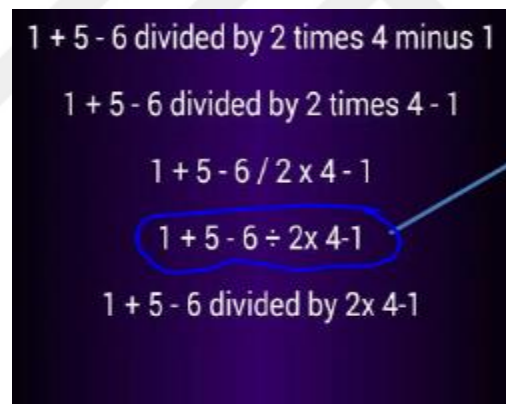


Figure 2.5: System executing1

Now you can see the suggested words and you can select which one you want because looks right and the application will recognize these words and change it into numbers. Let's say we choose the 4th one in the box, now what we need is to click the equation, then it shows the result of your equation with the details that stepped one by one like the below one:

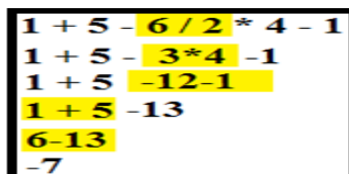

$$\begin{array}{l} 1 + 5 - 6 / 2 * 4 - 1 \\ 1 + 5 - 3 * 4 - 1 \\ 1 + 5 - 12 - 1 \\ 1 + 5 - 13 \\ 6 - 13 \\ -7 \end{array}$$

Figure 2.6: Result with details2

2.1.3. Camera Section

The app has a camera button and when you click into that button it automatically open the phone cane and you can capture an image, so if you need to use this part first before you open your camera you need to write your equation into a paper or as a text but it should be clear and just contain numbers, after that you can capture an image and the app recognizes the equation and compute it the same process that we already used it. Downside below you can see as an example:

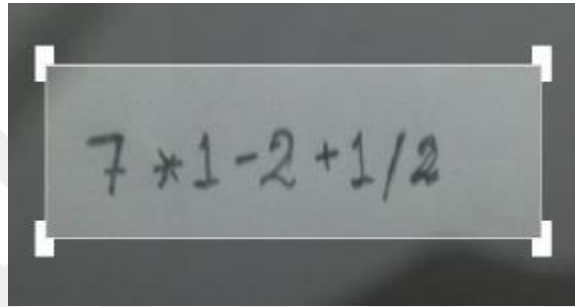


Figure 2.7: Camera view

After you click the camera button you capture and then when it recognize your characters then it start computing your equation.

2.1.4. Handwriting Section

This time you can write your equation by hand and then the application will recognize your words by using character recognition.

First, the app gives you a space that you can draw or write your equation. This is an example that help you understand clearly.

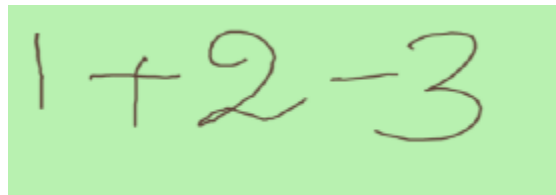


Figure 2.8: Handwriting

And then you can take a screen shoot and recognize it.

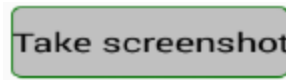


Figure 2.9: Screen shoot

After that it will compute your equation and show you the result with details.

2.2. PROBLEMS

Let's little bit think about education situation, there are some students who are planning to start studying or go farther for education, some of them want to become doctors, some others are planning to be engineers but the basic necessary thing that all these people will share will be mathematic, to be good in math you need to have a good basic knowledge about math and this project will help the clients to gain a good basic information about math, the app will help the user to develop and reach the level of knowledge that the user is targeting. However, when someone hear about math, the first think that comes into the mind is (think) we need to think more and more to be a good mathematician, because mathematic makes the brain work more and think more. In addition to that, it may take time for the user to understand the concept of the mathematic, but as long as the user practice or try more shows the steps which can be solved, how it's solved, and their priorities about which sign operator that must be solved first to make the correct result. Imagine the first day of your school and when it's your first time to learn mathematic, you expect from the teacher to explain the lecture slowly, clearly and separately, it's the same what we have in this application, the app shows every step clearly, how it comes, where it comes from, the concept, the logic and the formula that has to be used will automatically be seen there from the application

3. SYSTEM ARCHITECTURE

3.1. ARCHITECTURAL DESIGN

The user communicates with the system by inserting some inputs and then processing it to execute the expression, then the system transfers the data to the program storage and executes the function, and finally the system produces the result with details back to the user.

3.1.1. High Level Architecture

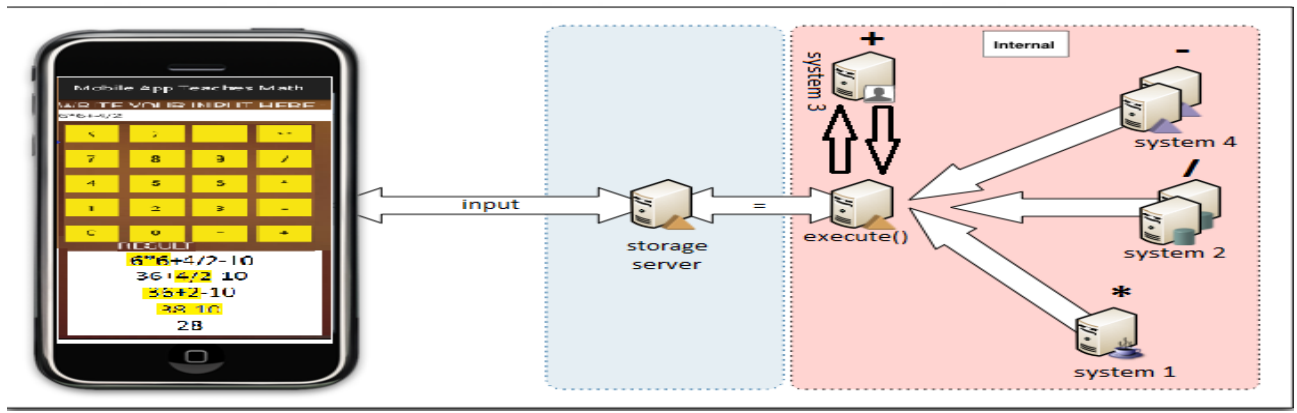


Figure 3.1: Internal system

At the beginning the system reads the input and store it into the memory space, then it starts executing the equation by considering its precedence priority. Braces has the highest priority, and after the braces multiplication sign and division take the same priority in the second place.

3.1.2. System Framework Design

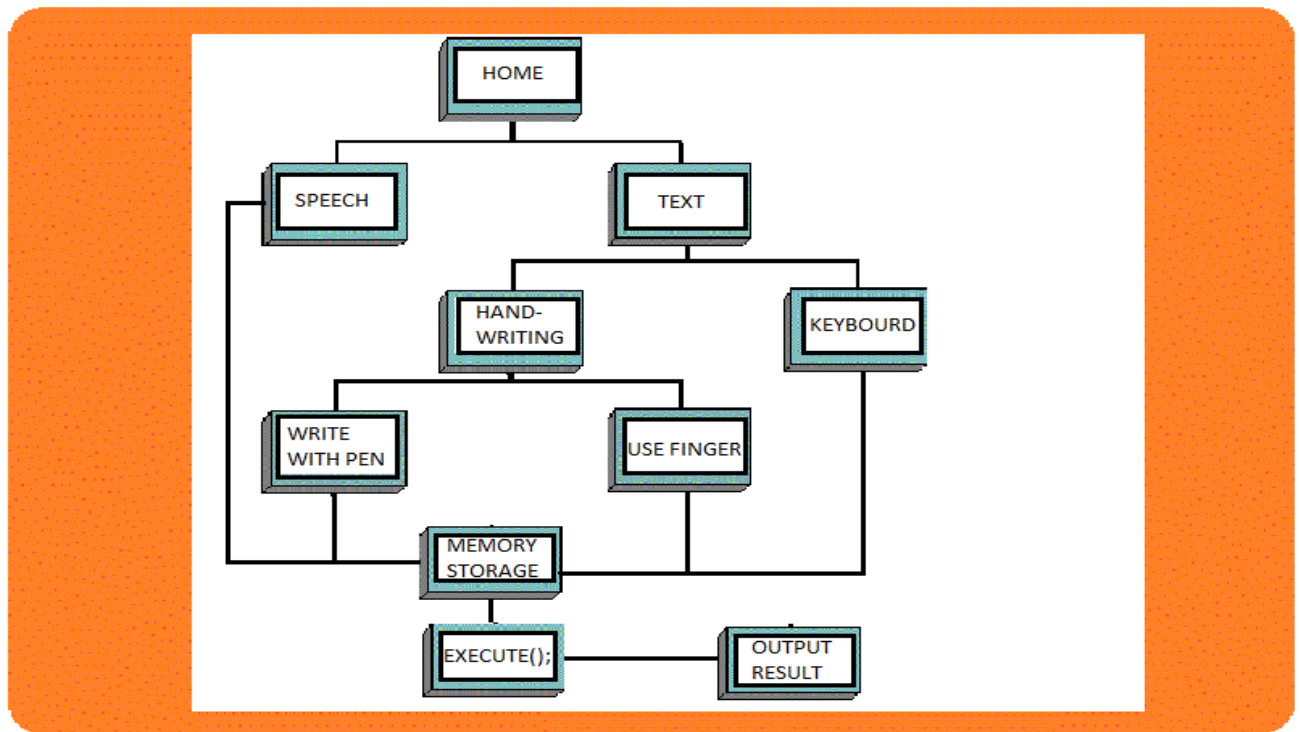


Figure 3.2: Framework design

3.1.3. Detailed Design

Introduction: The Software Design Descriptions (SDD) gives a whole architectural overview of mobile application System. This document presents to various stakeholders' different types of abstraction. It aims to provide the stakeholders a clear understanding of the system. In addition to that, the application design will show you the main functionality of the plan of the application.

3.1.4. Module Detailed Design

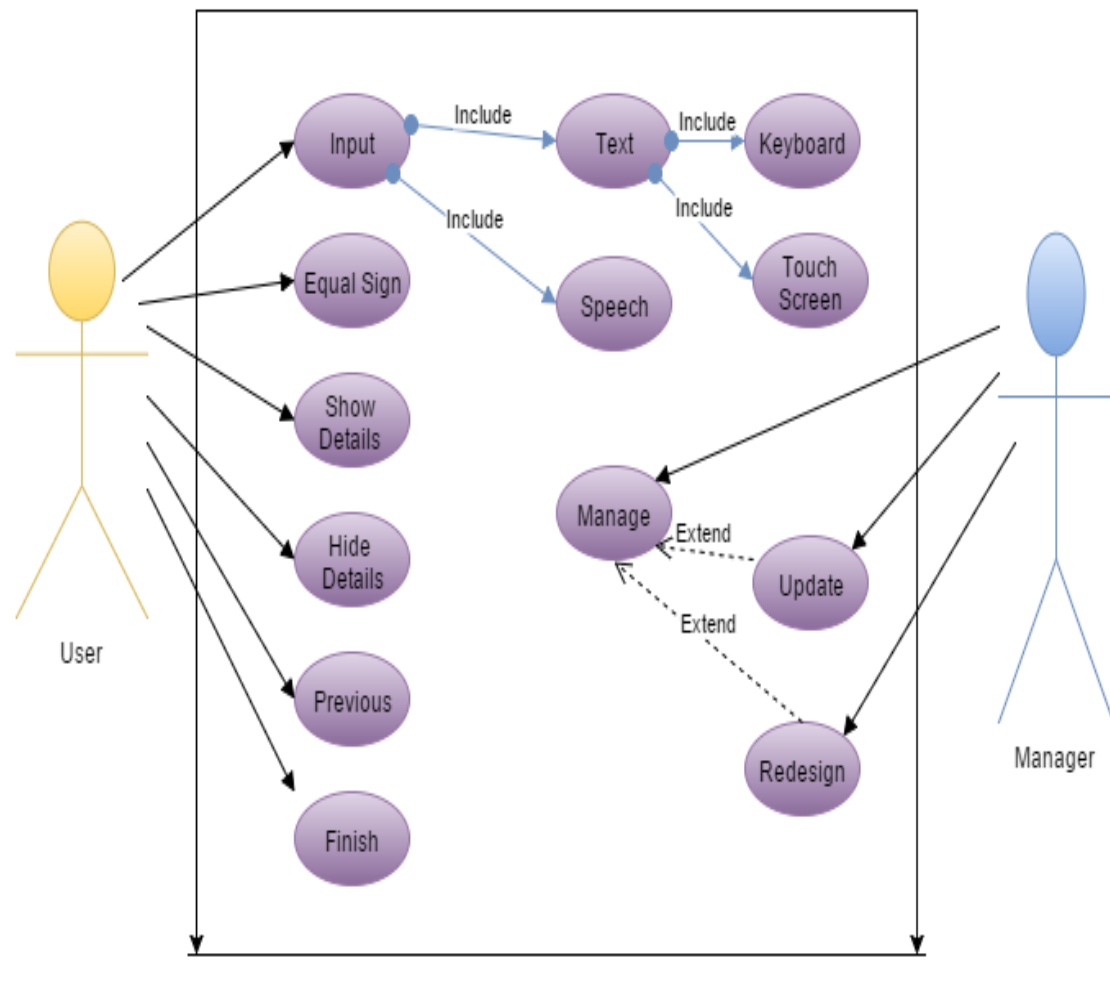
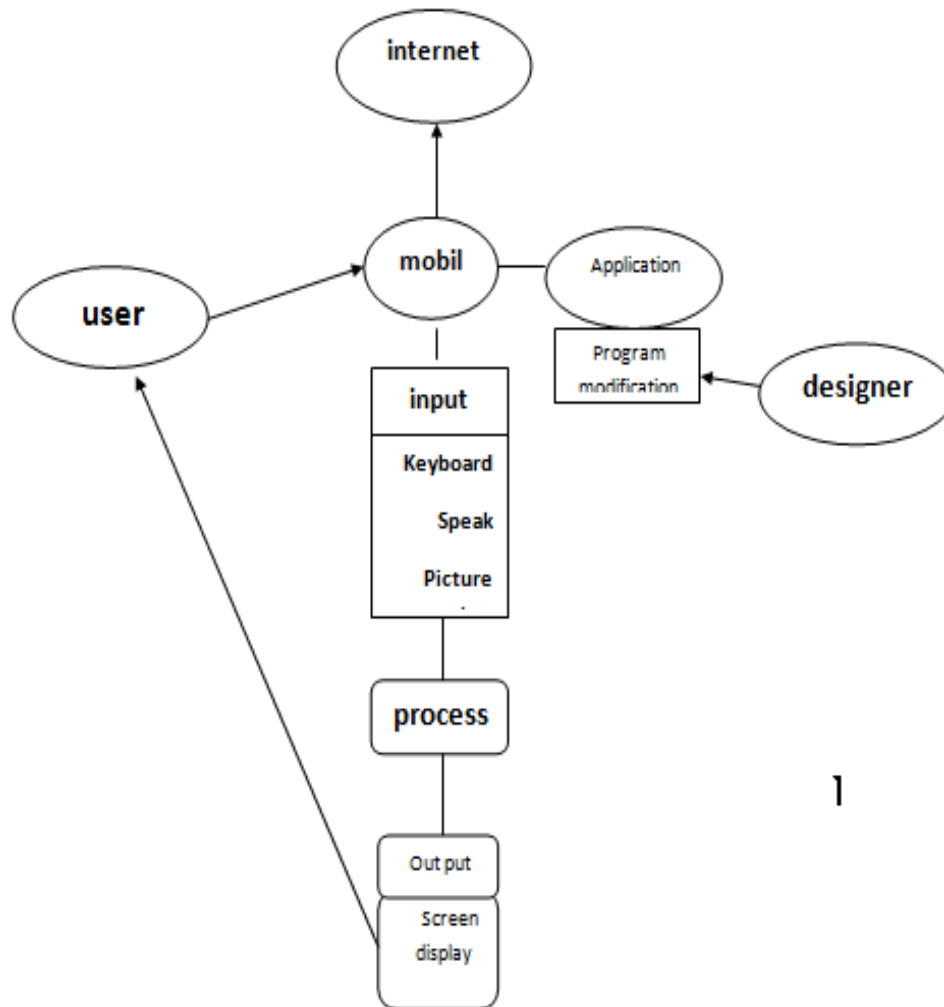


Figure 3.3: Use case diagram



The Domain Diagram of A MOBILE PROGRAM THAT TEACHES A SUBJECT IN MATHEMATICS is a kind of the UML

Figure 3.4: Domain diagram

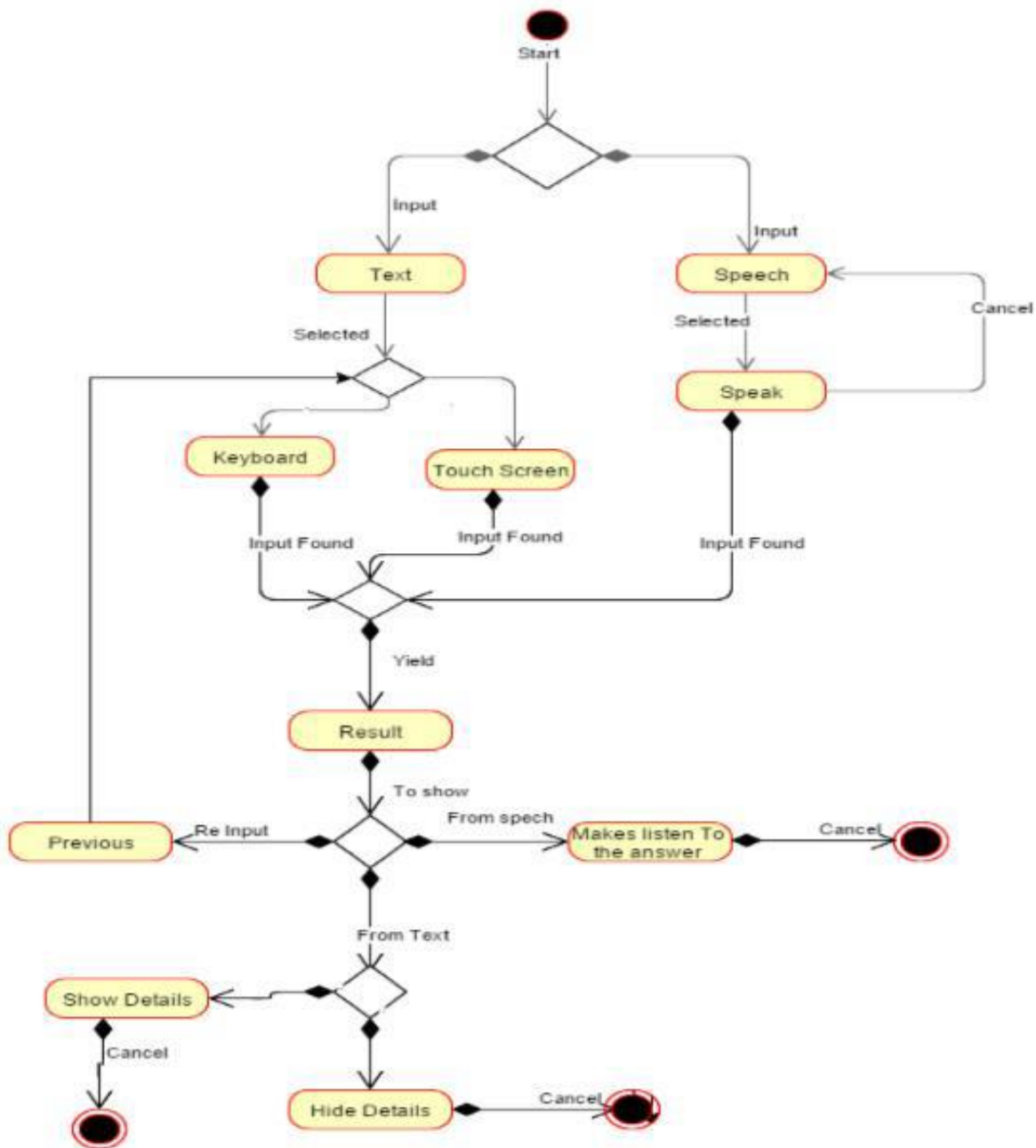


Figure 3.5: Activity diagram

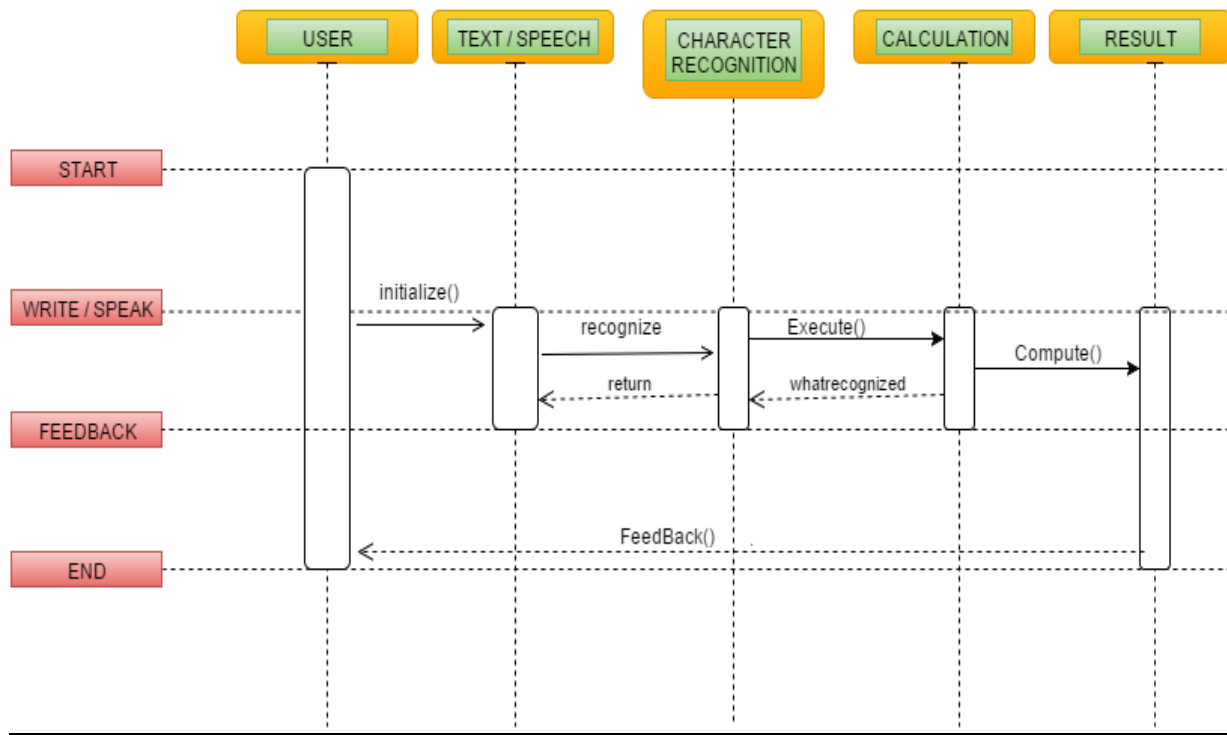


Figure 3.6: Sequence diagram

3.1.4.1. Participants in our sequence diagram

In sequence diagrams it is supposed to show or express

- Frames
- Life time
- Messages and Focus Control
- Combined Fragments
- Interaction Occurrences
- States
- Continuations
- Textual Annotation
- Tabular Notation

3.1.5. Main Success Scenarios

1- A user can insert a mathematic expression into the system to execute it by many ways:

- System should accept the input as a text :
 - ✓ Keyboard
 - ✓ Handwriting
- System should accept the input as a speech
- System should also accept the input as an image from camera and then it should recognize it

2- The user has the ability to request from the system to show the details of the scenario

- The system should display the details of the computation as outcome, which means if there are any mistakes in the system it should display where the error occurs

3- Also the user has the ability to see result of the calculation clearly by pushing equal button

- This can be the (=) button if the input was text from Keyboard
- This can be the (COMPUTE) button if the input was from touch screen
- This can be the (RECOGNIZE AND COMPUTE) button if the input was uploaded image from a storage.

4- The user has the choice to hide details or show it by pressing the button. In this case the application consider the choice of the user and apply it, for example if the choice is hide the details from me then it hides the info that requested before. System will not show the hide details without executing the equation.

5-The user can request the previous section. This is meant that the user may execute the application to run through speech, but latter on it is required to go back to previous page and then execute it to the text section, this button will be helpful for that case. The opposite one if the user requests the keyboard inside the text section but latter the user change his/her mind then this scenario is required.

6- The user can halt the application whenever is needed. It doesn't matter either it is calculating or just running without computation the task will be automatically exited and the application will be closed.

7- The admin can handle the system by controlling, changing, sharing and updating the system. In this case the admin is the producer and supervisor to manage it, it needs to go either in two ways to do that:

- The application can be updated, which means it can be added new activates or it can be replaced or removed an activity.
- The application framework interface cannot be changed by any user except the admin and most of the application parts will be maintainable.

3.1.6. Optical Character Recognition Scanning (OCRs)

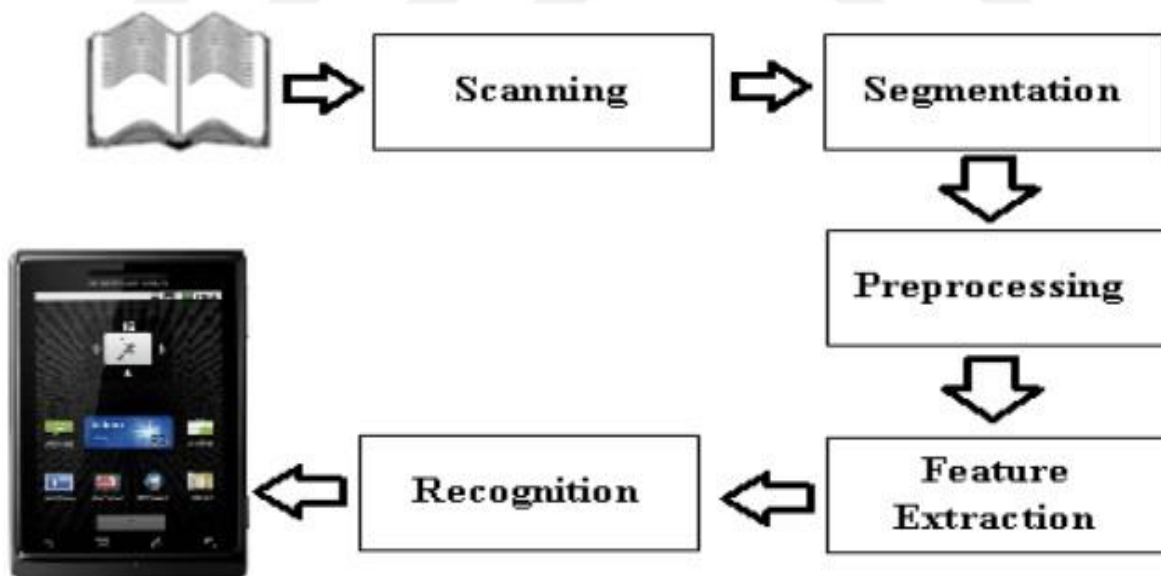


Figure 3.7: OCR scanning

4. DESIGN OVERVIEW

4.1. DESIGN & FRAMEWORK

This Applications contains four sections:

- ✓ Speech part
- ✓ Keyboard part
- ✓ Camera part
- ✓ Handwriting part

We implemented to combine all these one algorithm to solve into a one project, that's why this app is so useful.

4.1.1. Home Page



Figure 4.1: Home page1

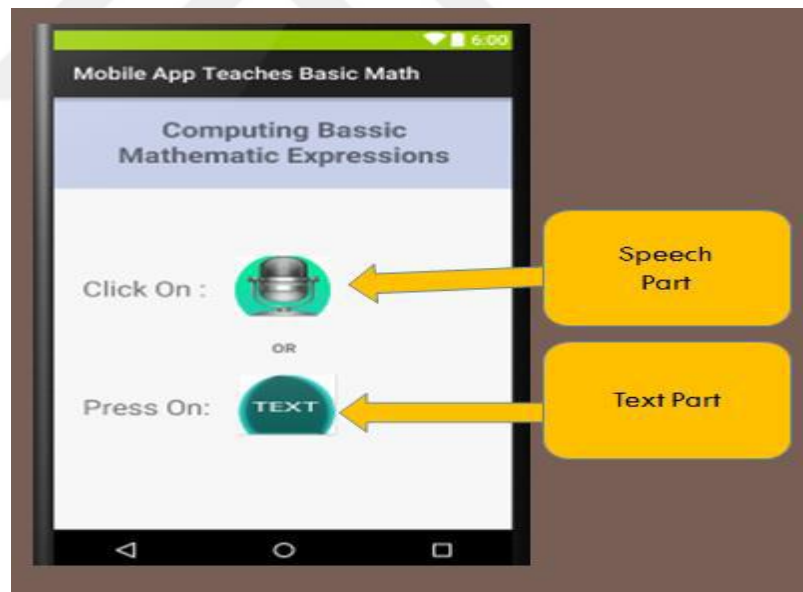


Figure 4.2: Home page2

As you can see in the home page of our project, we have two sections: (Section-A <Speech Part> and Section-B <Text Part>)

4.1.2. Speech Page

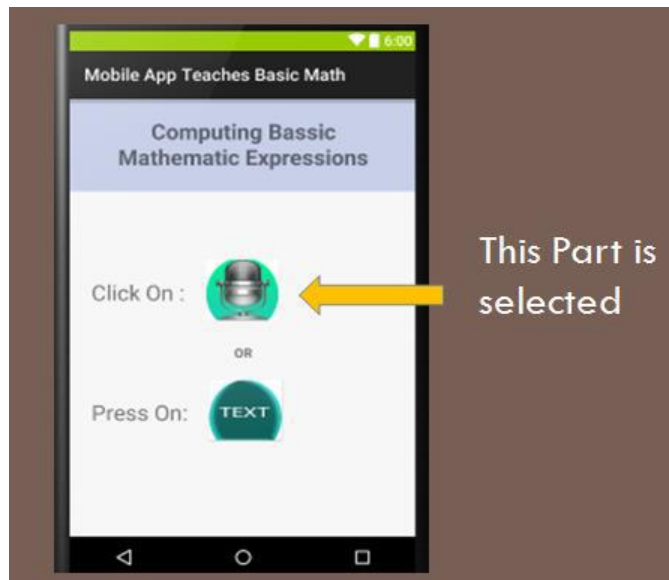


Figure 4.3: Home page3

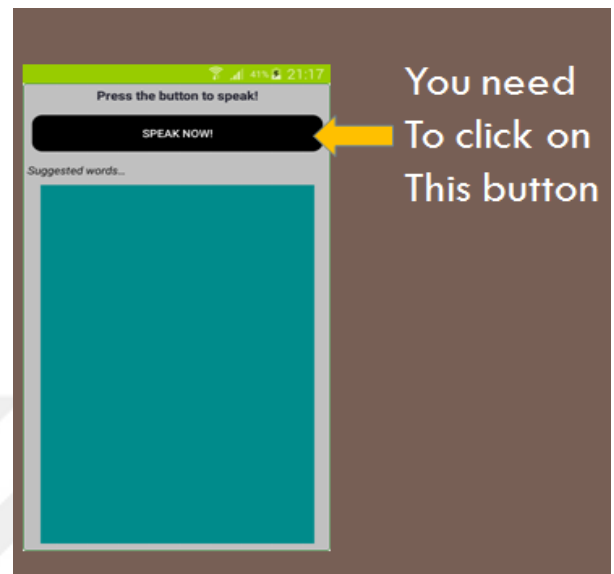


Figure 4.4: Speak Page

Before you click the button you need to check your INTERNET connection, if you don't have a connection, I suggest you to not use this part, but if you have it and after you click it, you will be able to speak to Google Speech and the system recognizes your speech.

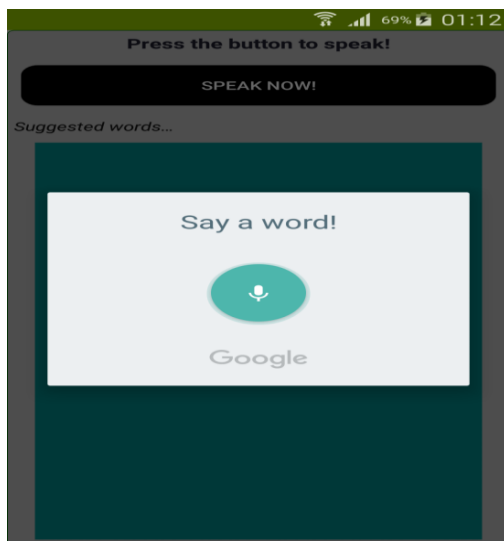


Figure 4.5: Voice page

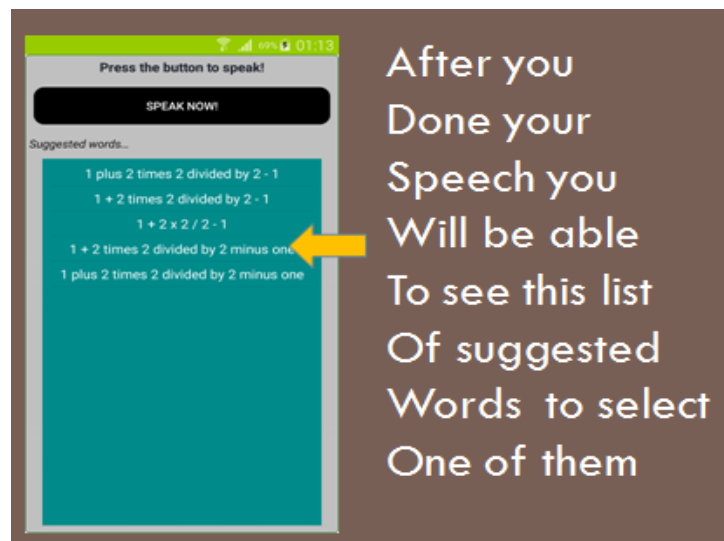


Figure 4.6: Suggest list words

So now you can select one word list from the suggested list word given below the button, once the user select a word it will show the result into another Activity Layout.

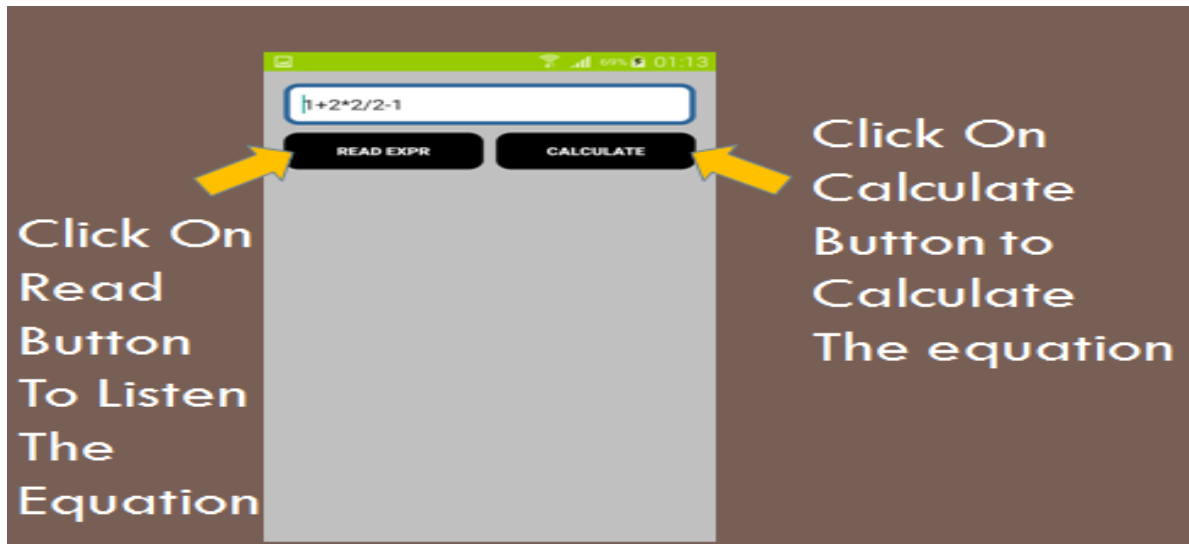


Figure 4.7: Read Expression

If you click READ EXPR button, the System reads the equation for the user, and also it displays the result as a Toast message, but if you click the CALCULATE button, the result will be visible (Not Hidden) to the user.

Finally you can see the result with the details explained step by step after the user clicked calculate button. The unique idea behind this project is providing the result with details like highlighting the process to make it more clear.

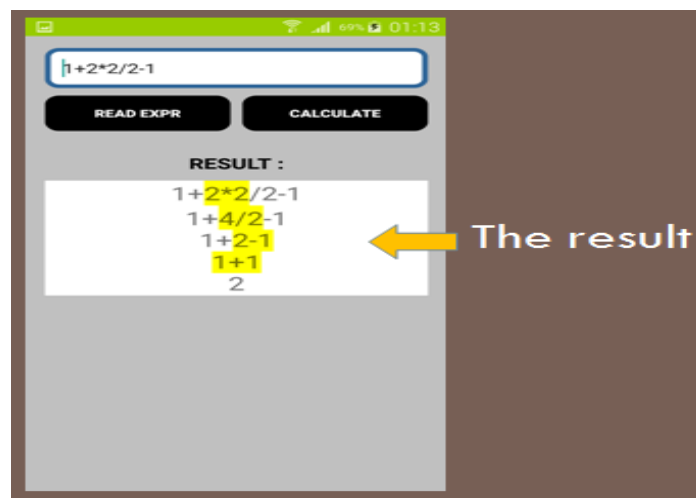


Figure 4.8: Calculated result display

4.1.3. Keyboard Page

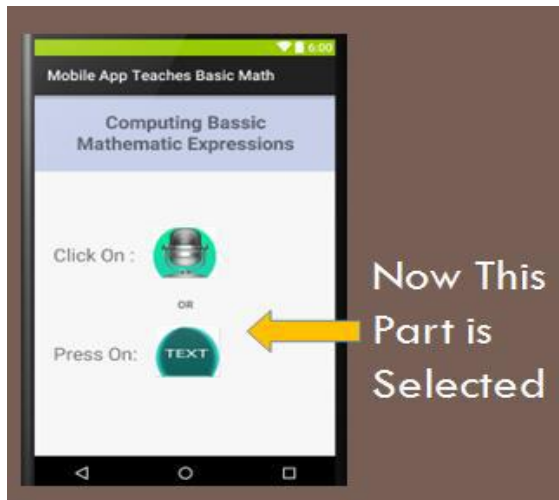


Figure 4.9: Home page4

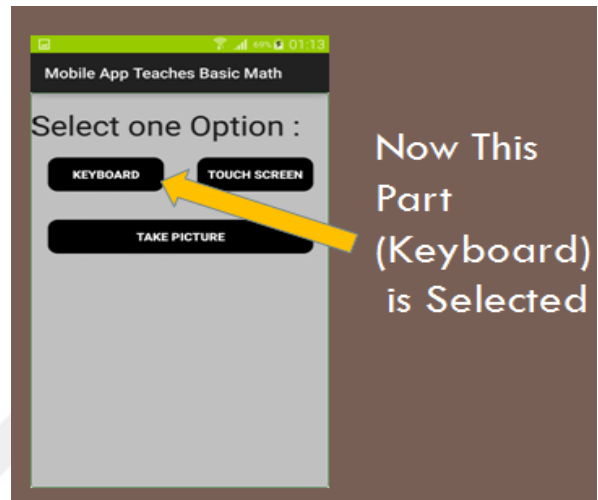


Figure 4.10: Menu page1

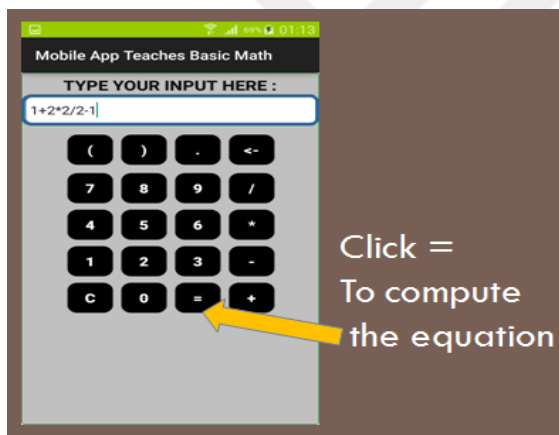


Figure 4.11: Keyboard page

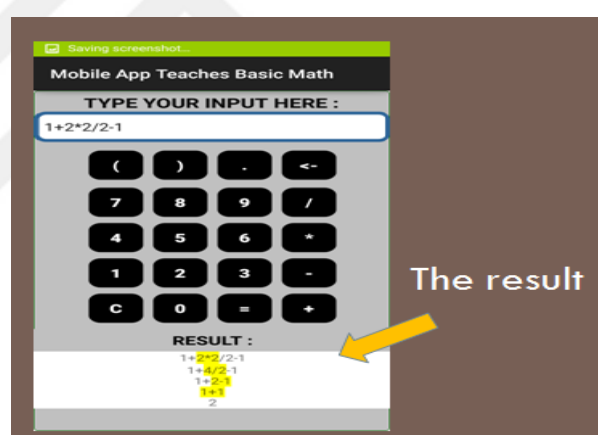


Figure 4.12: Keyboard page with result

4.1.4. Camera Page

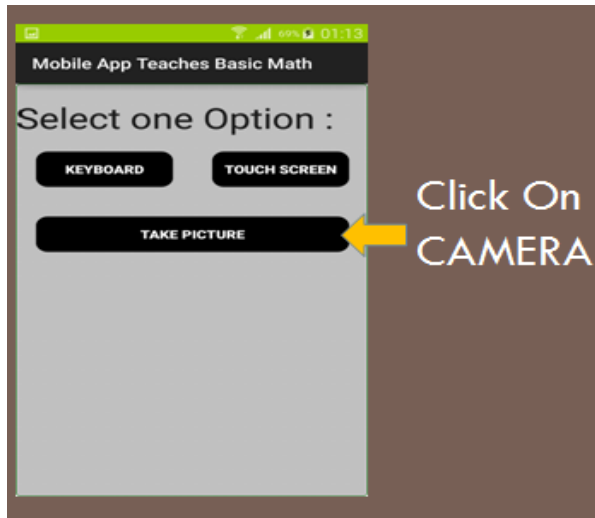


Figure 4.13: Menu page2



Figure 4.14: Ocr

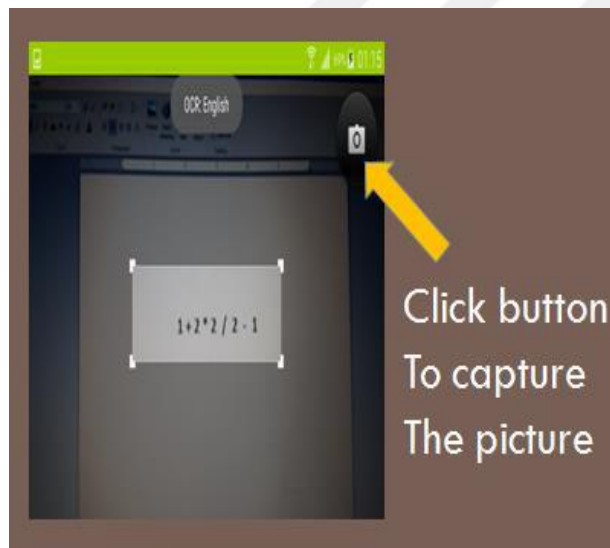


Figure 4.15: Camera page

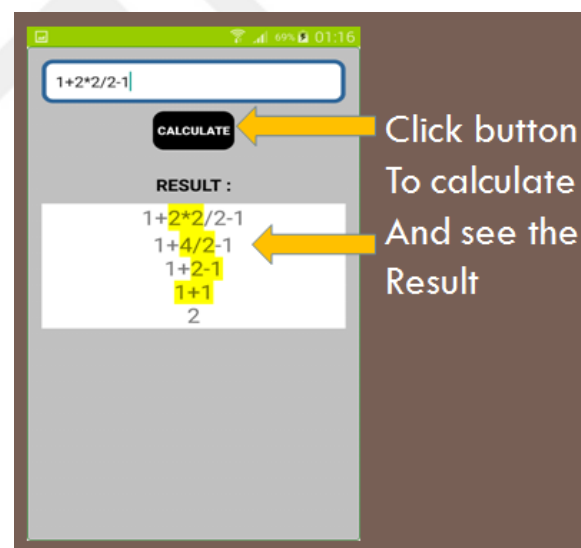


Figure 4.16: Camera calculated result

In the camera section, before you capture the image, you can prepare your equation in paper, but you have to write it clear and use good handwriting because the camera sense it may mix some of the digits according to their similar shapes and you may see some outputs that you didn't expect, to avoid those kind of results you need to print your equation more clear.

4.1.5. Handwriting Page

Figure 4.17: Menu page3

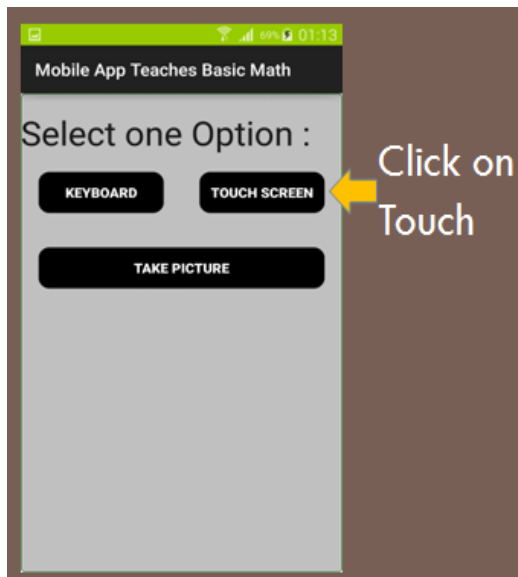
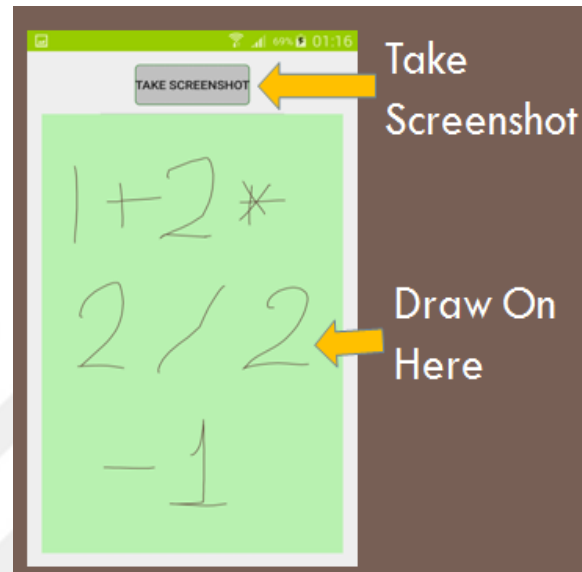


Figure 4.18: Handwriting page



5. CONCLUSION

This application document covers all kind of computing mathematic expressions in basic level, which can be helpful to save time occasions of the students in any level. Moreover, it's well advised that the user do have the basic knowledge about android usage and should have a device that allows to install android apps. The administrator is expected to be familiar with the interface of the android technology which supports the system.

Chart 5.1: Commentary

Commentary		
Scale	Technical Details	Materials Used
prepared: 8 months fixed: unlimited	Java, XML	Android Studio Smart phones Cables Computer

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APPENDIX A

PROJECT SOURCE CODE

```
private void calculate() { // this is highlighted flag sign cccccc ... into the paranthesis
//cccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
for (int r = 0; r < a.length; r++) { if (a[r] == ")") { String b1 = a[r]; String b2 = a[r - 1]; String
b3 = a[r - 2]; // sign String b4 = a[r - 3]; String b5 = a[r - 4]; Spannable W1 = new
SpannableString(b5); Spannable W2 = new SpannableString(b4); Spannable W3 = new
SpannableString(b3); // sign Spannable W4 = new SpannableString(b2); Spannable W5 = new
SpannableString(b1); W1.setSpan(new BackgroundColorSpan(Color.YELLOW), 0, 1,
Spannable.SPAN_EXCLUSIVE_EXCLUSIVE); W2.setSpan(new
BackgroundColorSpan(Color.YELLOW), 0, 1,
Spannable.SPAN_EXCLUSIVE_EXCLUSIVE); W3.setSpan(new
BackgroundColorSpan(Color.YELLOW), 0, 1,
Spannable.SPAN_EXCLUSIVE_EXCLUSIVE); W4.setSpan(new
BackgroundColorSpan(Color.YELLOW), 0, 1,
Spannable.SPAN_EXCLUSIVE_EXCLUSIVE); W5.setSpan(new
BackgroundColorSpan(Color.YELLOW), 0, 1,
Spannable.SPAN_EXCLUSIVE_EXCLUSIVE); txtRes.append(W1); txtRes.append(W2);
txtRes.append(W3); txtRes.append(W4); txtRes.append(W5);
```