

FINAL YEAR PROJECT REPORT ON IMPLEMENTATION OF AUGMENTED REALITY

BY

**SALMA AKTER
ID: 151-15-5314**

**SWARNALI SIKDER
ID: 151-15-5243**

This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering.

Supervised By

DR. FERNAZ NARIN NUR
Assistant Professor
Department of CSE
Daffodil International University

Co-Supervised By

NAZMUN NESSA MOON
Assistant Professor
Department of CSE
Daffodil International University



**DAFFODIL INTERNATIONAL UNIVERSITY
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APPROVAL

This Project titled “**IMPLEMENTATION OF AUGMENTED REALITY AN ANDROID APP FOR KIDS**”, submitted by **SALMA AKTER (151-15-5314)** and **SWARNALI SIKDER (151-15-5243)** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 10 December 2018.

BOARD OF EXAMINERS

Dr. Syed Akhter Hossain
Professor and Head

Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Chairman

Narayan Ranjan Chakraborty
Assistant Professor

Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner

Md. Tarek Habib
Assistant Professor

Department of CSE
Faculty of Science & Information Technology
Daffodil International University

Internal Examiner

Dr. Mohammad Shorif Uddin
Professor

Department of Computer Science and Engineering
Jahangirnagar University

External Examiner

DECLARATION

I hereby declare that, this project has been done by me under the supervision of **Dr. Fernaz Narin Nur, Assistant Professor, Department of CSE** in Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:

Fernaz Narin Nur
Assistant Professor
Department of CSE
Daffodil International University

Co-Supervised by:

Nazmun Nessa Moon
Assistant Professor
Department of CSE
Daffodil International University

Submitted by:

Salma Akter
ID: 151-15-5314
Department of CSE
Daffodil International University

Swarnali Sikder
ID: 151-15-5243
Department of CSE
Daffodil International University

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ABSTRACT

Our project title “kiddie: is an augmented reality application for Bangladeshi kid” which provides better and playful way to learn Bengali alphabets. In this application we tried to present a newer way of learning instead of traditional ones for the children of age 3 to 5 in Bangladesh. Although there are several ways to introduce a kids with Bengali alphabet but with this application they can easily get acquaintance with the alphabet in really very short amount of time. Nowadays almost every family in Bangladesh own at least one smartphone. The children of every country is very much attach to smartphones and also get easy access to their parent’s smartphones for playing games or watching cartoon while they become inattentive when said/told to study.by this application a kid can easily learn the alphabet with much eagerness and without annoying anyone. The most attractive aspects of this project is it will not only show the related object but also an interactive one. Another important aspect of this project is it will also show a full sentence consisting of the related alphabet.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The Bengali is the 7th most spoken native language in the world where around 250-300 million people communicate in this language [1]. It is one of the very important languages with its enriched literature. Traditional methods of education are becoming increasingly digitized and are being driven by technology innovations. In fact, the education technology industry (so-called EdTech) is to reach \$252 billion by 2020, growing at a 17% annual rate [2]. Where augmented reality plays an important role with guarantee that more than one billion users expected to join the trend by 2020[2]. This application has the potential to replace paper textbooks, physical models, posters, printed manuals, etc. It offers portable and less expensive learning materials. As a result, education becomes more accessible and mobile. It's a faster and more effective learning application which has vast opportunities to diversify and shake up boring lessons into Interactive lessons. So, by using this application our kids can find their pre-schooling more joyful.

1.2 Motivation

Motivation help's one to gain success. Without this, no one can achieve anything. So while working on our project we also have to be motivated towards our goals and these are some factors what pushes us to achieve our goals:

- Lack of adequate material except traditional methods to learn this language in early childhood.
- Lack of present's presence in language education due to increased number of working women.
- Augmented reality can make the learning process active, efficient, joyful and meaningful.
- Augmented reality can make the educational experience fun for a young and restless group of people
- Assist children achieve creative development in different areas.

- The Augmented Reality (AR) technology increases the user's sensory perception where text, video and 3D models can be overlaid all together onto a single image and it helps children to learn faster [3].
- No special equipment is required.
- Accessible learning materials: anytime, anywhere.
- Higher student engagement and interest.

1.3 Objective

We want to make an application for kids where our main objective is to provide an interesting field for kids to learn Bengali language with fun. We think it's really effective for them to feel more curiosity about our mother language.

The other objective s are given below:

- Provide more information with pictures so that they use it and also learn.
- Motivate the children for learn Bengali.
- Add animation with letters make the apps more interesting.
- Provide rhymes along with that it will be funny and informative to them.
- Being a device based system it will be easier to handle for kids.

1.4 Expected Outcome

When our application publish what will be customer's expectations that's called expected outcome of our application. We really believe that the kids (our main customer s are kid) are pleased to find this type of fun with new version, because it is new for most of the children and they like newly arrived things.

So the expected outcome s are discussed below:

- Kids who have less interest in Bengali, especially in English medium schools students, there interest can be grown through this application.
- Kids who are addicted to smartphone game, they can learn to learn with their phone.
- Children's are benefitted from this because it is educational application.
- The village children, who have less access to internet, so they find a new era from the app.

1.5 Report layout:

In our report, we arrange other discussion in several chapters, which are:

- a. In chapter 2 we discuss background of our application, how we plan our application and why we chose this.
- b. In chapter 3 we discuss requirements specification for our project. In this chapter the requirements for implementation presented in detail.
- c. In chapter 4 system design specifications and how the system is designed like front end design, back end design is allowed.
- d. In chapter 5 is based on system implementation and testing, where we find any bug about our application.
- e. Chapter 6 is our final chapter, where we focus future scope and conclusions about our application.

CHAPTER 2

BACKGROUND

2.1 Introduction

In Bangladesh child upbringing patterns are varied. Human beings need the most utmost attention and care in early childhood because this time is the foundation of all later leaning.in this period of life they need extra care and need to do activities that will prepare them to succeed in school life. Keeping it in our mind that children are the future of a nation we build this application focuses on "learning through play" by providing a hands-on, interactive atmosphere where children learn about alphabets through playing. It will help them achieve standard quality pre-school education in an affectionate environment with both parents and make them more creative with higher IQ scores and better school achievement.

2.2 Related Works

For building this application we did several related work and also did some comparison between similar applications with same type of idea. In order to generate some new idea from that existed idea. While doing related work we find out some extra features that need to be added to make this application more useful to the children compared to the existed one. There are several applications based on augmented reality but most of them are for English alphabets. Although there are also some application are available for Bengali alphabets but those are not so much enrich that a child needs specially the Bangladeshi kids.

“Magic world”[9] Bangla is augmented reality base app for learning kids Bengali Alphabets. Although this app is similar like our app but there is also some features that we add in our application which is not included in their App.

The app name is ABC augmented reality[4] made by the Canadian developers which released on 27 July 2016. This app was built with the aim to helping kids learning ABC alphabet from A to Z in a new way with augmented reality technology.

The AR kids learning app[5] made by Icelab solutions pvt Ltd which is also for learning English Alphabet

AR Flashcards[6] a free app which provides a beautiful way to learn animal alphabets. The app pronounces the letter and name of the animal when tapped on .

Bornomala[7] another free App which also shows Alphabets including human voice, image of object relating each alphabet for teaching kids Bengali Alphabets in a better way .

Hatekhor[8] which is an app to read and write Bangla Alphabet with animation, interactivity and audio for learning Bengali alphabet with their correct pronunciation.

2.3 Comparative Studies

There are several app available regarding this topic. Some comparative study that we did while doing related work are stated below:

- “Hatekhor”[8] App which is made by shurjomukhi limited is good and very useful for kids but in our app we use augmented reality for giving children a realistic view of an object relating each alphabet by showing animated 3D image. This type of application isn't available in Bangladesh this will be very much useful for Bangladeshi kid.
- In our application there will be interactive animated object with its name by which kids can learn faster.
- There will be a full sentence consisting of the related Alphabet which will help kids to sentence making and they can easily recite it like poem. This type of feature never made before in Bangladesh.
- In our app we use 3D animated image and human voice to make kids more attentive to their lesson.

After done related work, we did several comparative studies to take the decision what should we do for making our application more unique. While doing comparative study we compare our idea to several existed idea and we find out that our idea is unique because there are several app available in Bangladesh for learning Bengali alphabet. But they don't use augmented reality. As we are working with Bengali Alphabets using augmented reality that's why we are going to talk about Bengali Alphabet learning app.

2.4 Scope of the Problem

Scope of the problem: In scope of the problem, we will discuss what type of problem user can define and what the solution is. Previously we described what will happen after publishing this application. Now some questions arise which will helpful to understand our application scopes of the problem. The question s are given below:

- How kids are interested in educational learning instead of gaming or watching cartoons?
- How they can learn with fun?
- What types of things a kids should know for a preschool children?
- How Village children are benefited by this app?

Now if we can find the answer of the question we can easily know the scope of the problem. So the discussion is given below:

- We know, now a days, children are very curious about device. And smartphone is an easily accessible to everyone. So it's the best place to learn something good or spoil child brain with bad site. So this app will help them to learn something educational.
- This application will be interesting to them because it's only app for preschoolers. And it is also interesting and informative. So they learn with fun.
- For a preschool children knowing letter is a mandatory things. So if they learn letter in augmented reality, they can learn it so quickly. Bangladesh is such a country where internet is not available in village. So Village children are not entertained with

internet, so they can find more interest in this, and they can benefited this app because there need no internet connection for it.

2.5 Challenges

When we take anything as a challenge, the output of this work will be more accurate. Challenge of a work create more opportunities.

The challenge of our application is given below:

- Our first challenge is to make this app more interesting for kid, why they download this.
- To knowing about this app so that they can download it.
- One of the greatest challenge is to make this app available to everywhere including the rural areas. The children of the village, they don't know about augmented reality, or how this app running.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

It refers to such model which helps to understand whole idea of an application. Our application is based on the kids and our business process model defined how the system is running. In business process model is the summary of the whole work. Once can easily realize to see it at a glance. First we want to mention why business process model is important for our application.so the discussion is given below:

Why business process model? :

1. Build our idea clear to all so that they can understand everything easily.
2. The admin can find proper instructions to do what next.
3. User can use it without confusion.
4. Easy to handle everything.
5. Ensure a proper starting and ending.

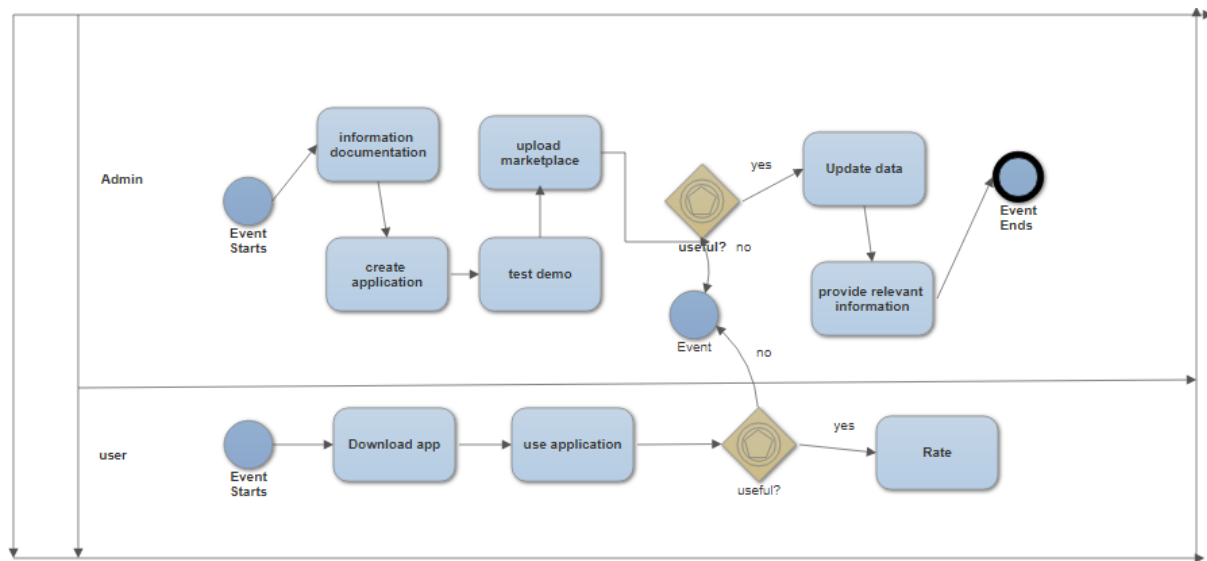


Figure 3.1: Business processing model

Figure 3.1 describe business process model of our application. Here first event for the admin who develop the application. For developing he should collect relevant information about the application. After collecting information he implementing his idea. The next rectangular box create application define the implementation part. After creating first he collects some user for testing the application to realize how much effective this app for kids. After testing upload it in marketplace. If everything goes well then well. Otherwise Admin update implementation to provide relevant information. On the other hand user download the application form marketplace and install it. Then use it. If they satisfy with the service then rate it. If the rating is not good then Admin have to update it.

3.2 Requirement collection and analysis

Initial requirements:

The initial requirements involves the system requirements for this application. These are given below:

- The system must needs a device which has a camera. Because for the application there need to open a camera.
- The system needs a document where the image have to store for detecting.

- The system should be easy to use because it is made for preschoolers they are the innocent user of the application.

User/Admin requirements:

The main purpose of the project is to increase kid attention to learn something interesting. For implementing this requirements are given below:

- It's an android based application so it has to be ensured that user use a smartphone.
- Users also will have known the use of the application.
- When the application runs the camera is automatically open, and detect an image, so these images are also initial requirements.
- Then it detects the image and virtually show an object related to the image so we have to collect the model of the object.
- We need to verify the image model for knowing the rank of the model.

Software requirements:

For implementing the application developer use unity and it's the main software for development. And for rating the image "www.vuforia.com" site is used. In user interface there needs only the installed apps.

Hardware Requirements:

Basically this application is android based. So for using this application users need a smartphone. And there use camera.

3.3 Use Case Modeling and description

In this use case model, we define some methodology in system to specify, identify and organize system requirement and also gives a proper view of the entire system. It also describes the goals of the users, the interaction between the users and the system with required behavior for satisfying these goals. A use case diagram defines four Components. Boundary, which defines the system of interest in relation to the world around it. Actors, usually individuals involved with the system defined according to their system. Use cases, which the specific roles are played by the actors within and around the system. Relationship

between and among the actors and use-cases. Why use -case model in our application? We Use-Case diagram for graphically depict the entire system to simplify communications.

- Some reason for using use-case model in our application are stated below:
- Specify the context of the entire system.
- Capture the requirement of the system.
- Drive implementation and generate test cases.

The Use Case model that we used in our project given below:

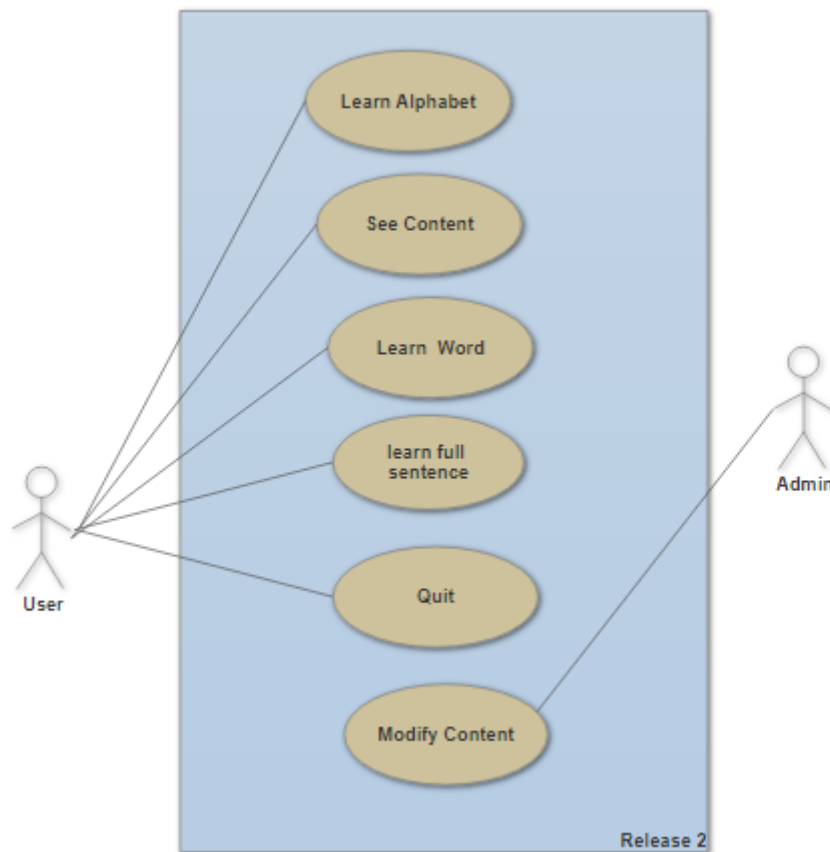


Figure 3.2: Use Case Model

In fig-3.2, here we define user and admin panel. So in this use case diagram, a user can learn alphabet see the app content, learn the word with complete full sentence related to the Alphabet and also quit. In admin panel, admin can update/modify the content of the app if it's necessary. This Use Case diagram is very much useful to understand the entire process. By this diagram we try to specify who is independent and who is dependent for making this section clear precisely.

3.4 Logical Data Model

Logical data model or ERD is the model where the data is modeled in a domain. The contain entities, and there relationship is presented with the data types and key value. So this model focus the main task and which task is related to other.

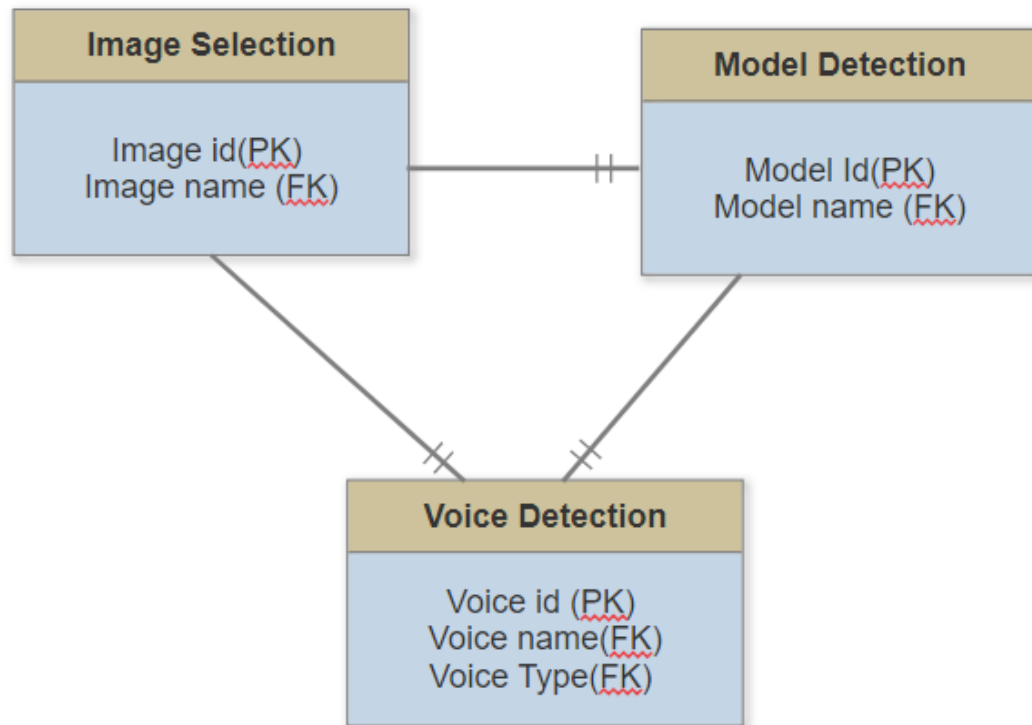


Figure 3.3: Logistic Data Model

The figure 3.3 describe the logical data model. In our application the relationship between entities to entity is one to one, because while show one picture there will be one model with one voice, so all entities are connected with one to one relationship. The image selection has image id which is ok and image name which is fk. Also model detection has model id and model name. Similarly voice detection has id name and one extra which is type.

3.5 Design Requirements

Design requirement is one of the most important thing because if we specify the requirements of design precisely. It will helps further Processing including project managing, technical development and system testify. Poor design requirement lead work in vain.in Figure 3.4

here we define design requirement by which everyone can understand what component we use to develop our system.

Why design requirement is necessary for our system?

Proper design requirement increases working process because it collect all the information of the system of the system properly. By proper designing requirement we satisfy our project specification precisely. While working on our project we face some problem related to requirement and we solve it by analyzing our design requirement which is given below:

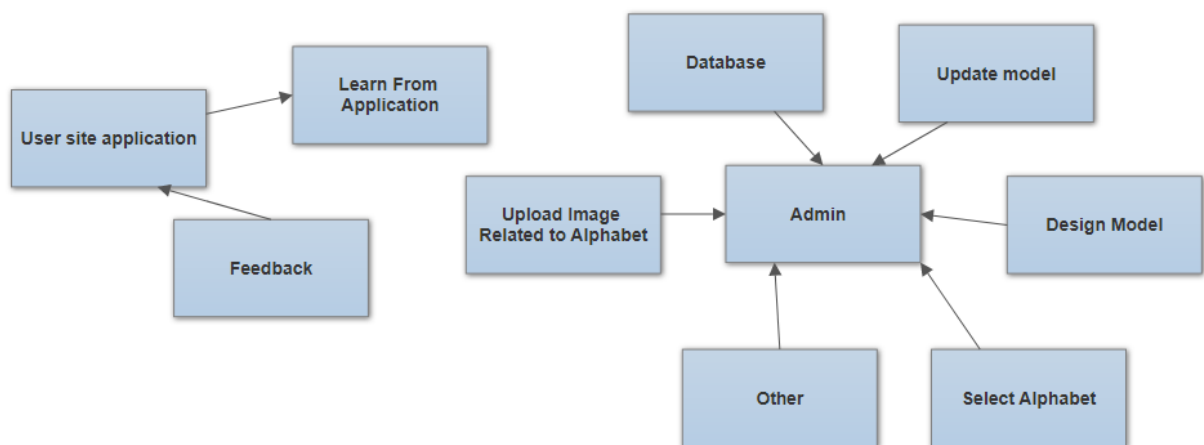


Figure 3.4: Design Requirements

In figure 3.4. Figure in fig-3.4 we specify design requirement by which we define database, design model, update model, select Alphabet, upload image related to Alphabet, user site application, learn from application, feedback those are the requirement for design the application. We just design the requirements so that we can easily find out the required component to complete the application. This designing requirement help users to collect information about the application which is one of the most important thing for application development.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-End Design (UI)

Front end is the part a user sees and directly interacts with. as front end design deals with interface and presentation of information. That's why we mainly focus on aesthetics so that we maintain user interests for our application. Because appearance is the best way to keep users attention by displaying the information efficiently. So that user can easily well understand what the application talks about. By using successful front end design and strategy of development we try to give best initial outlook of our android application. For front end design we basically used the xml file in where we use weight and weight sum to make the application more compatible to run whatever the screen size is. We also use some other design to make the application more user-friendly.

Is front end design make the system user friendly?

Yes, Front end design plays the vital role to make the system more user- friendly. A good front end design gives a positive impression about the application and attract the users by maintaining their interest. That's why front -end design is the most important part of an application.



(a)



(b)



(c)

Fig 4.1: Front end Design

In given figure 4.1 we show some of our design. For making Front end Design more interactive and user friendly we put animation, beautiful clear image and also human voice. Thus we made our front end design.

4.2 Back-end Design

What end users doesn't see but what makes the site run is called the back end. Any application is a sum of layers such as structure, design, content and functionality like that back end also consists of server, database and some server side application. As Back end Design handles behind the scenes functionality it is known as the brain of a site.it gives information from database without any direct interaction with the user. In fig 4.2 below, we specify part of Back end Design that is used in our application.

Function:

- Database creation, integration, management e.g.vuforia.
- Programming language java --the language c# and compiler visual studio --backup and restore
- Technology --and unity3D.

sonaliDatabase [Edit Name](#)

Type: Device

Targets (11)

Add Target

Download Database (All)

☐ Target Name	Type	Rating	Status ▾	Date Modified
☐ ou	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ oo	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ oi	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ e	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ hree	Single Image	★★★★★	Active	Oct 11, 2018 17:09
☐ uu	Single Image	★★★★★	Active	Oct 11, 2018 17:09

Fig: 4.2: Back-end Design

In fig: 4.2 we used vuforia for database management which is not visible to users. Using vuforia we target an Alphabet for find out the rating after creating the alphabet in Photoshop so that we can make the Alphabet detectable by the camera. Thus, we made database design Back end Design important than front end design?? Front end and Back end are both design are part and parcel of any application with equal importance. Both plays an important role for making an application more successful and user friendly. Front end Design helps to look the application more attractive and user friendly while Back end make the Front end works properly.

4.3 Interaction Design and UX

Interaction Design is a part of user experience design. Mainly Interaction Design is very important because it creates interaction between user and products. It is a design which enables to the user to achieve their target to fulfill the uses of the product in a most possible way. UX design is the depiction of the experience of using a product that experience is almost about the interaction between product and user. So in this section we want to focus about interaction design. Figure 4.3 is about the most possible interaction design of our application. [Image 50.jpg] As our application is based on augmented reality so while it is

running the camera is opened. User have to select target image. Then it detects the image and the object model is arisen. When touching the object a voice is pronounced. Thus children learn alphabet and word in a fascinating way.

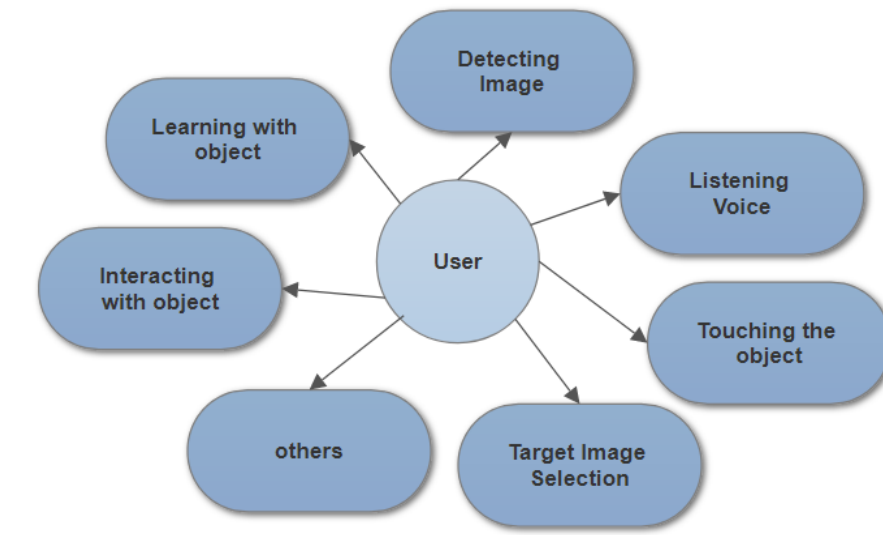


Fig 4.3: Interaction Design Sample

Why we are using interaction design and UX design in our application?

User experience involves the whole diagram of feeling and experience of a user during using the product. That's why it's necessary to talk over these topic. It also helps the admin to design the system more attractive to the user because within it user's feedback is expressed. A system is fizzled out if user does not take it warmly. So for better results of the application we keep our mind to design UX and interaction.

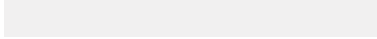
The process we use to design the interface:

- We use several process, main of them are given below:
- User and task analysis.
- Graphical user interface design.
- Software maintain.
- Usability testing.
- Prototyping.

We use these processes to make our interface. It's a little bit difficult for us, but we make it in our interest.

4.4 Implementation Requirements

For implementing our application we have to collect some extra information. Which includes the interest of children in learning, how much time required to learn, how much children s are connected with smartphone, how much they access internet, the market place value, uploading image, model collection, voice record, and so on. Thus we finally finish our work.

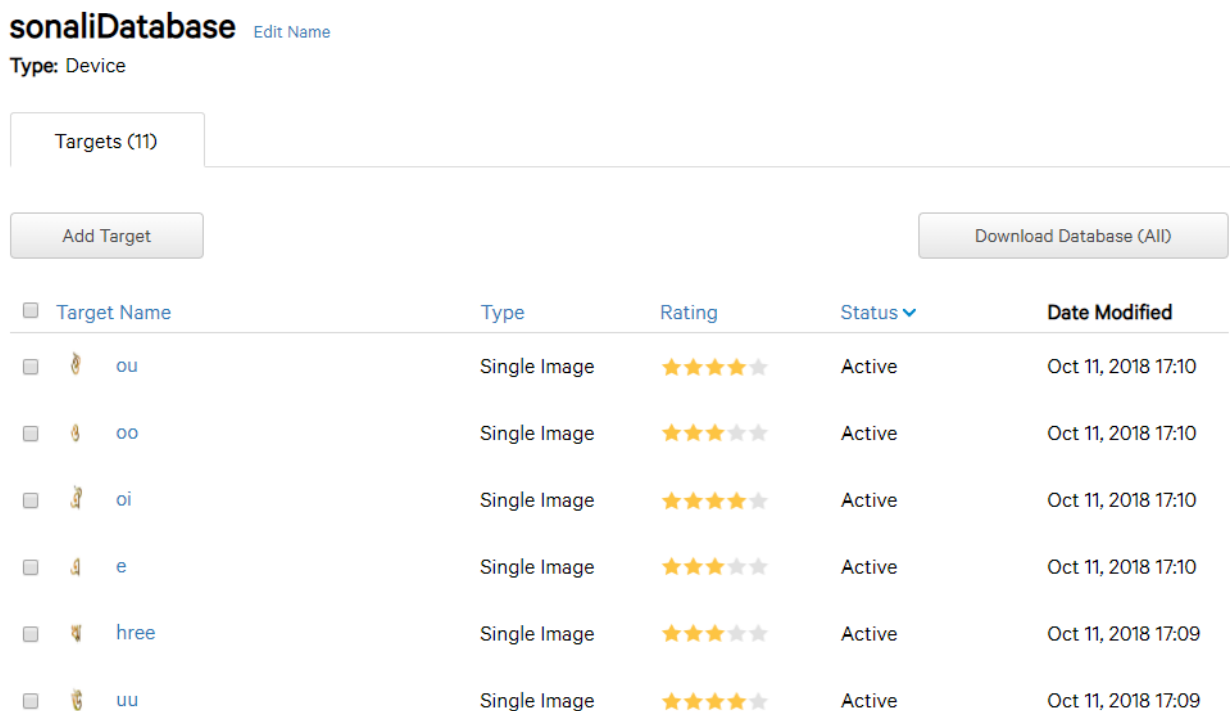


CHAPTER 5

IMPLEMENTATION AND TESTING

5.1: Implementation End database

We used vuforia for database management that the user can't see. We used vuforia for the rating and also used Photoshop to make the alphabet. After creating the alphabet we find out the rating of each alphabet. In figure 5.1 we define how we implement the database.



The screenshot shows a web interface for a database named "sonaliDatabase". Below the name is a link "Edit Name" and a label "Type: Device". There are two buttons: "Add Target" and "Download Database (All)". Below these is a table with the following data:

☐ Target Name	Type	Rating	Status ▾	Date Modified
☐ ou	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ oo	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ oi	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ e	Single Image	★★★★★	Active	Oct 11, 2018 17:10
☐ hree	Single Image	★★★★★	Active	Oct 11, 2018 17:09
☐ uu	Single Image	★★★★★	Active	Oct 11, 2018 17:09

Fig 5.1: Implementation of Database

Installation Requirement

1. Android studio
- 2 Photoshop
3. Unity
4. Java

5.2 Implementation of front-end design

Implementation of front end design mainly based on the xml file. We also used several things for the implementation. We not only use java code to link the front and back end but also various function. Implementation of Front end Design is based on various things for Implement. Those Front end Design We needed to apply:

- Java code
- Design xml file
- Photoshop for design Alphabet
- Unity in order to make our front end design work and also make more attractive we also did various things.

5.3 Implementation of interactions

After defining general architecture for interaction objects, we include some unique feature to interact our system. For interaction our system we use java code with the xml file we make interaction to the database. We make various function in our app for the implementation interaction. For implementation of interactions we use the following process .make connection between java codes with the xml file .make xml file proper weight. .fixed screen size for all the device. .create database for interaction implementation.

5.4 Testing Implementation

Implementation is the process of turning strategies and plans into actions to accomplish objectives and goals. Before implement, we completed our plan and objectives too. There are many tools available for testing android applications. For testing implementation, we use the following process. Testing implementation by some user getting feedback. Test by various software we completed our testing process by implementing the above process and user gave us positive feedback about this system. Hope user will have satisfied by this system.

5.5 Test Results and Reports

In order to reflect testing results in a formal way test report is needed so that result estimation process becomes quick. It is a document where the records data obtained from an evaluation experiment kept in an organized manner. 5.1 Implementation of Database we used vuforia for database management that the user can't see. We used vuforia for the rating and also used Photoshop to make the alphabet. After creating the alphabet we find out the rating of each alphabet.

Table 5.5.1: Integration Test

Test Case ID	Test Case Objective	Test Case Description	Expected Result
1	Check the interface link between app and camera	Click the app and enter into camera	To be directed to the camera
2	Check the interface link between camera and object	From detection of the object provide animation with sound(Rhymes)	Selected object shows the proper outcome

Table 5.5.2: System Test

Functions	Description	% TC's Execute	% TC Passed	TC'S Pending	Remark
Alphabet recognition	Check the alphabet is detected	100%	100%	0	
Showing target animation	Check the targeted object displaying properly	100%	100%	0	
Playing target audio	Check the targeted audio playing properly	100%	100%	0	

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

While working on this project we learn and experience a lot of things which was very amazing. This project took us through a various phase of project development that we didn't know before and helps us to build an android app called kiddie which is especially for Bangladesh children. This kind of learning app using augmented reality didn't made before although the manual app is available in Bangladesh. Children in Bangladesh are not getting exposure to the Bengali language compared to English in their early childhood. This "kiddie" app can help to bridge the gap. This app is children friendly as the children are learning in a playful way using augmented reality and it is better than taught traditionally. This app will be helpful for kids for getting familiar with their native Bengali alphabets with a significant amount of improvement compared to the traditional way without parental supervision. While developing this project we not only learn various new development technologies but we implement appropriately in our project. We are very thankful to our supervisor who help us to build this project and we feel so proud to work with them.

6.2 Scope for Further Developments

As we are making augmented reality apps, we have to develop it day by day with more new features so that kids find it more interesting and make them more eager to learn. In future we will try to add new features as well as many improvement.

There are some features that we are going to develop in future stated below:

- An app with interactive animation.
- New 3D models will be added.
- We want to work with image processing so that the user use this application on any Bengali Alphabet book instead of pdf.

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APPENDIX

Appendix: project reflection:

The purpose of this appendix is to provide an introduction to project reflection. Single project handle was a challenging and enjoyable experience typical of the course as a whole. I had little exposure to single work at university.

The experience taught me that how to make planning and crafting responses takes a longer time. The extensive effort required was ultimately a good thing. When working alone, I can end up with a result that is identical to my initial plans.

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