UMM ALQURA UNIVERSITY
PROPOSAL FOR FINAL YEAR PROJECT

IN CS/CE/IS

< LIVE CITY'S HISTORY REPRESENTING APPLICATION FOR SMART PHONE USING AGUMENTED REALITY TECHNOLOGY >

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Team Logo

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ABSTRACT

Interest in augmented reality has been taking a huge place in technology recently. Many systems, applications and games are being developed around the world in many different purposes. To accommodate the evolution of this technology, and since the lack of museums in our country; we have chosen to implement a smart phone application using the augmented reality technology that bring a hybrid world of virtual characters and items about the city placed in our real world.

For this project, an android augmented reality based application is created. The application main function is to bring a 3D virtual modelling and animation of our city into our real world, via the camera augmented in users' smart phones.

This application is not a touring advisor. The main purpose of this application is to expand the knowledge of the past about the cities for users (citizens/visitors) in an enjoyable, exciting, beautiful and easy to understand way.

FIELD OF STUDY

Augmented reality and artificial intelligent.

1. PROJECT BACKGROUND

Augmented reality technology is as the bridge that gapped between our real world and the virtual world; which make people more interested and excited about it. It also represents any information in an enjoyable and attractive way, which make it more understandable, clear, and easy to remember. One more big advantage is that augmented reality can accept different types of inputs such as GPS coordination details, different markers, and image recognition. Many application in a wide variety of fields including entertainment, education, marketing, medicine, manufacturing and more have been developed through augmented reality around the world.

In our country, Saudi Arabia, we have a huge history and important ones, including lots of Islamic events; but unfortunately only some are represented; since we only have few and not large museums.

For this application, the aim is to implement the important historical events of the cities in our country in an attractive way using 3D modelling and animation, connected to an audio describing the events. After that, they will be combined with the locations of the historical events.

1.1 Related Works:

There are lots of augmented reality based applications, some of them are used in museums with some features such as animating their antiques and providing more information and details. A close idea to our application is ARIS.

ARIS is an open-source platform for creating augmented reality based events for iOS devices. The events are designed in their website. Users' starts designing by selecting the location of the event using the GPS, then users can add different quests, conversations or media. After that, the indivisibles can download the event in the iOS app to explore it. ARIS can be used for verity of purposes, such as providing old images of a specific location, guiding people in a tour, and also for education.

1.2 Novelty of Our Application:

What distinguishes our application from other ones is the field of use. The application will function as a live museum of the whole city. All the 3D modelling and animation will be already modelled and saved in the application server; after they have been connected to their location with their specific dates.

If users were in the location of historical events, a notification will be send to users. Then, the application should display a menu of the historical events sorted by the dates of the events. In this time, user can choose which one to view using the camera augmented. As an example, if user was in the holy mosque area in Makkah, then the menu should include the following:

- Story of Building the holy Ka'bah; in the period of Prophet Ibrahim.
- Story of Zamzam water, in the Period of Prophet Ibrahim.
- Story of the owners of elephant, in the year 570.

In addition to the 3D modelling, there will be an audio describing the events, and telling the story of it. The description is provided in different Arabic language accents; such as western Arabic accent (Hejazi).

2. PROJECT SCOPE

For this project, the application is being developed for android operating system in smart phones. It aims to represent the historical events of the cities for users using the 3D modelling combined with the augmented reality technology. It will allow users to view the virtual world of the history event of a particular location by raising up the smartphone camera, where a digital world will be displaying upon the real world. The application will be implemented in Arabic language only. As a start, we will be covering one of the Islamic events field; the Islamic Battles.

3. PROJECT DESCRIPTION

The project will be divided to three main parts: 3D virtual modelling, augmented reality technology including GPS technology and android operating system programming.

First of all, the historical event should be clearly determined. Then it should be modeled and animated in the suitable way regarding the type of the historical event, its location, its date, and what can be implemented.

Secondly, the modeled event should be assigned to its location with its date. In one location, there might be more than one event assigned to it, each event is defined by its name and its date. After that, it should be saved in the application server.

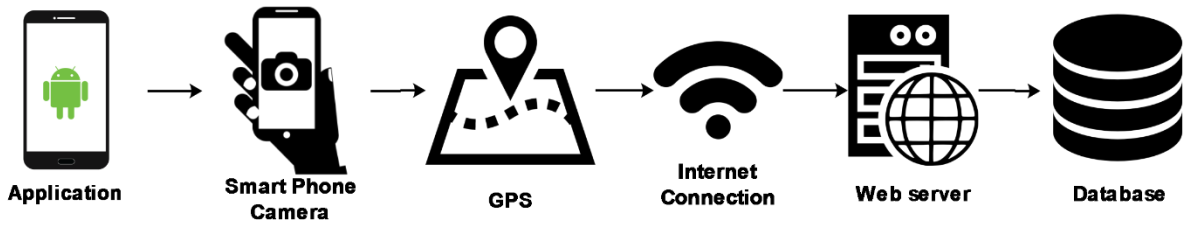

Figure 1- Communication Protocol diagram

When user starts using the application, the GPS is used to detect the location. After that, the application should display a menu of all the modeled events in that location. The menu shall represent the events with their dates where user can choose one of them to view. Finally, the application should represent the 3D modelling with the audio description of the selected event.

There will also be another use of GPS technology. Application should use the real-time GPS tracking feature to give the user the freedom to view the historical event from different angels based on user's location. As an example of Uhud battle event, if user was standing in Muslims side, and he point his camera to the side of the other army (Meccans cavalry); then he can see them as they are far away from him.

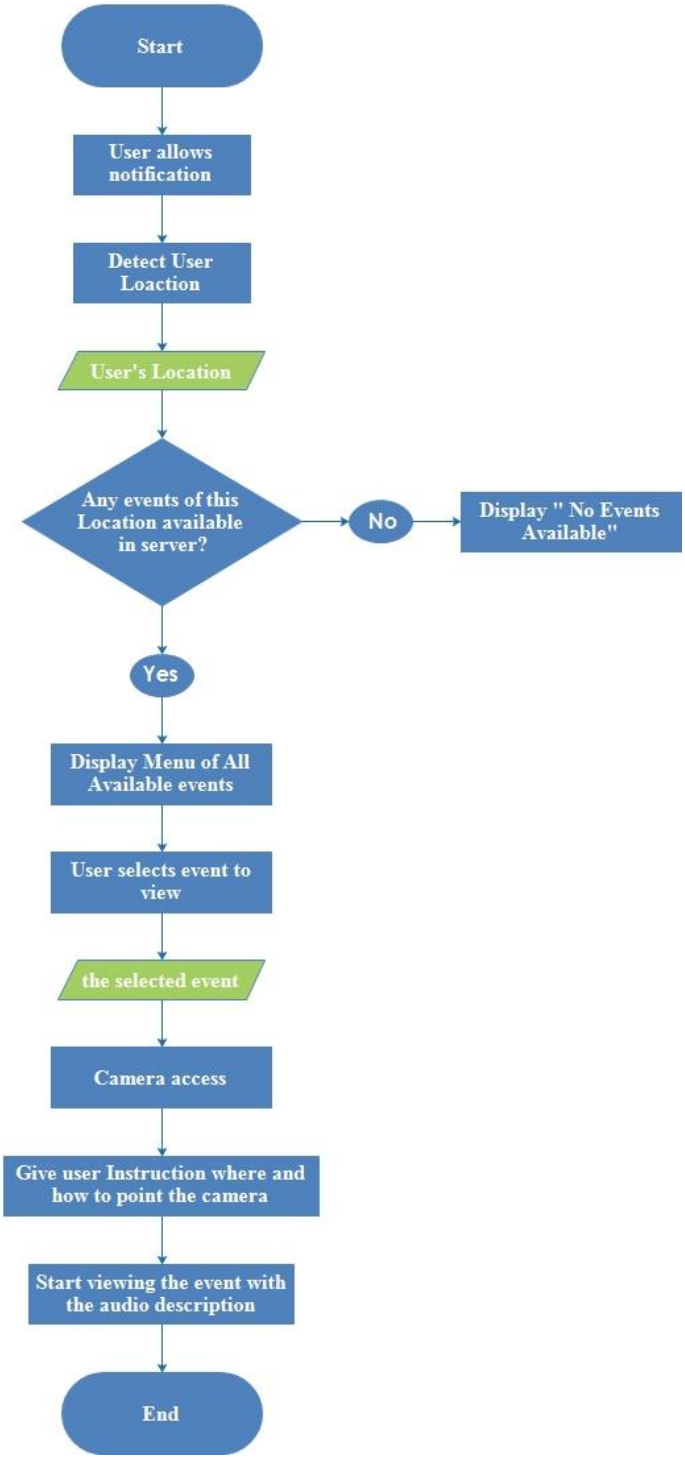

Figure 2- Application Main Function diagram

4. EXPECTED OUTCOMES

Hopefully, the following are expected outcomes of our project:

- Save the history of our country including the Islamic ones.
- Show the hidden beauty beyond our cities.
- Help users (citizens/visitors) to discover more about the city and motivate them.
- Generation after generation, people try to find more attractive ways to learn and teach, this application will help a lot in getting the information in an interesting way.

5. METHOD/APPROCH

Most likely, we will be following the waterfall and agile approaches. The work of this project will go in two parts, the first part will include the planning and analysis phases, while the second part will include the design and implementation phases.

In order to achieve our goals in this application, we have already searched for the appropriate tools for the project in the following topics: image processing for Android, augmented reality development programs, 3D modeling programs, GPS and interactive augmented reality features.

Based on the research, we have been suggested to use Java and C++ programming languages. While for the programming tools, we will be using the following:

- **Eclipse IDE and Android SDK;** which are the most widely known development kit for android app. It will be used for user interface, and GPS library. As well as using it for communicating with the server and for connecting the different parts of the application.
- **OpenCV;** which is a free functions library for real-time computer vision features that can be integrated with the Android application. It will be used to apply the interactive AR and recognizing the objects visually, then replacing dynamically the reality view of the objects with the 3D models.

- **Android NDK;** which is a toolset that allow using C or C++ as a part of an Android app. This toolset will be useful to connect the application with OpenCV.
- **MySQL;** which will be used to build the main database.

For the 3D modelling, we will be using the following graphics tools:

- **Unity with Vuforia extension;** Unity is a famous game engine that have been used to make 2D and 3D games in different platforms. It provides an easy drag and drop interface while dealing with objects. Vuforia is a development kit for implementing augmented reality. As a unity extension, we will take the advantage of the easy interface of unity and the vuforia features in creating augmented reality. With these two, we will add the 3D objects, then make them ready to be used inside the android application.
- **Google sketch up and/or 3D max;** which are the most famous 3D modelling programs. Both can be used to create the 3D models.

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