A MOBILE AR APPLICATION FOR LOCATING AND DESCRIBING SURROUNDING SITES (ARMap)

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Abstract: Augmented Reality is a variation of virtual reality that allows users to view the real world augmented with virtual objects. Therefore, it can be used to produce systems that provide users with rich information about the scanned area. In this project, we present an application that locates and provides the users with information about the local surrounding sites. The application, which we call ARMap, is designed to help users in urban areas or tourism destinations to locate places of interest near them by moving the camera of the device in all possible directions to overlay information of places around them. Places captured by the camera are located by adding bins displaying the place name as defined by Foursquare.com database. ARMap is developed with Android and is set to run on smart phones and tablets with different screen sizes, computational and memory capabilities.

I. INTRODUCTION

Augmented Reality (AR) creates an environment in which real world and virtual world objects are presented together within a single display. The core idea behind AR is overlaying computer generated graphics on top of the real world scenes to create a seamless spatially-registered environment. The main goal of AR is providing applications and programs to the users that bring virtual information to their immediate surroundings and also to any indirect view of the real-world environment (e.g., live-video stream).

The use of AR applications on mobile devices (e.g., tablets, smart phones, digital cameras) is gaining more attention due to the increasing power and decreasing prices of mobile devices. Moreover, mobile devices come with various input means (sensors, cameras, location) that facilitate the development of a wide range AR mobile application. Mobile Augmented Reality (MAR) expands the set of services that AR offers to include a wide range of scenarios in the rich diversity of the mobile environments. AR can be used in many types of applications including entertainment and gaming, tourism, and navigation.

A key feature of a MAR application is that it provides the user with context related information in real time. This information can support various context-dependent applications. For example, information about surrounding places, products, events, or moving objects. In this paper, we present a MAR application, called ARMap (stands for Jordan Guide), for locating and providing information about surrounding sites, building, offices, or any buildings of interest.

1.1 Problem Definition

Augmented Reality (AR) creates an environment in which real world and virtual world objects are presented together within a single display. The core idea behind AR is overlaying computer generated graphics on top of the real world scenes to create a seamless spatially-registered environment. The main goal of AR is providing applications and programs to the users that brings virtual information to their immediate surroundings and also to any indirect view of the real-world environment (e.g., live-video stream).
1.2 Existing System
The core idea behind AR is to generate graphics on top of the real world scenes to create a registered environment. Appearance of AR concepts in the 1950's in the cinema industry, currently, AR applications can be found in many domains including medical visualization, advertising, entertainment, education. Augmented Reality (AR) creates an environment in which real world and virtual world objects are presented together within a single display.

1.3 Proposed System
Augmented Reality is a variation of virtual reality that allows users to view the real world augmented with virtual objects. Therefore, it can be used to produce systems that provide users with rich information about the scanned area. In this paper, we present an application that locates and provides the users with information about the local surrounding sites.

1.4 Scope and Objectives
Augmented Reality (AR) is a groundbreaking technology which enhances the real world by virtual objects in order to create a new mixed reality environment. Typically Augmented Reality systems consist of an output device displaying the virtual information, a tracking system for determining position and orientation of the user, a computer processing the necessary data and arbitrary input devices for navigation and interaction.

Nevertheless water as a totally different environment adds some different, not yet quite managed challenges to the realization of AR applications. Beside leak tightness, water also requires new and innovative extensions to tracking and visualization as data transmission, lighting conditions and human perception are significantly altered under water.

The presented work can be further extended in many directions including:
- Enabling the retrieval of more information about venues in order to give detailed and more accurate results about the venues and locations.
- Providing the option of saving the visited sites with navigation (i.e., trip tracker). This option will require saving information in a light local database.
- Providing a vocal guidance option for users with disabilities.
- Developing versions of the application that work on different platforms (e.g., iOS for iPhones, Window)

II. LITERATURE SURVEY
In case of ARMap applications first thing comes in mind how to detect and describe the surrounding sites which are visited and stored in the cloud.
Outdoor positioning describes GPS. The user perspective types are Digital compass and Accelerometer, the description of the digital compass will show the direction of your sight and accelerometer describes the angle of your sight. Display component are Video see and Monitor base, Video see through combining a closed view HMD with one or two cameras, Monitor base is combining virtual objects and real objects on a monitor.

[1] A Survey of Augmented Reality by Ronald T. Azuma
This paper surveys the field of Augmented Reality, in which 3-D virtual objects are integrated into a 3-D real environment in real time. It describes the medical, manufacturing, visualization, path planning, entertainment and military applications that have been explored. This paper describes the characteristics of Augmented Reality systems, including a detailed discussion of the tradeoffs between optical and video blending approaches. Registration and sensing errors are two of the biggest problems in building effective Augmented Reality systems, so this paper summarizes current efforts to overcome these problems. Future directions and areas requiring further research are
discussed. This survey provides a starting point for anyone interested in researching or using Augmented Reality.

[2] Sensors for location-based augmented reality the example of Galileo and egnos by German Research Center for Artificial Intelligence (DFKI) Technical University Kaiserslautern

Augmented Reality has long been approached from the point of view of Computer Vision and Image Analysis only. However, much more sensors can be used, in particular for location-based Augmented Reality scenarios. This paper reviews the various sensors that can be used for location-based Augmented Reality. It then presents and discusses several examples of the usage of Galileo and EGNOS in conjunction with Augmented Reality.

[3] JoGuide android application by Fadi Wedyan Department of Software EngineeringHashemite University

JoGuideis designed and implemented keeping in mind the importance of achieving the following attributes: reliability, usability, extensibility, and robustness. JoGuide is deployed to run on Android platform version 4.1 or later and is developed to work on devices with different screen sizes and computational capabilities. JoGuideuses Global Positioning System (GPS) sensor, phone network and Internet connection to determine current location. The application uses a global maps website called Foursquare to get information about the sites of interest. The application uses the phone camera to catch the scene, sends it to the site and locates sites of interest. JoGuideallows users to learn more information about venues and places surrounded them.

[4] New Era of Teaching Learning Augmented Reality 3: Marker Based by Abhijitsinh Jadeja (HOD-PGDCA, BPCCS, KSV University, Gandhinagar)

Richa Mehta (Lecturer BPCCS, KSV University, Gandhinagar)

The main objective of this paper is to provide clarity of concepts to the students in a real like environment through 3d visual aids that may be used to clarify or enhance understanding of a concept or process. As a student said, “Tell me and I forget. Show me and I remember, Involve me and I understand” This paper focuses on involving the children in understanding of the concepts in 3D environment. The traditional method includes concept deliverance not based on visual aids. Now the modern teaching methodology includes visual aids such as projector, transparent slides, and models in 2d environment. If visual aids are converted from 2D to 3D environment, the student will have a live environment to understand the concepts. Visual aids tools are available to teachers to add reality, clarity, and variety to the drill which is necessary for students at the earlier stages of language learning.

III. REQUIREMENT ANALYSIS

In system engineering and software engineering, requirements analysis encompasses those tasks that go into determining the needs or conditions to meet for a new or altered product or project, taking account of the possibly conflicting requirements of the various stakeholders, analyzing, documenting, validating and managing software or system requirements. Requirements analysis is critical to the success or failure of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.

3.1 Types of Requirements

Requirements must be measurable, testable, related to business needs and opportunities. Basically, functional requirements directly support the user requirements by describing the “processing” of the information or the materials as inputs or outputs. Nonfunctional requirements generally support all users in that they describe the business standards and business environment; there are two types in requirements analysis.
• Functional Requirements.
• Non-functional Requirements

3.1.1 Functional Requirements
All requirements are gathered and they are prioritized. Functional requirements are:
• User can use this android application in his/her android device.
• As this application is user friendly can use easily.
• User can get pin pointed location name which he/she has already given when he/she has visited.
• The pointed location is stored in the database by user’s given name.
• This can help when user is unable to find the particular place which is already visited by him/her.

3.1.2 Non-Functional Requirements
The Non-Functional requirements elaborates performance of the system. Non-Functional requirements impose constraints on the design or implementation(such as performance engineering requirements, quality standards or design constraints)
• Performance
  An android application should be fast and efficient. Providing a “believable” augmented reality view to the user, the application should respond rapidly to the user’s movement. Moving the mobile device around changes the view of the user and thus, the displayed information should update rapidly. A response time of one second or less should be the minimum for the application to function properly.
• Maintainability
  Changing, adding and removing information and information sources should be facilitated. While users run the applications, it should be possible for the system administrator to make changes to the information base and make it available to the user afterwards.
• Security
  The user’s personal data, logged data and other privacy should be kept securely.
• Usability
  It should be easy for the user to install and use the application.

3.2 Software and Hardware Requirements
3.2.1 Software Requirements
Software component deals with defining software resource requirements that need to be installed on your computer to provide optimal functioning of an application. Software required for this project can be listed as follows:
• Windows 10
• Android SDK Tool
• Unity tool kit

3.2.2 Hardware Requirements
Hardware requirements are most common requirements defined by any operating system or software application. It is the physical computer resources, also known as hardware. A hardware requirement list is often accompanied by a hardware compatibility list especially in case of operating system. Hardware that required for this project can be listed as below:
• Processor i5
• Hard Disk-50GB
• RAM-4GB
• Android device-4G
3.3 Feasibility Study

Feasibility study is an analysis and evolution of a proposed project to determine if it is technically feasible, feasible with estimated cost, and will be profitable. Feasibility studies are almost always conducted where large sums at stake. There are three types of feasibility study:

3.3.1 Technical feasibility study

This assesses the current resources and technology which are required to accomplish the our project requirements within allocated time and budget. It should analyze that whether the technical skills and capabilities of the software team members, and determine that whether the relevant technology is stable and established.

3.3.2 Operational feasibility study

This assesses the extent to which the required software performs a series of steps to solve business problems and user requirements. It should determine whether the problems anticipated in user requirements are of high priority and whether the solution suggested by the development team is acceptable.

3.3.3 Economic feasibility study

This determines whether the required software is capable of generating financial gains for an organization. It focuses on cost incurred on software development to produce long-term gains for an organization and cost of hardware, software, development team, and training.

IV. SYSTEM DESIGN

4.1 Block Diagram of project

Fig 4.1 Block diagram of Project

4.2 Flow Chart

Fig 4.2 Flow Diagram
This flowchart Fig 4.2 explains the flow of our project. First starts the camera then it will check both for both GPS and internet connection with the application, if yes then it loads the objects which are stored in the database for existing. If object names did not exist then user can pinpoint the location which will be visible in the display capturing by the camera and user can name the pointed place and will be stored the database, later the given place name will be displayed when user goes to same location and placed his/her camera on the pinned location.

4.3 Data Flow Diagrams
4.3.1 Physical Diagram

![Physical Diagram](image)

**Fig 4.3.1 Physical Diagram**

4.3.2 Logical Diagram

![Logical Diagram](image)

**Fig 4.3.2 Logical Diagram**

4.4 UML Diagram
4.4.1 Use Case Diagram

![Use Case Diagram](image)

**Fig 4.4.1 Use Case Diagram**
4.4.2 Sequence Diagram

![Sequence Diagram]

Fig 4.4.2 Sequence Diagram

4.4.3 Activity Diagram

![Activity Diagram]

Fig 4.4.3 Activity Diagram

4.4.4 Class Diagram

![Class Diagram]

Fig 4.4.4 Class Diagram
4.5 Advantages and Disadvantages

4.5.1 Advantages

- The application aims to facilitate the process of searching sites surrounding the users.
- Use the technology of case.
- User-friendly and travel-friendly.
- Helps to eliminate redundancy.
- Reduction of human errors.

4.5.2 Disadvantages

- Time complexity.
- Network synchronization.
- Difficult to maintain AR system.
- Information overload.

V. CONCLUSION AND FUTURE SCOPE

This paper presented the implementation and evaluation of a mobile AR application for either local or international tourists for searching tourist attractions and culinary places in Phnom Penh city, Cambodia. The developed application runs on Android powered mobile devices. The application utilizes a location-based augmented reality technology. This technology allows the mobile user to look for nearby places in a mobile camera view. Also, it allows the users to view map routes that direct them head for the destination. The Camtour AR’s purpose is to grasp the chance of using the AR technologies to improve the user experience for travelling and overcome the difficulties they face. The Camtour AR can help mobile users for finding tourist attractions and culinary places easily and quickly. The application evaluation was done successfully to measure the usability of Camtour AR application interface. Based on the result of system assessment, it points out that the system usability level is achieved with 91.72% and ready to be used in the market. As a future work, the system can be extended to cover different cities and provinces in Cambodia.

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IV. New Era of Teaching Learning Augmented Reality D Marker Based by Abhijitsinh Jadeja (HOD-PGDCA, BPCCS, KSV University, Gandhinagar)
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