

Augmented Reality App for Location based Exploration at JNTUK Kakinada

Sanaboina Chandra Sekhar¹, Kadali Sravan²

¹Assistant Professor, Computer Science and Engineering Dept, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, India.

²Post Graduate Student, Master of Computer Applications, Jawaharlal Nehru Technological University, Kakinada, Andhra Pradesh, India.

Abstract – Location-based augmented reality (AR) technology utilizes GPS and geolocation data to track the user's position and cover digital information or objects onto the real world. By pointing camera at the environment, the user can see virtual objects or information overlaid onto the real world. This technology uses computer vision to seamlessly integrate the digital and physical worlds, providing an immersive and interactive experience for the user. This project aims to develop an AR application that utilizes GPS to locate and identify every department and various places in JNTU Kakinada. Additionally, the project seeks to integrate the latest AR Image Overlaying Technology to provide complete faculty information of the staff in the CSE Department, enhancing their overall AR experience. This advanced technology blends real-world and digital information seamlessly, creating an immersive experience. It makes exploring JNTU Kakinada easier than ever by using GPS.

Key Words: Augmented Reality, Global Positioning System, Virtual Objects, AR Application, Camera, JNTU Kakinada, Seamless integration.

1. INTRODUCTION

The AR app for location-based exploration at JNTUK offers users an exciting way to discover and explore the campus using augmented reality. By leveraging the camera and GPS capabilities of their mobile devices, the app superimposes virtual objects and information onto the real-world view. Users can download and install the app, granting necessary permissions for camera access and location tracking. Once installed, the app utilizes GPS to determine the user's location within the JNTUK campus. By the surroundings and matching them with GPS coordinates, the app identifies the user's position on the campus map. This enables the app to provide virtual content specific to the user's location. Using augmented

reality, the app overlays virtual objects and information onto the live camera view. Users can explore various points of interest within the JNTUK campus, such as buildings, landmarks, and recreational areas. By scanning these locations, users receive real-time details, multimedia content, and historical information. The AR app also offers immersive and interactive experiences. Users can explore the campus and get the details of every department and staff information.

2. PROBLEM STATEMENT

Develop an AR application that utilizes GPS to locate and identify every department and places in JNTU Kakinada. Additionally, the project seeks to integrate the latest AR Image Overlaying Technology to provide complete faculty information of the staff in the CSE Department.

3. LITERATURE REVIEW

The comprehension of various augmented reality techniques is a key focus of this literature study. We took a number of stages in our investigation, including the following:

- K. Gangurde et al., [1] demonstrated how AR can be utilized to overlay virtual objects seamlessly into the real world and discussed its potential applications in fields like gaming, education, marketing, and industrial training. T. L. Chou and L. J. Chanlin, [2]. In their paper presented the results of a study conducted to evaluate the effectiveness of the proposed location-based learning system. The authors discussed the impact of AR and location-based learning on student engagement, motivation, and learning outcomes. They may also highlight any challenges or limitations observed during the implementation.

- N. Isoyama et al., [3]. The authors have conducted an empirical study or experiment involving participants walking in a virtual or real environment while being exposed to AR object and texture presentations. They have manipulated the type and characteristics of the AR presentations and measured participants' walking behavior using motion capture or other tracking methods.
- O. Mujumdar [4] The paper likely contributes to the existing body of knowledge on augmented reality by providing a consolidated overview of the technology and its applications. It may offer insights into the capabilities and potential of AR, as well as address the opportunities and considerations for its adoption in various domains.
- T. Lee et al.,[5]. The paper likely presents the findings of the study, discussing the effectiveness and accuracy of the proposed methods for recognizing multiple real-world objects and estimating their 3D positions in augmented reality. The authors may highlight the strengths and limitations of the developed techniques, as well as any challenges encountered during the process.

- Visavadiya and Ahmed [6] likely present a Unity3D-built location-based AR app. The paper details design, development, features. Use cases like tourism, education, and entertainment are explored for enhancing user experiences.
- Geiger et al.[7] discuss challenges in creating such apps - technical, user experience, and design. Real-world examples showcase benefits and lessons learned cover engagement, usability, and integrating location-based services. Valuable insights, practical considerations, best practices, and future directions contribute to the field

- Liang et al. [8] introduce a markerless AR-based app, AR-UTHM Tour, for Android. It visualizes Universiti Tun Hussein Onn Malaysia's campus on mobiles, showing 3D models when users aim cameras at surfaces. Feature points guide virtual plane generation.
- Jiang and Subakti [9] contribute with indoor AR framework. It boosts interactive, context-aware apps in indoor spaces, enhancing navigation, retrieval, and engagement.
- Li et al. [10] investigate location-based AR's learning impact. Their AR system blends virtual content with physical locations, enabling user interaction. Study likely assesses learning outcomes, engagement, and related factors through participant interaction with the AR system.

4. PROPOSED SYSTEM

The proposed system aims to integrate the outdoor location-based augmented reality and AR image overlaying technology. Utilizing location-based AR, the

system recognizes real-world objects using coordinates and overlays virtual objects onto the physical environment. Additionally, the system employs AR image overlaying technology to identify markers and provide comprehensive faculty information for the Computer Science and Engineering (CSE) Department. This integration enhances the user experience by offering interactive and informative content in the context of JNTU Kakinada's CSE Department.

5.SYSTEM ARCHITECTURE

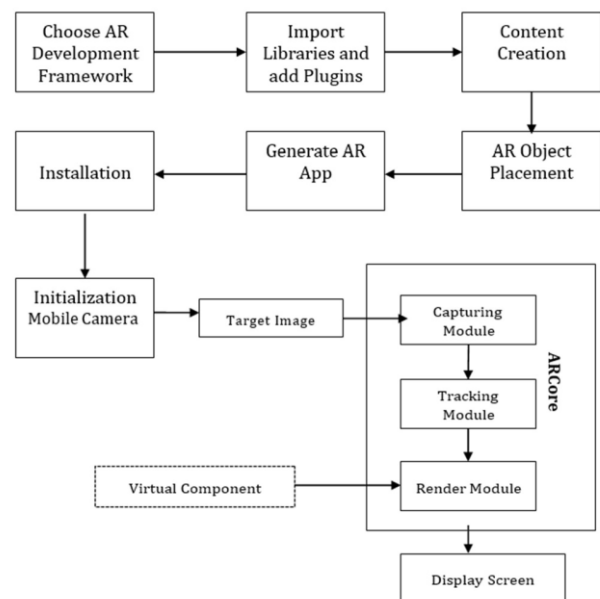


Fig - 1 : Architecture of the Proposed System

The process of Work Flow Diagram is described in following steps:

5.1 Choose AR Development Framework:

Start by selecting an AR development framework or SDK that suits project requirements. These frameworks provide the necessary tools and APIs to develop AR applications.

5.2 Unity Engine:

- Unity Engine is a popular cross-platform gamedevelopment engine.
- It is widely used for creating interactive 2D and 3D experiences, including AR applications.

- It provides a range of features and tools to develop and deploy AR content across various platforms.

5.3 Import Libraries and Add Plugins:

Once an AR development framework is chosen, import the required libraries and plugins into development environment. These libraries and plugins enhance the functionality and capabilities of AR app. They may provide features such as object recognition, marker tracking, or surface detection.

5.4 Packages:

- AR Foundation
- AR Core
- Vuforia Engine

5.5 Plugins:

- AR+GPS
- Vuforia

5.6 Content Creation:

Create or obtain the 3D models, textures, animations, and other assets that we want to use in AR app. Use 3D modeling software, such as Blender, to design and optimize virtual objects. Ensure that the assets are suitable for real-time rendering on mobile devices.

5.7 Blender:

Blender is a free and open-source 3D modeling, animation, and rendering software widely used in the game development, film production, and visual effects industries.

5.8 AR Object Placement:

- Implement the functionality to allow users to place virtual objects in the real world.
- Find the coordinates in the google maps where to place the virtual object.
- Assign the coordinates to the virtual object using AR+GPSPlugin.

- This involves integrating the AR development framework and using its APIs to detect and track the user's environment.

5.9 Generate AR App:

Compile and build AR app for the target platform(s) we are developing for (e.g., iOS, Android). Use the tools and utilities provided by the AR development framework to generate the necessary binary files or installation packages for distribution.

5.10 Installation:

Install the generated AR app on the intended device(s). Make sure to follow the device-specific installation instructions for each platform.

5.11 Initialization Mobile Camera:

Once installed, initialize the app and perform any necessary setup or configuration steps. The smartphone device itself contains a built-in camera that is capable of capturing images and videos.

5.12 Target Image:

When we use the camera function on phone, it captures a target image of the scene in front of us. This image consists of pixels arranged in a grid, forming a digital representation of the visual information.

5.13 Capturing Module:

The capturing module in the smartphone's software handles the process of capturing the image from the camera hardware. It adjusts settings such as exposure, focus, and white balance to ensure a clear and well-exposed image.

5.14 Tracking Module:

In certain scenarios, the smartphone may employ a tracking module to detect and track specific objects or features within the captured image. This can be useful for various purposes, such as augmented reality (AR) applications or object recognition.

5.15 Render Module:

The render module processes the captured image data and applies various algorithms and transformations to enhance the visual quality or perform specific tasks. This

may include noise reduction, color correction, image stabilization, or other image processing techniques.

5.16 Virtual Component:

In the context of augmented reality (AR) or other similar applications, virtual components may be added to the captured image or added on the real environment based on coordinates. These virtual components can include virtual objects, overlays, or visual effects that appear to interact with the real-world scene.

5.17 Display Screen:

The processed image, which may include enhancements and virtual components, is then displayed on the smartphone's screen. The display screen is where users can view and interact with the final result.

6. RESULTS



Fig - 2: Experimental Results

This is the Location based AR object placement at the CSE Department using GPS co-ordinates of the building. The placement of object in the real world is completely based on mobile internet connection and accuracy of mobile GPS. We integrated the CSE Department virtual object with the actual co-ordinates of that department.

These co-ordinates are taken from the Google Map.

Similarly, we placed all the virtual objects in their respective department for enhancing the AR exploration at JNTU Kakinada.



Fig - 3: Experimental Results

This is the AR Image overlaying to identify and rendering the Dr. Sanaboina Chandra Sekhar information at his cabin board. Whenever we place the mobile's camera on his wooden board, it will display the above AR image. It includes Professor's information like Gmail, Contact number, LinkedIn.

Here, All the fields in AR image is clickable. Whenever we click on this fields, it will redirect to their respective pages. Similarly, we created this AR images for the staff in CSE Department.

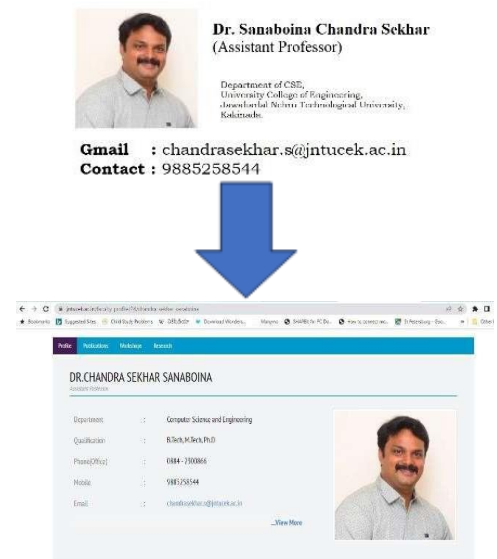


Fig - 4: Experimental Results

The above figure shows the redirection of AR Image when we click one of the field in AR Image. Generally, we click on card field in AR Image, it will redirects to

www.jntucek.ac.in/faculty_profile/24/chandra_sekhar_sanaboina page.



Fig - 5: Experimental Results

The above figure shows the redirection of AR Image when we click one of the field in AR Image. Generally, we click on call field in AR Image, it will redirects to call in our mobile phone. It will shows the mobile number of respective faculty.

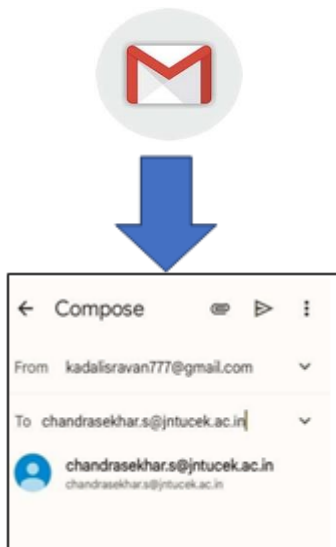


Fig - 6: Experimental Results

The above figure shows the redirection of AR Image when we click one of the field in AR Image. Generally, we click on Gmail field in AR Image, it will redirects to E-mail Application in our mobile phone. It already includes the email address of respective faculty.



Fig - 7: Experimental Results

The above figure shows the redirection of AR Image when we click one of the field in AR Image. Generally, we click on LinkedIn field in AR Image, it will redirects to LinkedIn page. It will shows the LinkedIn profile details of respective faculty.

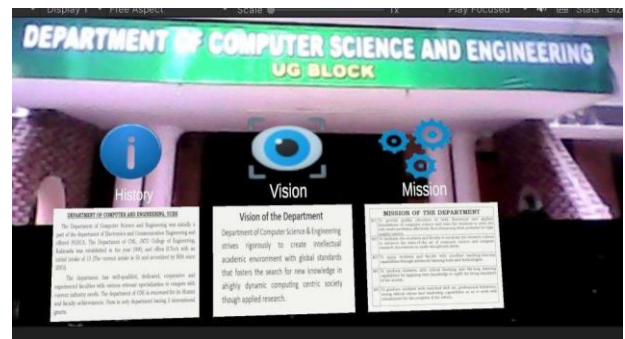


Fig - 8: Experimental Results

This is the Location based AR object placement at the CSE Department using GPS co-ordinates. It displays History, Vision and Mission of CSE Department. Whenever we click on the icons, it will display the information about their respective icon.

7. CONCLUSION

This project combines GPS to explore JNTUK Kakinada and AR image overlaying technology to provide CSE Department staff information has successfully created. By seamlessly blending real-world and digital information, this project has made it easier than ever for students, visitors, and anyone interested in the CSE Department to access comprehensive faculty information.

The future scope is to providing real-time AR navigation and directions through the overlaying of digital information onto the user's view of the physical world.

Abbreviations

The following abbreviations and notations are used in this manuscript:

AR Augmented Reality

GPS Global Positioning System

CSE Computer Science Engineering

JNTU Jawaharlal Nehru Technological University

SDK Software Development Kit

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