

CHAPTER

6

AUGMENTED REALITY EXPLORATION FOR CAMPUS TOUR

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6.1 INTRODUCTION

Augmented reality (AR) merges the real and virtual environments by integrating computer-generated content into the physical world through digital devices. This interactive technology enhances users' perception of reality by overlaying text, images, and videos onto their immediate surroundings. AR comprises three key elements: the fusion of real and virtual worlds, three-dimensional (3D) registration, and real-time interactivity (Azuma, 1997). Through the cameras of various devices, users can observe virtual objects seamlessly superimposed onto the real environment. These devices range from high-cost head-mounted displays (HMDs) to more affordable and widely accessible smartphones, enabling AR applications to be utilized across diverse contexts and user groups.

In practice, AR has found diverse applications across various working environments. These applications span navigation, advertising, education, construction, manufacturing, sports, and the medical industry (Kokorogianni et al., 2017; Olsen & Kim, 2025). By combining

AR with other sensors, such as global positioning system (GPS), the capabilities of handheld tracking can be significantly enhanced. While most existing devices rely solely on camera-based tracking, the integration of multiple sensors holds promise for future advancements.

One specific use case involves a mobile AR with a GPS-based system designed to cater to the needs of university students. Users of this application can explore popular locations within the university virtually, gathering relevant information and accessing additional details about nearby places. Universities typically feature multiple buildings to accommodate the educational needs of thousands of students across various faculties and departments. With each new enrollment cycle, the student population grows. However, the expansive campus area can sometimes confuse new students and visitors, leading them astray among the various buildings.

To address this challenge, universities often organize campus tour activities. These tours aim to highlight specific locations crucial for newcomers and visitors. During each semester, knowledgeable guides familiar with the campus lead these tours, providing essential information to new students. Despite these efforts, it remains challenging for tourists to retain all the details during a single-day visit. Fortunately, technological advancements, particularly AR, now offer a modern solution. Self-guided AR devices empower tourists to explore and acquaint themselves with the campus more effectively. Universities utilize AR as a campus tour mechanism, enabling tourists, new students, and prospective students to familiarize themselves with the campus environment.

6.2 INNOVATION APPROACH

In this chapter, our work produced UTM ExplorAR. By leveraging location-based AR, we provide users with real-time information about points of interest while they explore and tour the sprawling campus. Through the mobile app, users receive dynamic overlays on their screens, enhancing their understanding of the environment based on

their current location. This innovation benefits first-year students navigating the vast campus and ensures that visitors have essential information readily available during their tours. Moreover, AR opens doors to novel interactions, fostering brand awareness and positioning universities at the forefront of technological advancement. By embracing AR, universities not only enhance the user experience but also showcase their commitment to innovation, leaving an indelible mark on prospective students and visitors alike.

Figure 6.1 shows the systematic approach to delivering the tasks and outputs for the UTM ExplorAR. This systematic approach is to guarantee the accuracy, dependability, and applicability of the study outcomes.

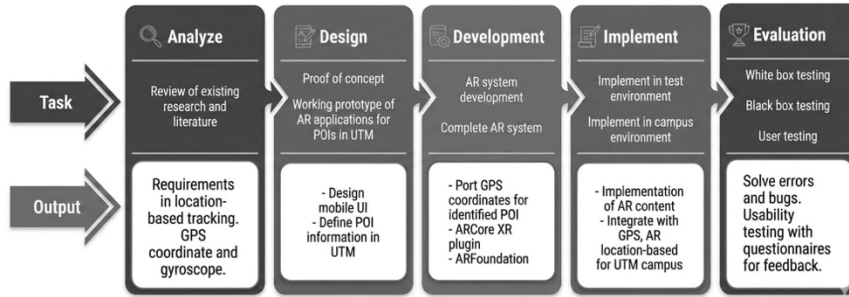


Figure 6.1 Systematic approach and workflow

The core concept of this innovation is to create an augmented reality-based GPS application tailored for university students. The Analyze stage concentrated on examining AR through the application of location-based methods. It covers a concise history of AR and delineates the distinctions between AR and virtual reality (VR). Additionally, this stage evaluates the deployment of AR in smartphones, the integration of mobile GPS, and the tracking methods utilized in AR. This stage is crucial, as it serves as the foundational guideline for this work.

When creating a system, understanding the system requirements is crucial, as they outline the system's functionalities, offered services, and operating systems. The prototype should meet all its functional requirements defined below: