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Indoor Navigation System

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Abstract: ***At some point in their life, everyone has probably gotten lost in an auditorium, had trouble finding an exit at an airport, or maybe they got there late because they didn't find suitable lecture hall in a university. But this way of getting lost in complexes and large halls could soon be a thing of the past. Today, indoor navigation apps for mobile devices are common and people need to find their destination inside tall buildings. Most indoor navigation apps use different technologies such as Wi-Fi fingerprints and Bluetooth beacons. These applications use pre-computed paths and fixed background maps to guide users to their destinations. Users of these systems need to understand how specific interior cards and card reading signals work in general. Additionally, these systems require complex and precise calculations to determine a route before navigating begins, which can be affected by spotty Wi-Fi signals. Discover Indoor Maps, the new generation of indoor navigation. In this article, we offer an indoor map that expands to 3D capabilities using augmented reality, with an increasing focus on commerce and general orientation. Indoor navigation systems integrating augmented reality allow users to locate locations in buildings and gain more knowledge about their surroundings. Although different efforts with different technologies, infrastructures and capabilities have been introduced, the procedures used to specify these systems have not yet been standardized. Additionally, while systems generally manage location contextual information in a proprietary format, a platform-independent model is desirable, which would encourage its access, updating, and management. This article proposes an approach for the development of an indoor navigation system based on the integration of augmented reality and semantic web technologies to present navigation instructions and contextual information about the environment. It consists of four modules: Defining Spatial Models, Data Management (Ontology Supported), Location and Navigation, and Content Visualization.***

I. INTRODUCTION

Indoor Navigation is all about providing flexible guidance to people in chaotic and unfamiliar buildings in universities and resorts. Navigation systems help users easily enter unfamiliar surroundings. The term "navigation" collectively includes the tasks of locating a user's location, planning a feasible route, and guiding the user along the route to a desired destination. Our system will provide sm ooth localized navigation in large institutions using our navigation system. Indoor navigation is a revolutionary concept that visualiz es indoor sites and spatial data on 2D or 3D digital maps.

This allows us to walk around universities, large shopping malls, hospitals, auditoriums, etc. navigation. In terms of complexity, ind oor navigation is very different from outdoor navigation. In our indoor navigation, the technology is rather complex as it consists of 3 modules which should be categorized as site mapping, database population and user interface design. Augmented Reality (AR) lev erages dynamic and accurate 3D maps for realworld experiences. Displaying people, assets and places on a digital map enables solut ions such as indoor navigation and indoor positioning.

Indoor navigation apps for mobile devices are common and people need to find a destination inside a tall building. These application s use precomputed paths and fixed background maps to guide users to their destinations. Users of these systems need to understand how specific interior cards and card reading signals work in general. Additionally, these systems require complex and precise calcul ations to determine a route before navigating begins, which can be affected by spotty Wi-

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It is an indoor navigation app that can use augmented reality without any restrictions. The first step in the development of this applicati on is to build a 3D model of the building and its interior where we will deploy this application. We use cellular tools to develop 3D mo dels of buildings. The system needs to know the user's location and it needs to be mapped to a 3D model of the building. Aunit that allo ws the device to detect horizontal and vertical surfaces and planes.

It also includes motion detection, allowing phones to understand and track their position relative to the world. As AR Core continue s to improve and expand, it will add more contextual and semantic understanding of people, places, and things. Unity is a free and o pensource 3D computer graphics software tool used to create animated films, visual effects, art, 3D printed models, motion graphics , interactive 3D applications, virtual reality and computer games. Unity will naturally import DCC (Digital Content Creation), fbx a nd obj files. To achieve this, we will install QR codes in all possible destinations in the building, assuming that any destination can b e used as a starting point for the user.

Each QR code is linked to a specific graph node, but not all nodes contain a QR code. Using QR codes, the navigation map can iden tify the user's location and place 3D objects on the smartphone screen. 3D objects are represented by arrows defining the direction to the next point. Once the user scans a QR code, the system will know their current location and prompt them to choose a destination. After the user selects a destination, the user's camera is activated.

Google AR Core performs both location and mapping by getting realtime information from the user's camera, which means compari ng the realtime information from the camera with the 3D model of the building to get the location exact from the user. As the user m oves through the building, their location is updated very seamlessly, like GPS. Depending on the selected path, the AR (augmented r eality) arrows point to the next node on the path. So the user knows exactly where to turn right or left. When the system knows the u ser's location, it uses the A* shortest path search algorithm to find the shortest path to the selected destination.

The A* algorithm is faster, more efficient and more reliable than Dijkstra's algorithm. After the system finds the way to the destinati on, it places a virtual 3D arrow object on the user's camera screen to help the user reach the destination by the shortest path. The sho rtest path is continually updated as the user's location is updated.

II. LITERATURE REVIEW

Research on indoor positioning systems/indoor navigation is comprehensive and diverse. This is a subject that has been studied over the years using various techniques. Therefore, the objective of the following study is to identify different methods that can be used t o determine inland navigation. The time people of all age groups spend on cell phones has increased dramatically every year, reduci ng the use of other media. Smartphone ownership and fast internet connections such as home broadband, 3G, 4G and 5G are increas ing dramatically.

According to multiple statistics conducted by several research centers, 92% of users are between 18 and 29 years old, 74% are betw een 50 and 64 years old, and 42% of smartphone users are 65 and older. This has led to the use of mobile applications. According to analytics, users spend 5 hours on their smartphones, 90% of which is spent on various apps. The purpose of this report is to identify the need for inland navigation and the different technologies and devices that can be used to achieve it. Additionally, a user survey was conducted to shed light on the usage habits of users in their daily life for the positioning system.

Data collection raises many questions about how data will be integrated and identifies the need to verify program content. The objec tive of the research is to find out how to develop the desired applications or functions, and which functions are of most interest to us ers. It mainly focuses on indoor navigation and the applications created for it. Different technologies like GPS, AR, ie.

Augmented reality must be replaced by other solutions to create indoor navigation. More detailed measurements such as infrared, ult rasound, radio signals, etc. The study evaluates various positioning technologies. Traditional positioning technologies such as GPS f ail when a user moves from an outdoor location to an indoor location. This is due to signal attenuation that occurs when the GPS sig nal encounters obstacles such as construction walls.To overcome this problem, this article mentions different positioning techniques with different ideologies.In recent years, several reviews of asbuilt modeling from point clouds have been published (Volk, Stengel and Schultmann et al., 2014) (Patraucean, Armeni, Nahangi, Yeung, Brilakis and Haas et para.2015) (Liu and Zlatanova et al., 2013). Most of the work has focused on the efficient reconstruction of structural elements of the building (Oesau, Lafarge and Alliez et al .2014) (Mura, Mattausch and Pajarola et al., 2016) (Tran, H.; Khoshelham, Kealy and DíazVilariño et al., 2019) and openings while correctly modeling floor elements, free space modeling and taking into account Given the importance of barriers to inner orientation , barrier modeling has received less attention.Several recent works have addressed the complete simulation of floor assemblies. In in door conditions, point clouds and handheld laser scanner trajectories were combined to segment and identify stairs, staircases and fl oors in plan (Staats, Diakité, Voûte & Zlatanova et al., 2017) (Balado, Vilariño, Arias and Gonzalez -Jorge et al.2018).

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The process begins with a projection into a point cloud discretized into a voxelbased model and a region ascent followed by a projec tion into a point cloud discretized into a voxelbased model. Outdoors, the orientation of the trajectory has been used to identify road segments and thus define the soil composition in curbs, sidewalks, ramps and stairs based on geometric and topological characteristi cs (Balado, Vilariño , Arias and Soilan et al., 2017) (Vilariño, Verbree , Zlatanova and Diakité et al.Already 2017).
Optical and visionbased location systems use motion sensors or cameras in a user's mobile device to assess the location of a person or object within a building by detecting markers or images in the building (Mautz & Tilch, 2011); Klopschitz, Schall, Schmalstieg a nd Reitmayr, 2010).
A marker is a static object with a marker that can be used as a reference in the field of view of an image sensor (e.g., cell phone cam era) (Mautz, 2012).

III. ANALYSIS AND DESIGN

A. Needs analysis

1) Hardware Requirements

Any smart device with a camera. The requirement of the camera is to locate the user's current location and provide realtime navigati on through the camera.

2) Software requirements:

a) Android operating system
b) Unity Software
c) Windows 7 (+)
d) 2 GB RAM
e) Graphics API

B. Technical And Software Details

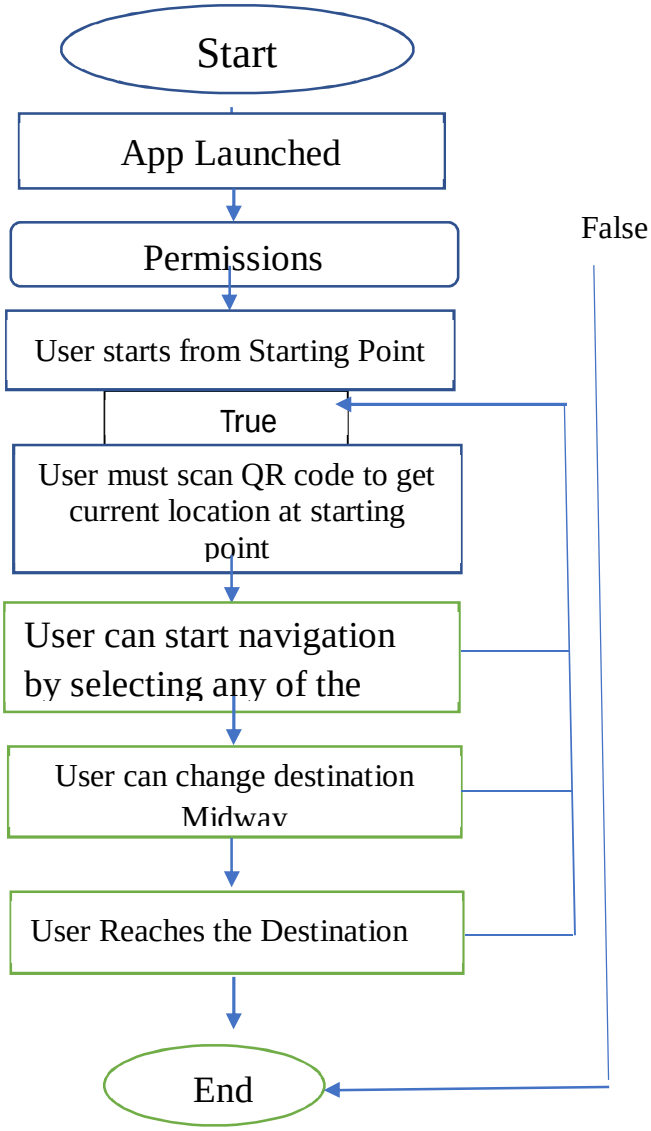
Unity**:** Unity provides a workspace that combines artistfriendly tools with a design based on the components. fairly intuitive game d evelopment.
Both 2D and 3D development can take place in Unity, with 2D physics being handled by the popular Box2D engine. Unity uses a co mponentbased approach to game development around prefabs. Prefabs allow game designers to create objects and environments mo re efficiently and scale faster. Google AR Core is a plugin that unifies AR functionality. In order to provide augmented reality, our d evices must understand it.
AR Core provides several tools for understanding objects in the real world. These tools include context recognition, which allows th e device to detect horizontal and vertical surfaces and planes. It also includes motion tracking, allowing phones to understand and tr ack their position relative to the world.
As AR Core continues to improve and expand, it will add more contextual and semantic understanding of people, places, and things Blender is a free and open-
source 3D computer graphics software tool used to create animated films, visual effects, art, 3D printed models, motion graphics, int eractive 3D applications, virtual reality and computer games.

IV. ANALYSIS AND DESIGN

A. Design and Work Proposal

Indoor Navigation Systems shall be able to display their location on a map on their own smart devices. Users should be able to choo se their preferred destination on their device. Their devices must be able to direct users where they want.
The software should use the camera and 3D animations to guide the user. They should be a minimap for better understanding by the user.
Users of indoor navigation systems display their location on a map on their smart device. After selecting a destination or point of int erest. The route to the selected destination is displayed on the map.

B. Block Diagram

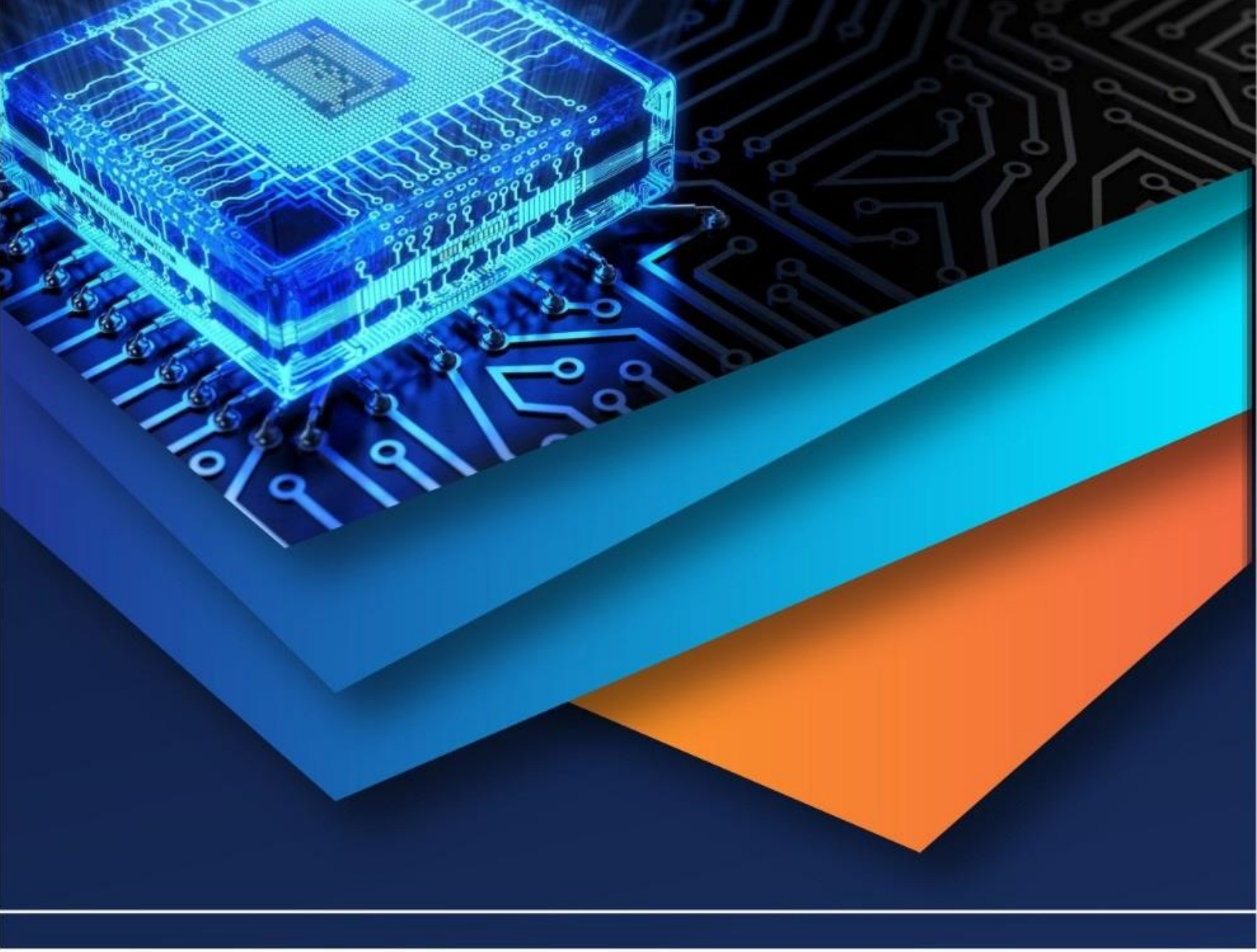


V. CONCLUSION

Users of indoor navigation systems can view their location on a map on their smart device. After selecting a destination or point of interest, the route to the selected destination is displayed on the map. This tool is invaluable for newcomers and guests as they can find their destination room faster and easier. Some people may find it an added benefit not to have to ask a stranger for help if they get lost in a new building. Navigation instructions are displayed on the camera view.

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