Organization name: Directorate of IT & Cyber Security, DRDO

Team Name : Code Clan

Problem Statement : Indoor Navigation App (CK139)

College Code :

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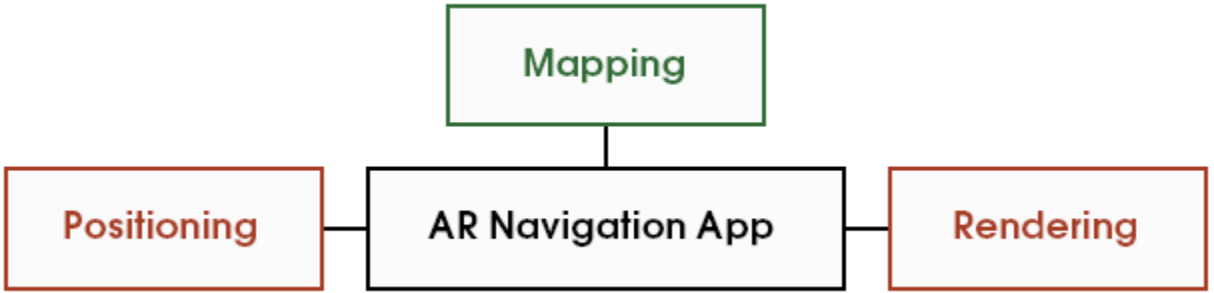
Category : Software

With a Smartphone in hand, it is pretty easy for us to find our way to the destination using outdoor GPS navigation mobile apps, even when we are in an unfamiliar city. However, it is possible to get lost indoors, with GPS satellite signals not being accurately traceable in case of navigation apps. Indoor navigation deals with navigation within buildings. Because GPS reception is normally non-existent inside buildings, Wi-Fi or Bluetooth Beacons can be used for indoor navigation. But these have an accuracy of 5 – 15 meters and requires costly hardware installation. It's easier to navigate indoors when you can see your surroundings. We intend to develop an augmented reality application which will show the directions to the destination in the user's camera. It consists of 3 modules which have to be factored in; and these include: **Mapping**, **Positioning**, and **Rendering**. With a map and coordinates, we make the required route. So, the map for the required route is captured and stored in cloud. Rendering module manages the design of AR content and its work is to draw a route in 3D map already captured. Then we determine the precise location of users indoors by the streaming data fed by the user's camera and the directions are shown in their camera.

Technology Stack:

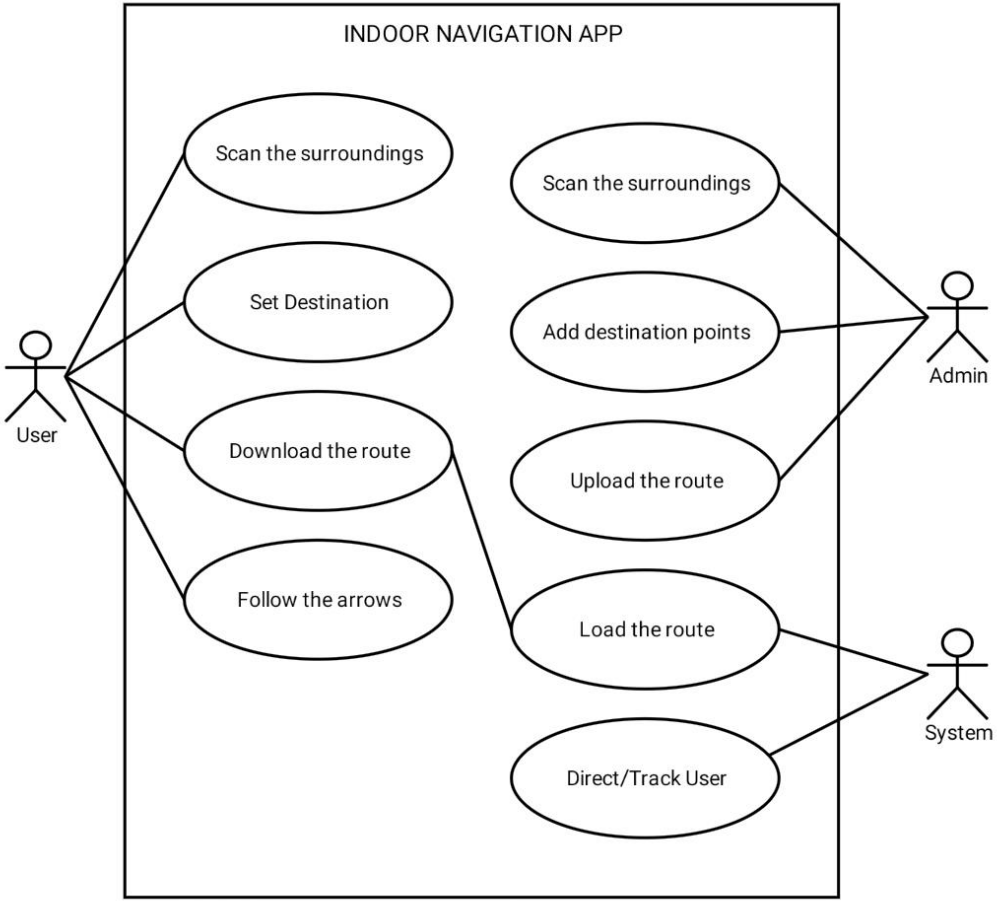
AR-based indoor navigation is one of the most popular but still a relatively unexplored niche, as the technology is far from being perfect at present, and it's necessary to develop greater flexibility and scalability to enable it to flourish. The solution includes three modules namely **Mapping**, **Positioning**, and **Rendering** which makes it easy to update or upgrade the components independently.



The application is developed in **Unity** from the scratch to the end using some essential plugins like **Google ARCore** to embedd the animations as augmented reality, **MapBox** for maps, **Placenote** to store the captured route map, etc. We aim at developing the front end in the simplest way possible so that the users can easily reach their destination by just opening the camera where the directions are shown as animations in their surroundings.

Use Cases:

- The user is the primary actor for the Indoor navigation app. As the user opens the app, he is asked to choose a destination based on his present location. Once the destination is chosen, route is downloaded and animated directions are shown in the surroundings to reach the destination.
- Whenever a user wants to access a route it is the system's (secondary actor) work to get that particular route from the cloud and render it to the user.
- Admin can add new routes or update the existing routes by capturing the route map and uploading them on to the cloud.



Dependencies/Showstoppers:

Few hurdles that might arise while developing this system are:.

1. The application requires to navigate the user to the destination with high precision.
2. A large amount of the development goes into the prototyping and 3D models creation for the AR module.
3. Admin needs to capture the map with a high quality camera.
4. User is also expected to use a smartphone having a good camera for rendering clearer and stable animations.