iGuideU (An Indoor Mapping System)

Data Structures and Algorithms Project

CSE 2003 **Slot: B1**

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Abstract

- We are all already familiar with GPS navigation outdoors and what wonders it does not only for our everyday life, but also for business operations.
- Outdoor maps, allowing for navigation via car or by foot, have long helped mankind to find even the most remote and hidden places.
- Increased levels of efficiency, unprecedented levels of control over operational processes, route planning, monitoring of deliveries, safety and security regulations and much more have been made possible.
- Some places are, however, harder to reach and navigate than others.
- For instance, places like big indoor areas – universities, hospitals, airports, convention centres or factories, among others.
- Luckily, that struggle is about to become a thing of the past.

Introduction

- Indoor navigation is quite different in terms of complexity compared to outdoor navigation.
- With outdoor navigation, millions of people currently use the technology as it doesn’t require much performance; modern smartphones and even smart watches have built-in GPS and maps.
- Indoor mapping allows you to position objects and people in a closed environment.
- This is especially important in hospitals, airports, universities, hotels and in general any environment with large concentrations of people.
- This allows for example to have patients, clients, children etc. always located within those spaces. Which is a qualitative advantage.

Problem Statement:

- Navigating outdoors is easy, thanks to GPS and various map services.
- However, navigating inside an unfamiliar building can be a major hassle for anyone.
- Outdoor navigation is done by GPS via satellite communication. But these GPS signals are not available or of lower strength in indoor areas.
- As a result, it is difficult to navigate indoors using GPS.

Proposed System

- Developing an Indoor Navigation system which will work without the GPS system.
- The proposed system has two parts integrated into a single system.
- The first part is the hardware consisting of the RFID tags and reader. This system will not be discussed in detail.
- The second part of the system is a backend server with runs a model using Dijkstra's Algorithm which will give the mapping from current location to the desired location as the output.
- The output will be displayed to the user via a mobile app.
- Through this Indoor Mapping System, people will be able to navigate Inside huge buildings like hospitals, shopping malls, universities etc.

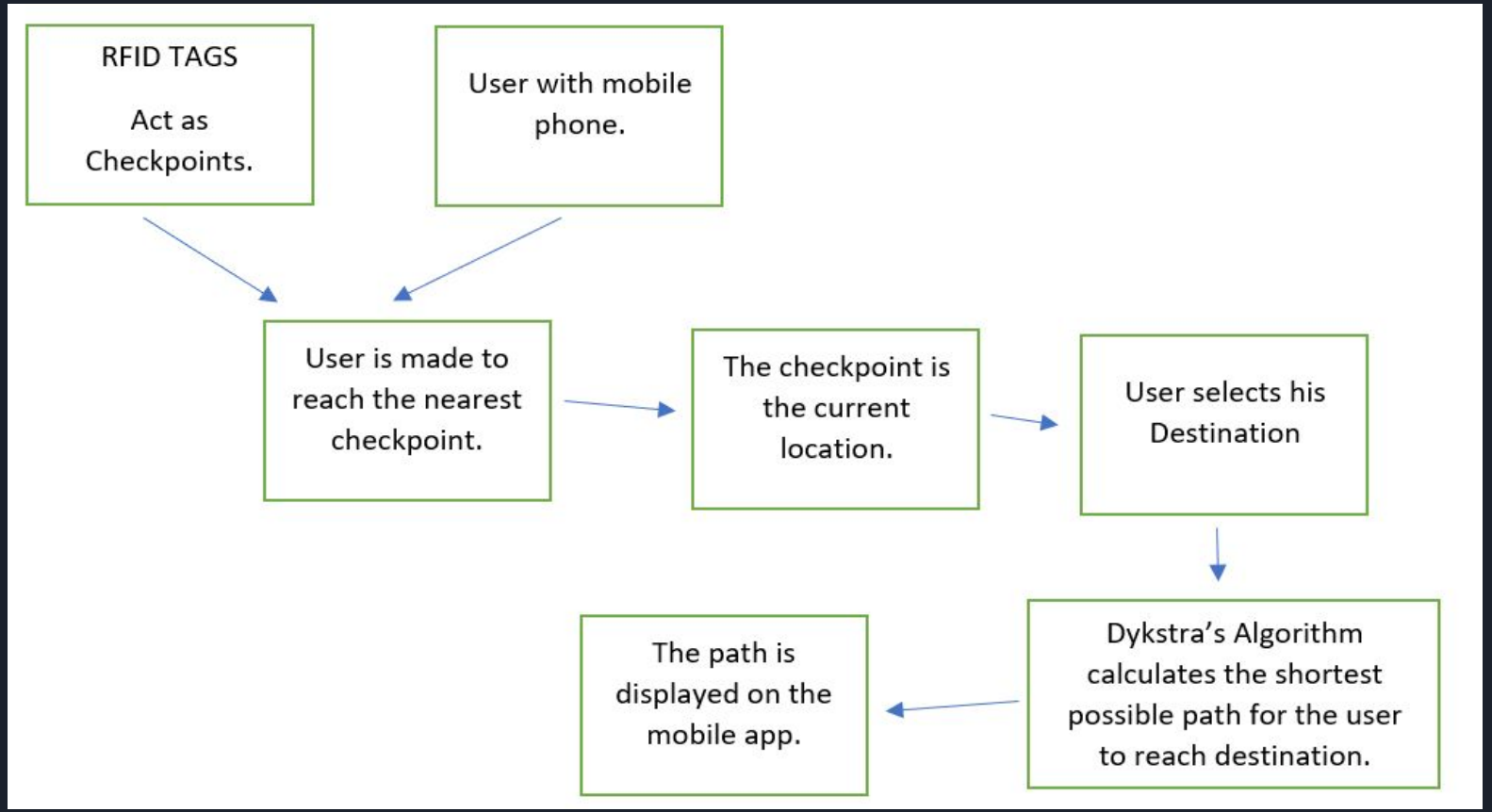
NOTE : In this project, ground floor of TT building of VIT university is chosen for demonstration of the working prototype.

Algorithm used:

Dijkstra's algorithm:

- Dijkstra's algorithm calculates the shortest path between one node and every other node in the data.
- iGuideU uses Dijkstra's algorithm to calculate the shortest distance between all the checkpoints defined inside the building.
- When the user is at a place inside a building, considered as origin and selects his preferred destination, the shortest path between these two nodes is highlighted and considered as the navigation path to the user.

BLOCK DIAGRAM:



How it works?

1. iGuideU works on interfacing of two systems:
   a. Hardware System: To know current location of the user.
   b. Software System: To calculate the path from user's current location to destination.
2. The Idea is to define checkpoints like main entrance, hallway, room numbers, washrooms etc. in the indoor area.
3. These checkpoints are marked with RFID tags which transmit Radio Waves.
4. All these marked checkpoints are fit into Dijkstra's Algorithm to find the shortest path between the origin and the destination of the user.
5. A mobile app will be developed which receives and tracks these radio waves from the RFID tags and takes the user to the nearest checkpoint and then asks for the destination of the user.
6. These destinations will be menu driven from which the user has to select his desired destination.

How it works?

6. After the user selects his destination the Dijkstra's algorithm calculates the shortest path from the user's current position to his destination.

7. The navigation path is displayed to the user via the mobile app and the user can now easily reach his/her destination without any trouble.

8. The system can be further developed by including voice assistance navigation to the users.

9. Thus, iGuideU solves the problem of indoor navigation and helped the people to navigate inside huge buildings conveniently.

Working

- As the Hardware part is not discussed, let us assume that the user is at the main entrance which corresponds to the code number 0 which will be encoded in the RFID tag.
- As the source location ‘0’ is scanned, now the user will have to select his destination from the dropdown list.

```
Enter source location: 0

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Choose your destination:
0 Main Entrance
1 Entrance/Exit2 (Balaji Store)
2 TT Gallery1/Shakespeare Gallery
3 Main Lift1
4 Entrance/Exit1 (SBI ATM)
5 Gents Washroom
6 Ladies Washroom
7 Room: 38,37
8 Room: 35,36
9 Room: 30-32
10 Room: 33,34
11 Room: 25-27
12 CTS
13 Room: 15,14
14 Room: 12,13
15 Room: 10,11
16 Room: 6 to 9
17 Room: 3-5
18 Room: 1,2,20
19 Room: 18,19,21,22
20 Lift2 & Stairs
21 Room: 39 to 43
22 Nescafe
23 Amphitheatre
```

Working

- Let’s assume the user chose TT-Gallery 1 as his destination. The output will be

Novelty

- Currently, Indoor Navigation Systems are limited to usage because of various reasons.
- The current system uses high cost systems to navigate users inside buildings.