QRcode Based Navigation System on Cloud Computing Platforms

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Abstract-Smart phones are widely used as navigation aid nowadays. Most of the smart phones provide a built-in Navigator or Map application with some sort of GPS capability. These navigation applications provide accurate navigation for outdoor location using GPS unit of the Smartphone. But providing accurate navigation inside a closed building is still a challenge. Several solutions are available in the market for indoor navigation using Bluetooth, Wi-Fi and AGPS. But their reliability of navigation in all given scenarios is still a challenge. In this paper we propose a elicit a cost effective and 3D latitude, longitude and altitude smart phone solution which helps in indoor navigation with the help of QRcodes. The QRcodes are used in this context to provide location information to the user optically. QRcodes will be used all across the building to carry the information required for the navigation systems. QRcodes will be used all across the building to carry the information required for the navigation system.

Keywords: QR code, cloud computing, Navigation system, Smart phones.

I.   INTRODUCTION

Navigation/Map applications for Smart phones are quite useful in the day-to-day life. There are lots of applications available in market which provides efficient and user friendly navigation to the user. Most of the applications are successful in assisting the user with his current location and providing directions to particular destination for outdoor locations.

In most of the scenarios this is achieved using the GPS unit of the Smartphone. But accurate navigation while not in line of sight with GPS satellites is still a challenge. There is a limitation for smart phones to locate their exact position while in covered areas such as shopping malls, airports, railway stations, multi storied buildings, apartments.

There are in door navigation systems available in the market which uses Bluetooth, Wi-Fi, AGPS or RFID. Bluetooth requires expensive receivers and the accuracy of bluetooth navigation depends upon the number of cells used. Wi-Fi also demands expensive access points for indoor navigation. AGPS uses network assistance servers for indoor navigation Using AGPS technique; accuracy is very much limited because of approximation. Information provided by the system is 2D.

It involves infrastructure cost for provider and the user. RFID requires active tags for indoor navigation, where the accuracy is directly proportional to the number of active tags used. Active tags are self powered and hence costly. Also close pass by is required to sense RFIDs and even the user need to be aware of the RFID position. Most of the existing solutions are far from providing an accurate and cost effective indoor navigation.

The following paper is described as follows: section 1 briefs about the introduction and motivation of the smart phones in our daily life styles and as well as in the marketing application and then how it is useful in the field of the GPS and navigation systems. Section 2 describes about the motivation of the paper with the three steps, creation of the floor plan, using QR code and lastly smart phone navigation application. Section 3 deals with the Existing system with the advantages and disadvantages. Section 4 deals with the proposed system with advantage and disadvantages. Section 5 briefs about the techniques used in the proposed system. Section 6 tells about the model view diagram in brief with the methods used. Section 7 describes about the algorithm steps and the flow chart. Section 8 deals with the conclusion and lastly the references.

II.   MOTIVATION
(i)   Creating the Floor plan

To provide proper navigation to the user, the indoor location plan should be made available to the user. A floor plan needs to be created for the indoor location. For multistoried building separate plan is required for each floor. The floor plan essentially represents the layout of a particular floor depicts a sample floor plan, where areas A to F denote important places in the floor. These areas could represent a shop, escalator, lift, washroom, entrance/exit areas and so on.

Once the floor plan is created, floor plan is assigned with corresponding geo location co-ordinates. These location coordinates are used to overlay the floor plan on top of the geographical map. Once the floor plan is created, the floor plan is made available for the user through a URL link. Each floor should have the corresponding floor plan. This could be made accessible using any of the wireless technologies. Once the map is made accessible wirelessly, the URL of the floor plan is encoded into the QR code. Once the floor plan is created, points are identified where the QR code needs to be placed

(ii)   Using QR Code

QR codes are two dimensional codes where the data is encoded in an optically readable format. For indoor navigation QR codes are used for two purposes.

1. To provide the user link to the map of the indoor location.
2. To provide the location details to the user QR code for a location contains two parts.

First part contains the URL information from where the floor plan could be downloaded. Second part contains location information such as latitude, longitude and altitude. Floor plan here refers to the layout of the particular floor in the in-door location. QR codes can be placed all along the pathways and also on important locations with corresponding latitude, longitude and altitude of the location. The entire floor could be placed with QR codes at strategic locations. Before placing a QR code at a point 'a' inside the floor, the geo location details for the point needs to be found, which is typically provided by civil construction department. Geo location details include altitude, latitude and longitude of the point.

(iii) Smart phone Navigation Application

The navigation application in the mobile uses the camera to read frames continuously. The current visuals of each frame are checked for the presence of a QR code within the frame. Once a QR code is found, the application decodes the QR code and obtains the floor map URL and geo location details. If the floor plan is not present already then application downloads the floor plan using the URL via wireless connectivity. This floor plan is overlaid above the actual geo location map such as Google maps.

III. EXISTING SYSTEM

Smart phones are widely used as navigation aid nowadays. Most of the smart phones provide a built-in Navigation or Map application with some sort of GPS capability. These navigation applications provide accurate navigation for outdoor location using GPS unit of the Smartphone.

Advantage:
- User can Locate the outdoor details on smart phone using GSM device
- The exact Location details of User can be found

Disadvantage:
- User can not locate the inside indoor details because of week signal as the wall, house, will obstruct the signal to reach the smart phones.

IV. PROPOSED SYSTEM

Need to create a floor plan (Map of floor). Once the floor plan is created, floor plan is assigned with corresponding geo location co-ordinates. These location coordinates are used to overlay the floor plan on top of the geographical map. Once the floor plan is created, the floor plan is made available for the user through a URL link.

Each floor should have the corresponding floor plan. This could be made accessible using any of the wireless technologies. Once the map is made accessible wirelessly, the URL of the floor plan is encoded into the QR code as once the floor plan is created; points are identified where

the QR code needs to be placed. QR code for a floor X at point a could be defined as QR code(X, a) = URL for floor plan(X) + Location Details (a); where Location Details (a) = Latitude, Longitude.

Advantage:
- User can locate the floor plan in its Smart phone by using QR code.
- No need to have any GSM device inside smart phone
- Main advantage of this approach is that it is cost effective for the service provider. Users/visitors.
- Complexity and time to implement is less for this approach.
- There are no additional configurations which the users have to maintain for indoor navigation.

Disadvantage:
- QR code must be generated by QR code generated device which is costly.

V. PROPOSED TECHNIQUE

QR codes are two dimensional codes where the data is encoded in an optically readable format. For indoor navigation QR codes are used for two purposes.
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Navigation Application Components

This section provides details about the mobile application components. QR detector processes the visual frames and checks for the presence of a QR code. If a QR code is detected then QR Detector forwards the QR code to QR Decoder. QR Decoder component decodes the QR code and obtains the code contents. This content is being accepted by content parser module and parses to find out the floor plan URL and geo location details. Floor plan handler module uses the URL to download the floor plan and its location coordinates from the floor plan repository. Once the floor plan is downloaded, floor plan handler overlays the plan on top of the geographical map using the location coordinates. As a final step the location details from the QR code is used to provide the user his current location.
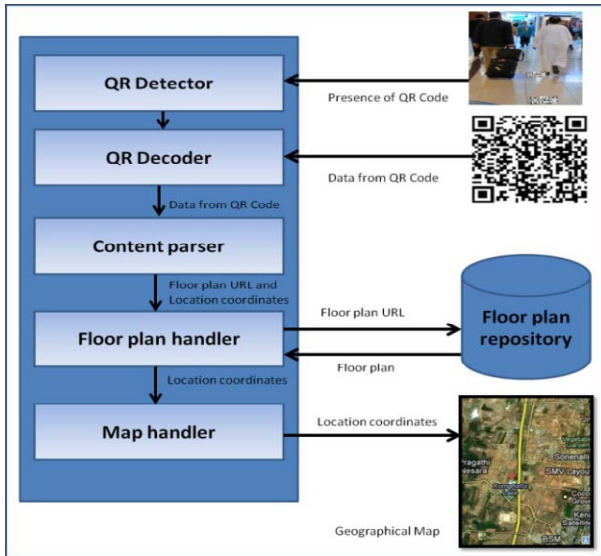
VI. MODEL DIAGRAM

Figure 1 : Smart phone application components

Algorithm Steps :

Step 1 : Start

Step 2: Initially scan the QRcode

Step 3 : Check for the condition : Valid QR code ,
     If condition is YES goto step 4, else goto step5

Step 4 : If condition is YES, valid QRcode
     (i)   Fetch the floor plan from the cloud
     (ii)   Find the location cordiate send by the cloud
     (iii)   Show the location with the map to user

Step 5 : If condition is NO, invalid QRcode go to step 6
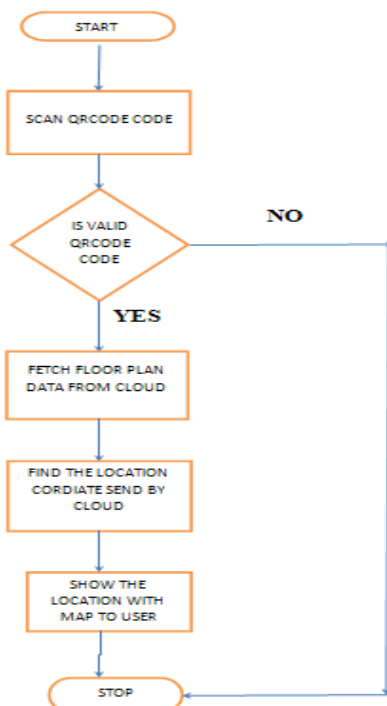
Step 6 : Stop

VII. FLOW CHART

Figure 2 : Fetch floor plan from cloud and shows location map with user

CONCLUSION

The main challenge in this approach would be the impact of handling change in floor layout. Any layout change would lead to repetition the whole process. QR code detecting and decoding depends on the resolution and quality of the camera used by the smart phone. A low quality camera can have a negative impact on indoor location navigation. Also identifying and decoding the QR code while the user moving fast is also a challenge. Another challenge that the service providers might be facing will be in strategically positioning the QR codes along the building for optimum usability.

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