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Functional Specification Contents

0. Table of Contents

1.0 Introduction

1.1 Overview

My aims for this project is to develop a mobile application to facilitate visually impaired or blind people to get their surrounding areas information from their smart phone through Global Positioning System (GPS). The application was designed as orientation aid to help visually impaired or blind people to find their way. The users would interact with the application via an Android Interface to obtain a locations query information.

1.1.1 Description of a need for the system

It has been bringing me an attention for a while to consider to develop a mobile application for visually impaired and blind communities to save their money to buy and carry an external GPS device while walking it to an unknown place where this days a smart mobile phone can do the task and creating a mobility convenience. The core for this system is to help visually impaired and blind people to get their current location detail, surrounding areas information such as public and private business services, provides a step to step navigation guide and making a route record through Global Positioning System (GPS). The system is designed to minimize user(s) search query interaction with keyboard while walking it to a busy and noisy street and road and so forth. When making a query such as check my location, exploring surrounding places, navigating a place, user(s) will be given an audio announcement on the return information by Text-To-Speech system.

1.2 The application in business context

Deployment

At this stage of the development process, it is being foreseen that the will be launched and available online via a website and hopefully the app will also become available via Google's Play Store and it will then make available to local blind organization through its community. As previously mentioned, the function of the application will provide a mobility convenience, avoid carrying an external GPS device rather than paying an unaffordable massive price. The proliferation of Smartphone's/tablets means that this should be a cheap, cost effective and time saving way achieve this.

1.3 Glossary

This is a mobile platform that allows users to use their smart mobile phone to obtain their surrounding areas information, exploring a place of interest and provides a step to step navigation guides and recording a route through Global Positioning System. All the requested information will be provided an audio announcement by Test-To-Speech system. This is a cloud platform as a service and support, all license trademark to Google Android must be accepted when using it. I am considering to implement the application code in Java programming language but I leave it open as an optional coding in Xamarin for Android application in C# programming language

2.0 General description

2.1 Product / System Function

The functions of the product / system will be the ability to obtain real time information through http web services. Users will also be able to explore surrounding areas business activities and information and make choice whether user(s) need a navigation help. Meanwhile, users also allow to record a route for their future use.

The Text-To-Speech system will be announced the textual representation information to the users. Therefore, this could increase user(s) confidence and work independently while walking it to an unfamiliar place.

On opening the application, the users will be shown a welcome home screen, it will then the system will be testing out the cellular network connection is working fine. In the event of no network coverage, the screen will provide a "Try again" button to enable users to refresh their cellular network status.

After checking the network coverage, if successful connected to the network, the next screen will be shown four different functionality buttons, this include a button for "My Location", "Explore", "My Route" and "Record". When users pressing on each of the functionality button, users will be given an audio announcement in textual representation through Text-To-Speech system on the return query that users make.

2.2 User Characteristics and Objectives

The user base of this application will be those who are having visual difficulty, mobility inconvenience to get around surrounding areas information that might not accessible for them when users entering to an unknown territory by themselves.

The core objective for this application is to minimize users to carry an external device and spending money to buy a separate device where users can simply use their smart phone to perform the same task that GPS does. The application will be useful for the user when users trying to interact input query with keyboard while users walking it to a busy and noisy place. The application will allow users to get what surrounding areas information in a few quick steps and informations will be announced in textual representation by Text-To-Speech system.

2.3 Operational Scenario

Users experience

Users will not be able to use the application when user's cellular network is unavailable. This could be users in a hidden area which surrounded by tall building, inside the building and in the remote area which has no good network coverage. In this scenario, the application will keep connecting to the network and cellular phone battery power become weak quickly.

In the event of a bad or severe weather, the cellular network become lack and fluctuated to connect to Global Positioning System

Another example why users having difficulty to connect to the network is because users run off their data internet quotas and the application keep trying to connect.

2.4 Constraint

Constraint of the application

At this early pre prototype stage of the design process, it is not believed that there will be any issues running the software on any Android devices with latest or oldest Android operating system. This software has been selected as it is the most recent large update available. The application, in all realism, should run on any Android powered device with minimal difficulties.

Speed requirement

There may be issues with the speed of the application on older device but this will be down to lack of memory and processing power on their part.

Time constraint

This is an individual project, due to lacking support from a sighted person, when making design such as screen size, colours, grid positioning so forth will be a huge challenging for me to work on my own to deliver this project on time. Hopefully, this technical issue can be dealt and achievable.

Industry protocols Constraint

This application will be using a Google Geolocation, Location Service APIs' library and require a license key and an update digital map to relate the GPS signals.

3.0 Functional Requirements

The application establish a cellular network connection checking My Location

Description:

The system will be able to take input query from user, the system will gather all related information and return it to user and the system will provide audio feedback through Text-To-Speech system.

Criticality:

This is an essential step, if the application cannot get users cellular network status talk to the Map API, then there will be no information can return to user.

Technical Issues:

For any connection to Map API services, the application must require data internet quota to establish the connection.

Dependencies

This is dependent on the user having an Android device with internet connectivity which supported through Android Connectivity APIs. The application being functional.

The application establish a cellular network connection to enable Explore

Description:

The system will be able to take input query from user, once the system get exploring and it would allow user to toggle points of interest from the return explore lists and the list items will be spoken out by Text-To-Speech when user touch at one of the list item.

When the application established a connectivity with cellular network, the Map APIs must now have user current location details, the Map APIs via http web services will then gather the surrounding areas information within the user current position and returns a list of public or private business details.

Criticality:

This is the essential to the functioning of the application. This is important when datas are being return and relates it to digital map.

Technical Issues:

In the event of a bad weather, there are no guarantee the Map APIs would provide an accuracy of the information that been queried. Users should take cautious!

Dependencies:

The function is dependent on a relevance documents that have entered the internet search service provider database.

The application access the Google Maps Directions API through an HTTP interface, with requests constructed as a URL string, using text strings or latitude/longitude coordinates to identify the locations, along with your API key.

The application creates a route record entry database to enable Record

Description:

When a route been requested to record, the application create a record entry into the database. Prior to the entry process, connectivity between Map APIs and cellular network must be connected, this mean no interruption and corrupted data be entered the database.

Criticality:

The application cannot function without Distance Matrix and Direction APIs where no actual URL / http internet connectivity.

Technical Issues:

Again, the application dependent on an internet connectivity, thus cellular network connectivity must be in a reasonable condition at the very least.

Dependencies

On each of the data been recorded into the database, the cellular phone memory must have hold enough or at least a reasonable capacity.

The application provides a step to step navigation from My Route

Description:

The system allow user to select recorded route. On each of the selection, the system provides a step to step navigation guide to user in a textual representation with Text-To-Speech system.

Criticality:

The function will fail to respond when internet connectivity through cellular network is lack, therefore the navigation guide will not be able to proceed.

Technical Issues:

The route data must still matching to the Map APIs service via cellular network

Dependencies

The system must have a separate Text-To-Speech application been installed into the cellular phone. Whenever the system need a spoken textual representation, it should able to compatible with this Text-To-Speech system. Again, the system must have internet connectivity to process this kind of request by user.
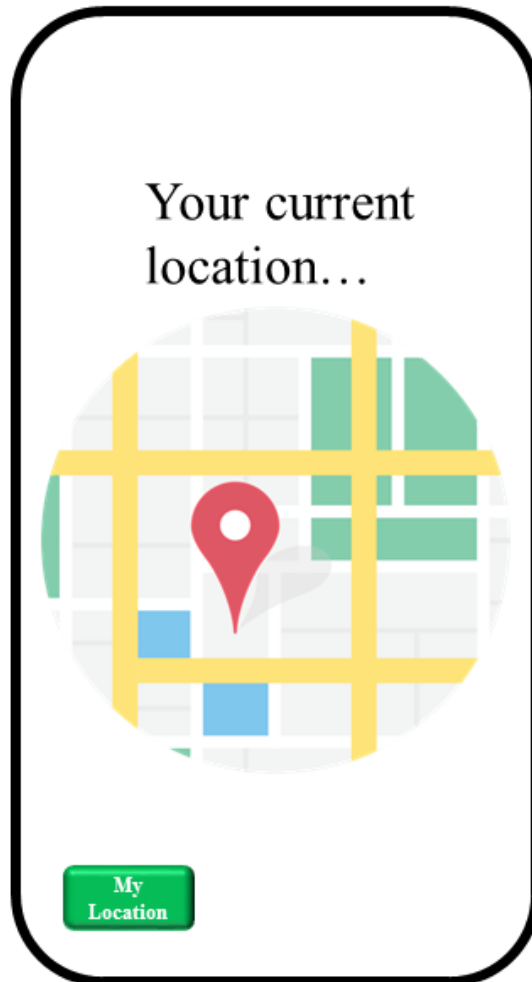
4.0 System Architecture

This is an architecture diagram showing the layout of the application.

Illustration of the application home screen
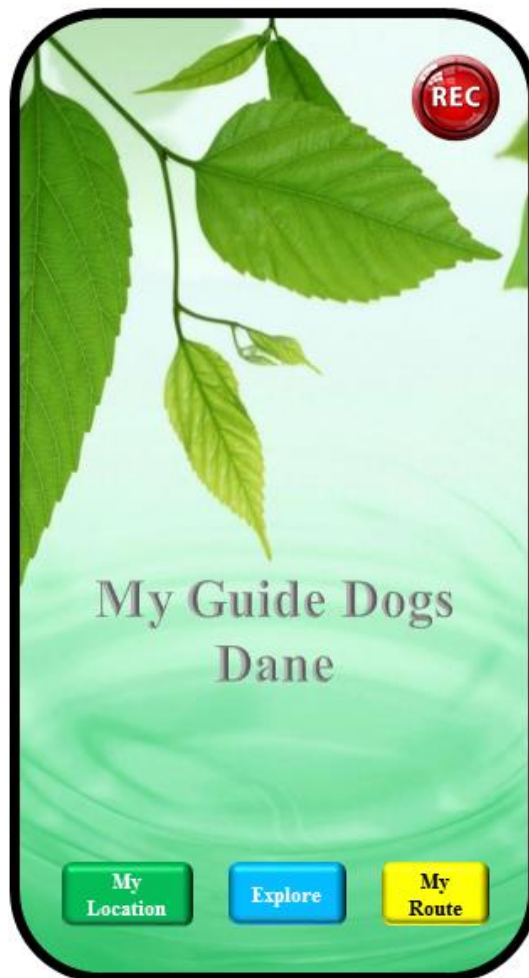
The application shows the home screen with three different functionality button at the bottom and one function button at the top right corner of the screen.
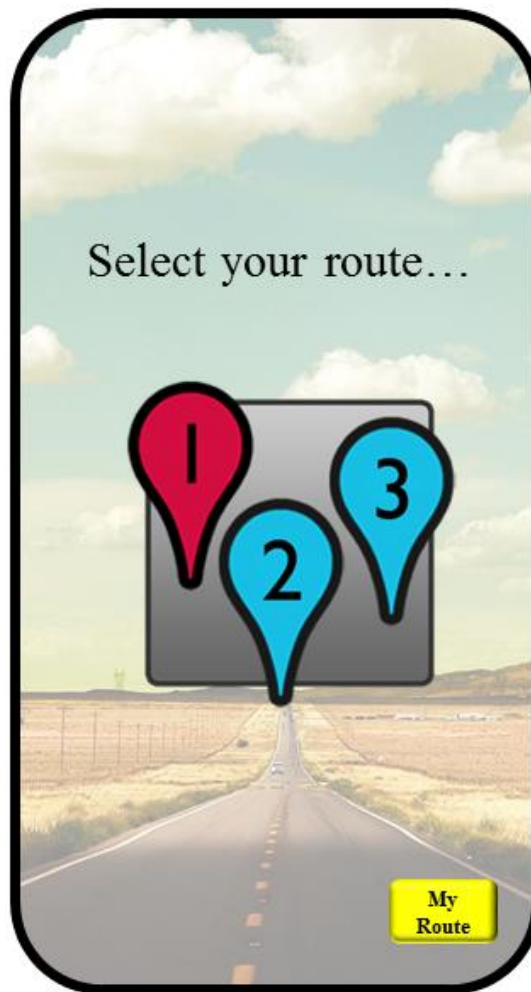
Illustration of the application of My Location

When "My location" is selected the application will sent a signal call to the GPS system and return a query through relates it to digital maps of user(s) area. The application will then announce the street information as they are encountered with Text-To-Speech system.
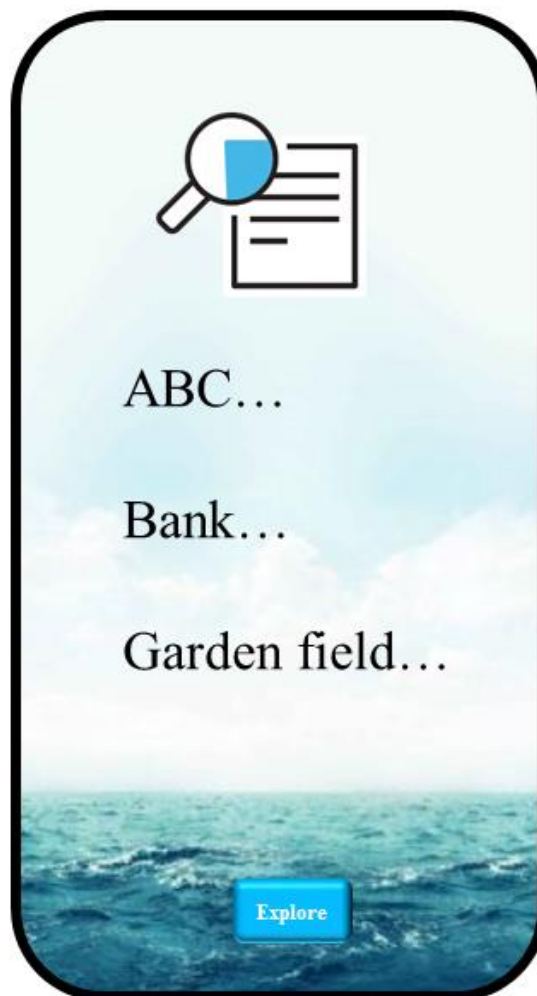
When "Explore" is selected, the application will search and calculate for the surrounding areas information and relates it to digital map of user's current position and return surrounding points of interest such as public services i.e. banks, hospitals, bus stations and business services i.e. restaurants, shopping centres and so forth. When users selected a destination from the explore lists, then the application will provide (announce) step by step instructions on how to navigate them with Text-To-Speech system.

When this "My Route" is selected, it searches on database whether an archive routes are existed, if found a history route, system will provide a step to step guide navigation with Text-To-Speech announcement.
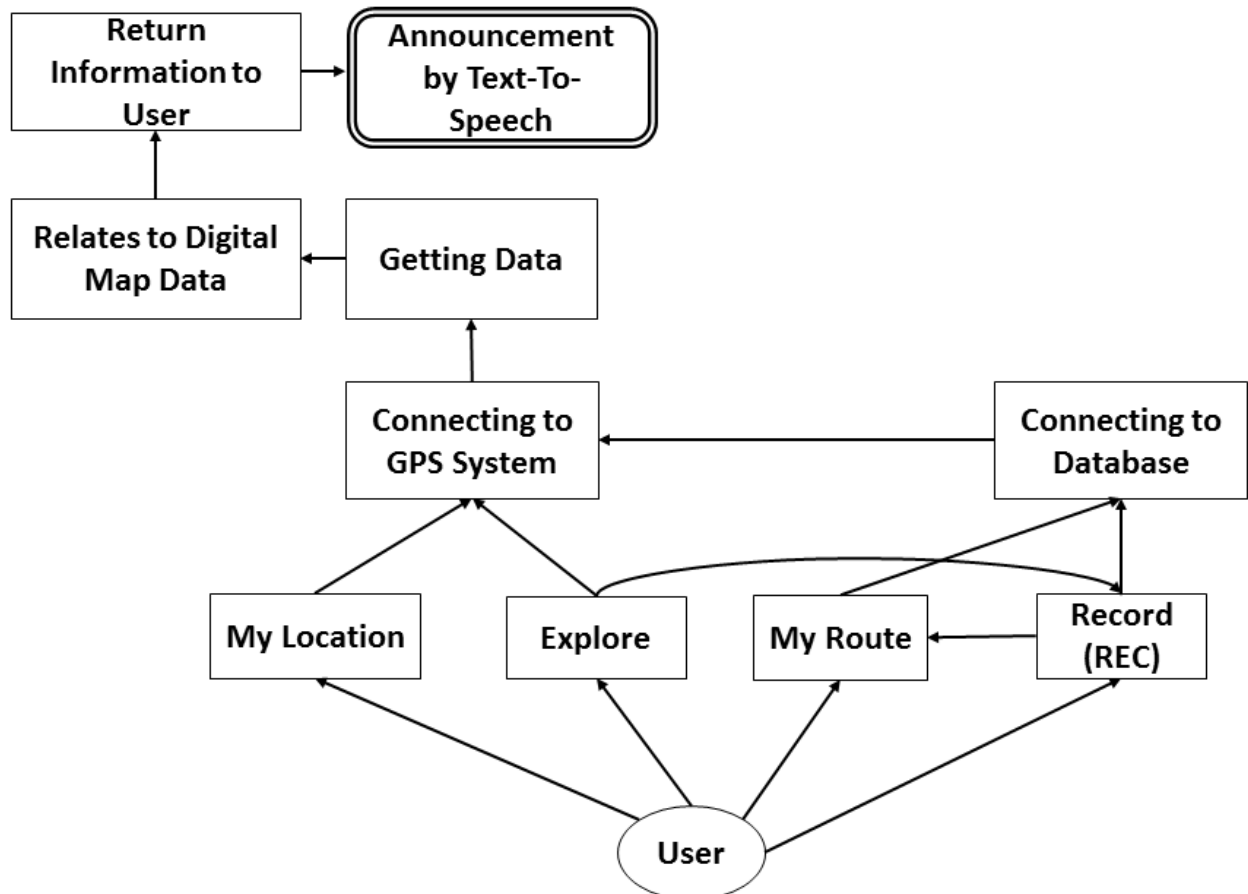
Illustration of the application Record
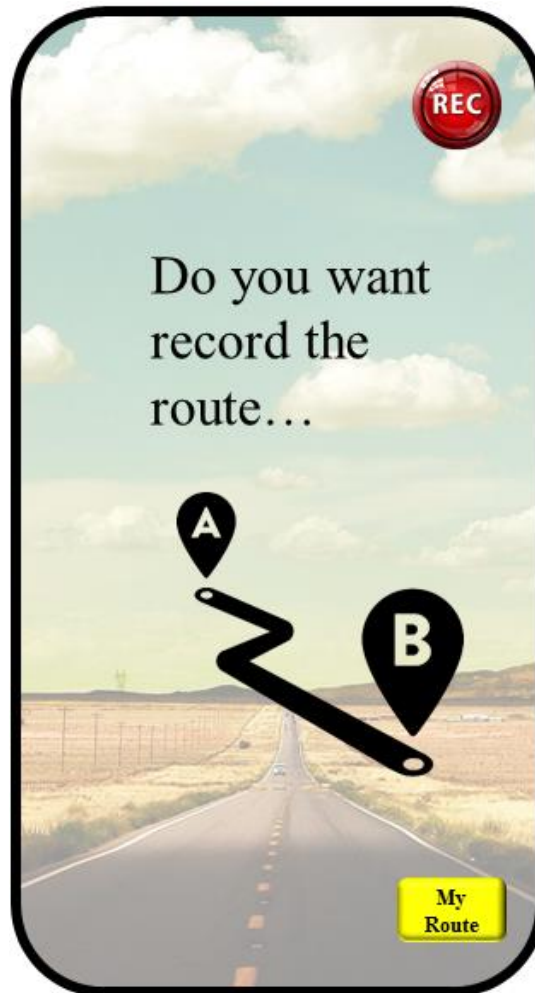
When "Record" is selected, the system establishes an entry point into the database, it records user's movement through GPS and store the movement point into the database.
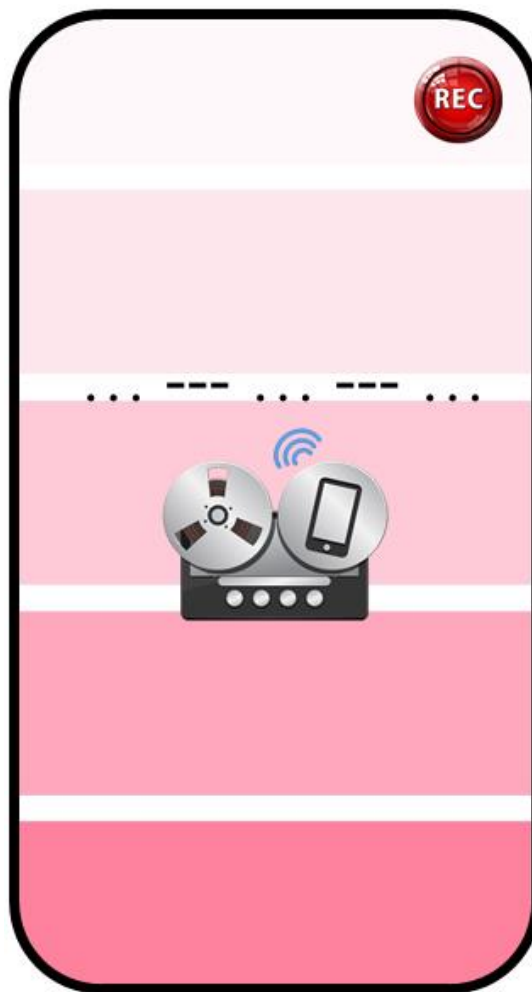
5.0 High-Level Design

The Data Flow Diagram shows below are the flow of the process of taking input from the user.

```
Return                  Announcement
Information to   ──►    by Text-To-
User                    Speech
  ▲
  │
Relates to Digital  ◄── Getting Data
Map Data                     ▲
                             │
                  Connecting to  ◄────────────  Connecting to
                  GPS System                    Database
                   ▲   ▲                           ▲  ▲
                  /    │    \                       │   \
          My Location  Explore   My Route  ◄──  Record
                 \       │        /    \          (REC)
                  \      │       /      \         /
                       User
```

Users making a query through connecting GPS, and the data send back from the internet then relates to the digital map and user getting a message and Text-To-Speech announces the textual representation.

6.0 Preliminary Schedule

At the beginning of planning, designing and developing this project I have spent time to research about use of Google Location Services, Google Map, Google Place, Google Geolocation APIs documentations and how to relates its digital map through a MAP APIs availability. I was considering what programming language I want to use to developing the application. I have also consulted with IT professional personnel to get a general opinions about the core of the application.

7.0 Appendices

Release and repository at:

http://gitlab.computing.dcu.ie

release application at:

http://www.play.google.com

Google Geolocation services and pricing and plan at:

https://developers.google.com/maps/pricing-and-plans/