

NTS – A NAVIGATION TRACKER SYSTEM

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Abstract

People are fond of travelling to various places and are unaware of the directions and the route to be followed. Without knowing the accurate and optimal directions they might end up getting to a wrong place. This paper introduces NTS (Navigation Tracker System), which is implemented to provide the tourist with the map along with the directions showing the optimal path between the source and the destination. We intended to create a lightweight interface for Android mobile device. The system integrates Google Maps API, Android Software Development Kit (Android SDK), ASPX web page created on web server and web 2.0 technologies like Javascript with .NET technologies. The output is a system which not only consumes less resources of the host device as compared to Google Maps application but also consumes 30 times less space on the device. NTS will also provide additional information like directions, time and distance between the source and the destination which are not provided implicitly in other applications.

Index Terms: GoogleMaps, Android, JavaScript

1. INTRODUCTION

Nowadays, people prefer the mobile applications that give more information in less time and at less cost. So we designed NTS by which a user can get to know the optimal path between source and destination, the distance between them and the time taken and directions to be followed to reach there. Google Maps are being used that give digital maps and highlight the path between the two places using markers and lines. But, this application was designed to provide more information to the user in faster and efficient manner.

Google Maps is free web mapping service application provided by Google and is made for non-commercial purposes. Other applications currently being used are Global Positioning System (GPS) takes the latitudes and longitudes of the places and Google Earth. With the use of Google Maps API, the developers can integrate the data in their applications with the Google Maps [1].

This paper focuses on the technical details of the Navigation Tracker System (NTS) which gives the optimal path between the two places. It also gives the directions and the total time required to reach from source to destination and also the distance between them. In addition to this, it provides the map that has the path between source and destination. This application consumes less resources of the host and provides

with the required information in efficient way. It occupies less storage space in the device. The downloading cost involved for fetching all the information is very less.

NTS is designed by using Google Maps API, Android SDK, and web 2.0 technologies like ASP.NET [2] [3] [4] and Javascript with .NET technologies.

The layout of this paper is as follows: Section II presents the review of tools used. The analysis of proposed system including characteristics and design constraints is explained in Section III. Section IV gives the detailed design of system. Section V shows the application interface of system and the results. Section VI draws on the conclusions and gives the future prospects.

2. REVIEW OF TOOLS

Android is latest technology and is being widely adopted by people. It is a software track for cellular devices and includes operating system, middleware and key applications.

2.1 Overview of Android

Android was initiated in 2005 and is an operating system that relies on Linux for core system services that include security, memory management, process management and network stack and driver model [5] [6].

- **Development Tools** - It includes Android Software Development Kit (Android SDK)[7] which provides the tools and APIs that are necessary for developing the applications on the Android platform using the Dalvik Virtual Machine (DVM) with Just-In-Time compilation to run compiled Java code [8] [9].
- **Devices** - It supports Smartphones, Tablet computers, E-readers, Netbooks etc that have Android environment [10].

2.2 Core Libraries

- **Media Libraries** – They support playback and recording of audio and video formats and static image files [8].
- **Surface Manager** – It manages the access to subsystem and composites 2D and 3D graphic layers [8].
- **LibWebCore** – It is modern web browser engine [8].
- **SQLite** – It is lightweight relational database engine [8]

2.3 Application Components

The building blocks of Android applications are Application components. The application components are as follows:

- **Activities** - Activity represents single screen with user interface. All activities are independent of one another but a different application can start multiple activities depending upon the application requirement [11].
- **Services** - A service runs in the background to perform long running operations without blocking the user interaction with an activity. It does not provide a user interface [11].
- **Content providers** - A content provider keeps a check on the shared set of application data. Other applications can query and modify data by using the content provider. It also helps in reading and writing the private data [11].
- **Broadcast receivers** - A broadcast receiver responds to system-wide broadcast announcements. Although it does not display user interface but it creates a status bar notification to alert the user about the occurring of the broadcast event [11].

3. SYSTEM ANALYSIS

NTS takes 30 times less storage space as compared to the MAPS application of Android, so it is more efficient and consumes less resources of the host device. It provides directions to the user along with the distance and the time taken also gives the map connecting two places with the help of overlays object that is markers and lines. .NTS has the following characteristics and constraints:-

3.1 System Characteristics

- Consumes less resources of the host.
- Occupies less storage space in the device.
- Provides the optimal path between the source and destination.
- Gives the directions to reach the destination.
- Specifies the total distance and the time taken to reach destination.
- Works in faster and efficient manner.

3.2 Design Constraints

- **Hardware Requirements:** Intel core i3 or above processor, 300GB hard drive, 3GB RAM, 1366*768 pixels display resolution.
- **Software Requirements:**
 - 1) *Client*- Application installed on the Android device should have powerful GPS receiver to get the location of the user automatically.
 - 2) *Server* –
 - Eclipse IDE
 - ADT Plugin for Eclipse
 - Android SDK
 - Microsoft Visual Studio .NET 2005 platform
 - ASP.NET and C# languages
 - Google Maps API

4. DETAILED DESIGN AND IMPLEMENTATION

4.1. System Architecture

The NTS is designed in Android and in .NET environment. The architecture of the system is shown in Fig.1.

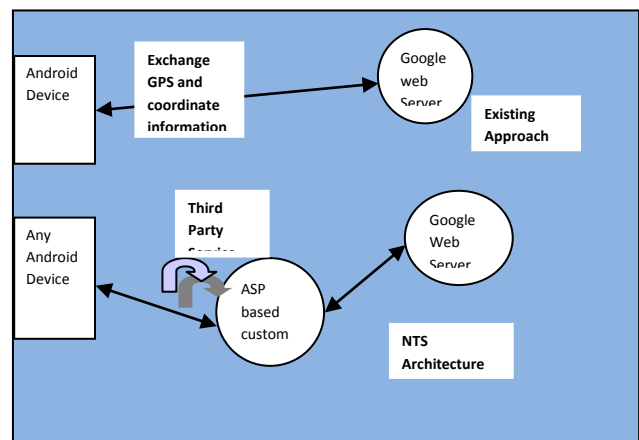


Fig-1. Architecture of NTS

The above figure also shows the difference between the architecture of existing applications and NTS.

4.2. Modules of NTS

- **GPS Location Listener Module** - This module interfaces with the hardware of the mobile device and detect the GPS coordinated received, typecast received coordinates to appropriate decimal precision size.
- **Automatic Location Listener Module** - This module combines with the existing GPS Location Listener Module to allow the collected GPS coordinated to be passed onto ASPX web page.
- **Manual Override Source Location Module** - This module is an alternate to the Automatic Source Location Listener Module, which requires that the user manually enters the source and destination address and forwards the request to ASPX web page.
- **GeoEncoding and Reverse GeoEncoding Module** - This module interfaces with the modules 1) & 2) and using Geoencoding provided by Google API's to get the most accurate Location coordinates in order to generate the optimal route between the source and destination.
- **Customized Location Overlay Module** - Objects on the map are called overlays which moves when a user drags or moves the map.
- **Interfacing ASPX to Google API Module** - This interfacing is the final step performed to get the directions and the route from Google server and then providing it back to the client.
- The modules implemented in the application are shown below.

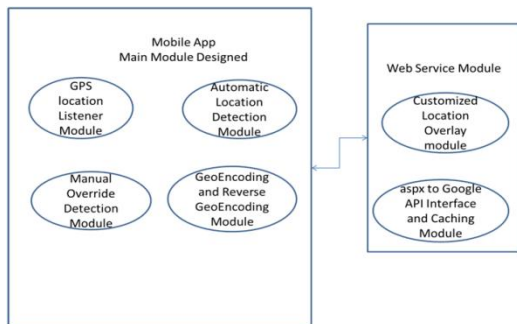


Fig-2. Modules of the application

4.3 System Functionality

The user enters the source and destination location on the mobile host. The request is then passed to ASPX web page which is hosted on our web server. In the web server there are empty tags defined to fill the directions from Google server. The request from ASPX web page is forwarded to the Google

Server which gives the map and the directions along with distance and time to ASPX page. The ASPX page in turn gives the response back to the client.

The 1 level DFD of the NTS system is shown below:-

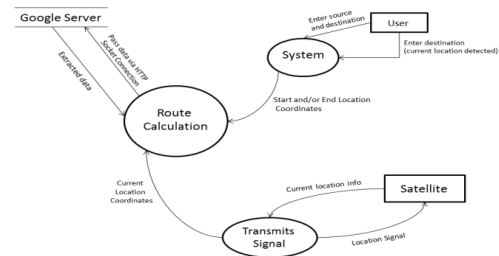


Fig-3. DFD Level 1

5. RESULTS AND APPLICATION INTERFACE

The following snapshots were taken:- This is the main GUI of the application containing the manual and the automatic location detection options.

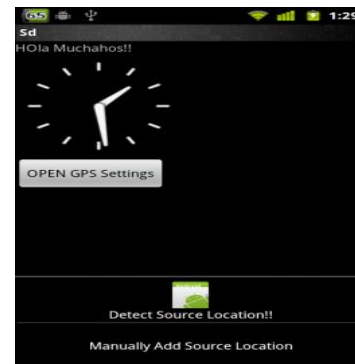


Fig-4. The main GUI

We click on manual location detection option

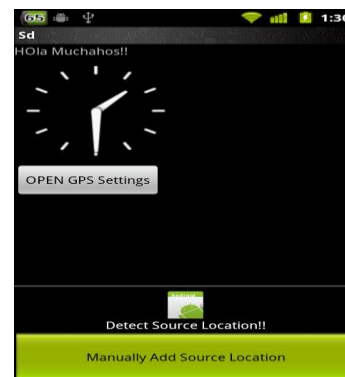


Fig-5. Click on Manual add source location

In this we enter the source and destination address of the user. The application generates the entire turn by turn route with expected time and distance between the two points.



Fig-6. This page takes source and destination details

Now we click on Automatic Source location detection option.

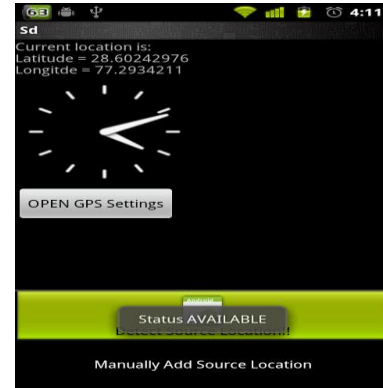


Fig-9. Automatic Source Location Detection

Here, the destination address is entered by the user.



Fig-7. Displaying Directions

This page displays the map to the user showing the path between the source and the destination.

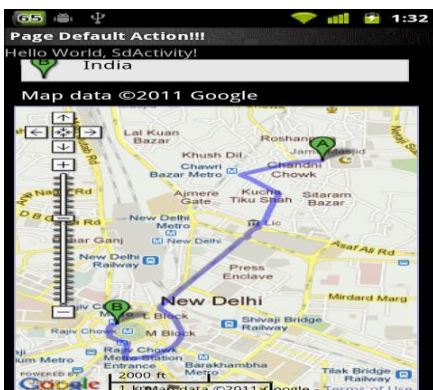


Fig-8. Displaying Map

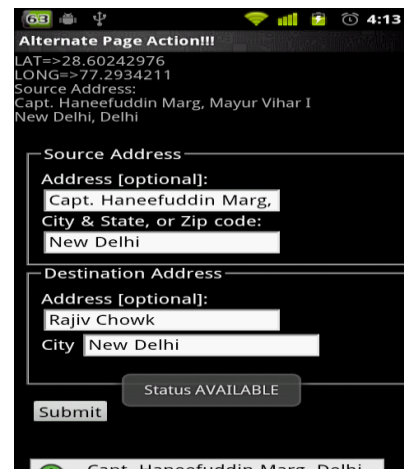


Fig-10. Enter destination

Corresponding to the current location, driving directions are displayed turn by turn till the destination along with distance between the turns. The application also provides the total expected time and distance to reach the destination.



Fig-11. Driving Directions

The entire navigational route is plotted on the map from the current position to the destination. The street address of the current location is continually displayed at the top

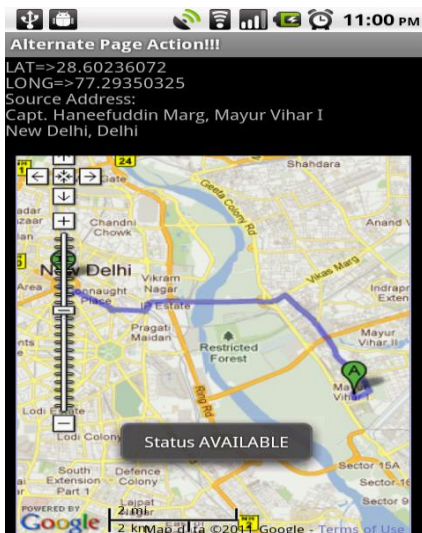


Fig-12. Display Maps

Comparison of size of our application and the Maps application shows that NTS application saves about 30 times space as compared to standard Maps Application. Hence a lot of optimization is achieved.

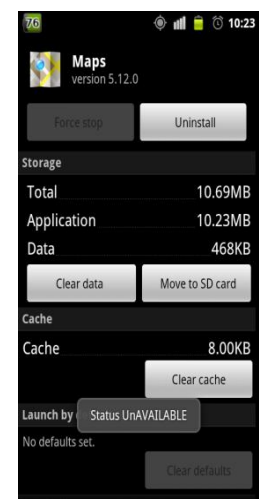


Fig-13. Comparison of applications

CONCLUSIONS AND FUTURE PROSPECTS

The NTS developed for Android devices using Google API's, Android and .NET Framework fully meets the intended objectives. The application has reached a stage where all bugs have been eliminated, and the scope could be extended to myriad degrees. The application is operated at a high level of efficiency and all the users associated with the application will fully understand its advantage when deployed.

The project was started keeping in view all the problems which a person might encounter while travelling to an unknown place. The Software was built successfully in the end but still have a scope for further improvement. Our software works only in Android Environment. In near future, it can also be deployed on different platform like Symbian.

ACKNOWLEDGEMENT

The authors would like to express sincere gratitude to the Director of the Institution Mr. Kaiser Singh for providing excellent computational facilities and stimulating work environment for carrying out the research work.

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