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Somaiya Simplified: Campus aid for Somaiyaites

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Abstract: Mobile phones are nowadays far more than merely devices to communicate with. Especially, smart phones are products that help to make our work and everyday life easier. Along with the advance in technology and popularity of these devices, the use of mobile applications increased enormously in the last years. In the context of this work a mobile application for the K.J. Somaiya College of Engineering, Vidyavihar, Mumbai is developed. This paper describes the initial thoughts on this application and the process that led to the final system environment. The resulting application enables the user finding paths to specific locations on campus and offers him access to professor directory, timetable, mails, and enables him to receive notifications about upcoming events.

Keywords: Navigation, user, login, notifications, directory.

I. INTRODUCTION

THE Somaiya campus is a complex infrastructure. Especially new students and people who are on it for the first time have a hard time to orientate themselves and find places. As mobile devices like smart phones become ever more powerful and affordable for a majority of people, they are starting to access all different parts of life. The majority of these mobile devices have built-in techniques to determine their geographical position. These techniques combined with the right software can provide the user with location-based information, which can help a user in different ways. The goal of this project is to create an application prototype for a Smartphone, which supports people on our campus with navigation and campus details.
Somaiya simplified is an android based application for Somaiya students which provides them with:

- Locating and navigating to various places within campus.
- Notification about the events taking place within the campus.
- Directory which maintains information about faculty.
- Accessing college mail and timetable.
- Navigation today is provided by different platforms.

Google has its navigation system. However with regards to the campus of Somaiya the information available is not sufficient. All the internal nodes have not been identified by it and hence inside campus smaller landmarks are difficult to identify.

II. RELATED WORK

A. Collection of Data

In the initial stage of the project determining the exact co-ordinates and distance between 2 adjacent points was carried out. This information was collected with the help of GPS.

With the help of these points a preliminary map was developed highlighting all the main landmarks.

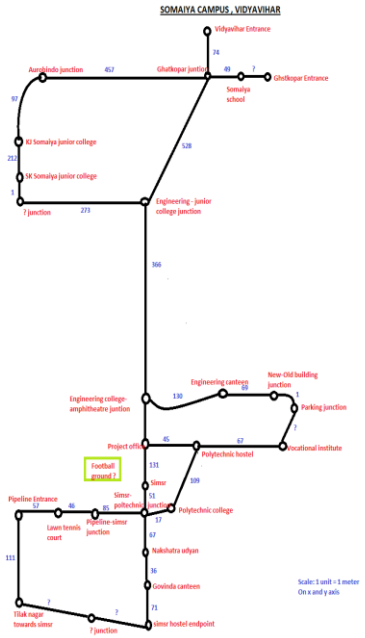

Fig. 1.The basic map: Preliminary points collected.

B. Development of Graphical User Interface

After the initial collection of data, different screens for the application have been developed. This included of login, register screens for user.
Upon login the user has to choose amongst the provided functionalities of the application. The GUI consists of various dropdowns and self-explaining icons to help the user have a smooth operation of the application. The GUI has been developed and modified according to the changing functionality and requirements.

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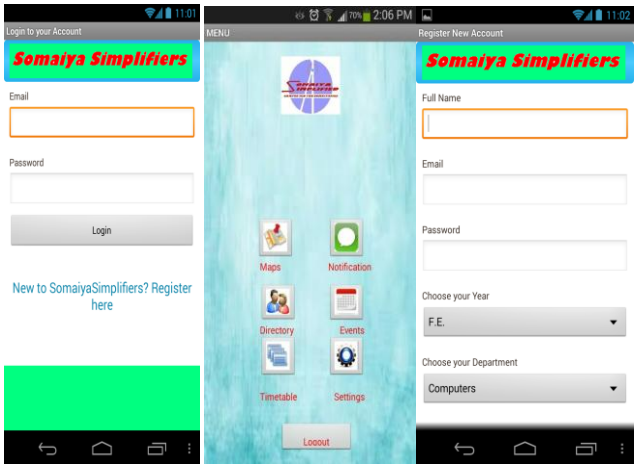

Fig. 2.Login Page, Registration Page and Menu Page.

As seen in above figure, a new user has to register an account to use the services of the application. Once registered, user has to login. Once login, the application remembers the user, i.e. the user does not have to login again and again. The users can logout as per their wish.

C. Creation of Database

Most of the data of the application has been stored on the server side. The data in the database includes professor information for the directory, timetables, list and details of the events. Along with this, the map and the path information is also available. This information is made available to the user on proper invocation of the controls with the help of remote procedural calls.

The database maintained at the server is updated in a timely manner to keep the user updated. The application also has some user defined settings to make it more user oriented.

D. Server Side Implementation

- Web Services:

To communicate with clients the server exposes different REST web services. These interfaces can be used by the client to either send or retrieve data. JSON is used for the data interchange between server and client.

- JavaScript Object Notation:

As an exchange format to communicate between server and client JSON is used. It is a structured way to store data in a text based format. The media type of JSON is application/jsonand is the only return type the server produces.

To transform Java objects into a JSON format and vice-versa the GSONlibrary developed by Google is used. It offers serialization and deserialization of basic JSON and Java objects. It can be extended with custom classes for handling the serialization (or deserialization) of more complex objects used in the project. This is achieved by implementing the JsonSerializer(or the JsonDeserializer) interface.

Given that the embedded augmented reality framework Mixare needs a specific JSON format, the option for custom serialization is very helpful.

With annotations such as @PathParamor @QueryParam, POST and GET parameter can be passed to a Java method. Based on these parameters and the resource path the server gathers the requested information from one or more data sources and returns the result in JSON back to the client.

E. Implementation of Navigation

In this project, we incorporate roadmap-based path planning techniques to a web-based route planner that covers the K.J. Somaiya College campus. The goal is to allow users to quickly find directions to all buildings, departments, and major services. We use a layered roadmap approach to compose multiple transportation methods into a single query able roadmap. The user interface is implemented using Google Maps API.

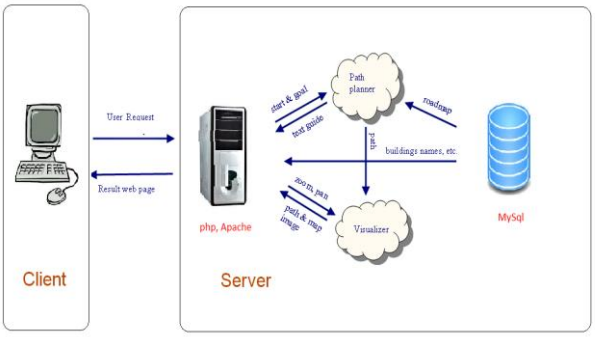

Fig. 3.System organization - Major modules are web interface, path generator, and database.

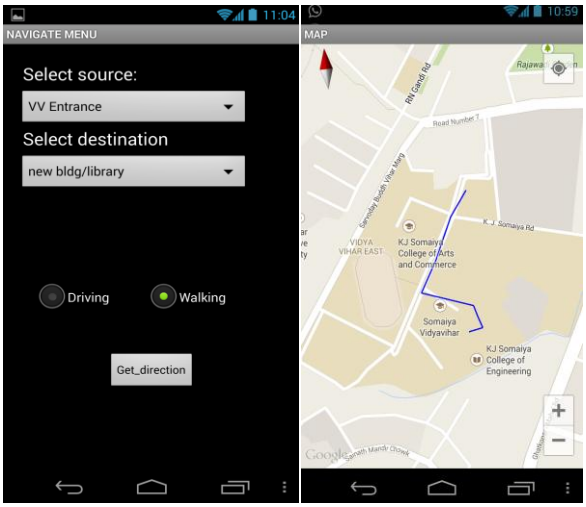

Fig. 4.Navigation Menu and the corresponding path plotted on the map.

F. Use of A Algorithm*

The A*, or A star, algorithm is a different algorithm to solve the problem of finding the shortest path between two nodes in a graph. We have made use of this algorithm for navigational purpose. Similar in concept to Dijkstra's algorithm, it finds the shortest path by advancing one node at a time from the source. The difference between the A* algorithm and Dijkstra algorithm is in its shortest path formula and its updating process. Instead of updating all the adjacent nodes, the A* algorithm only updates nodes that have not been visited before with an optimistic hope that

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this is the shortest path because it comes from the shortest "estimated path". The shortest path in the A* at each step is not absolute. Instead it is a sum of the absolute path from the source to the node and a heuristic estimation of the distance from this node to the destination. The optimal performance of the A* algorithm depends on the heuristic model. The heuristic estimation has to be reasonable, and should not overestimate the distance between the node and the destination. Although the A* algorithm provides a lower complexity cost than Dijkstra algorithm, the solution determined by this algorithm is not optimal mathematically, which means the solution is not verified to be the best solution.

G. Implementation of Directory, Events and Notices for the Application

The details about the directory, events and notices have been maintained at the server side database. Using php code the connectivity with the android functionality and database has been established. This information can be updated dynamically with admin access to the database which is secured properly and cannot be accessed without proper credentials.

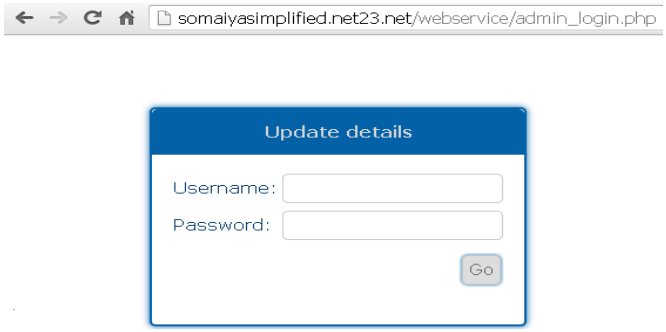

Fig. 5.Admin Login Page.

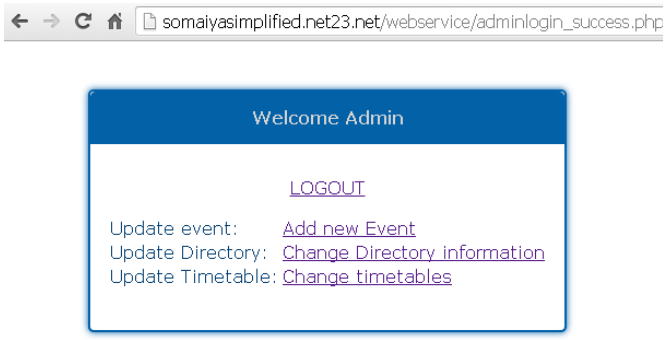

Fig. 6.Admin Menu.

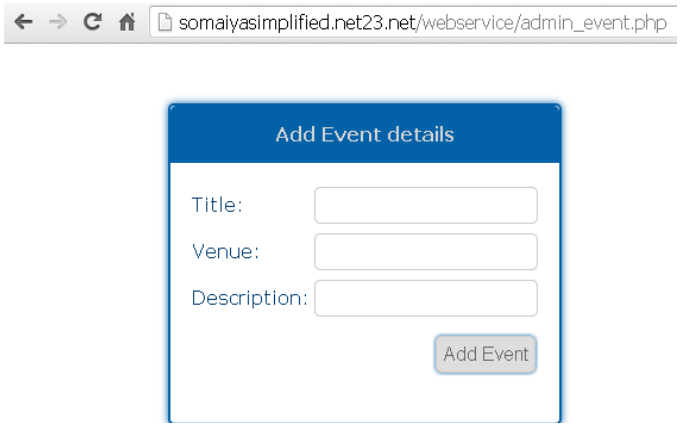

Fig. 7.Add new events.

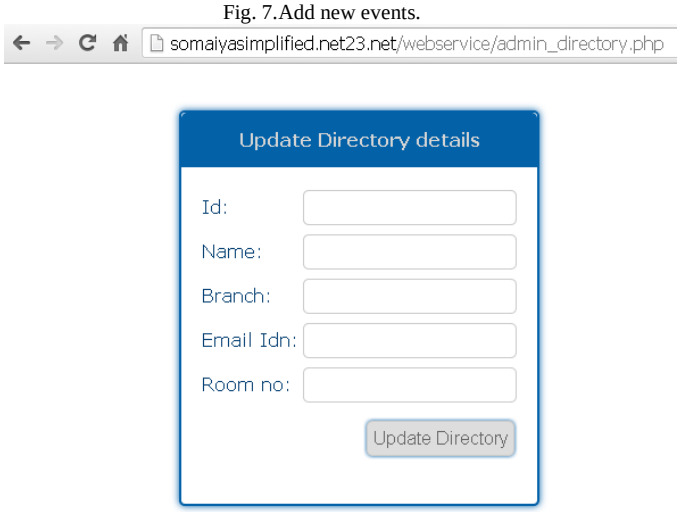

Fig. 8.Update Directory.

All these events and directory can be viewed in mobile phones as shown in below figure.

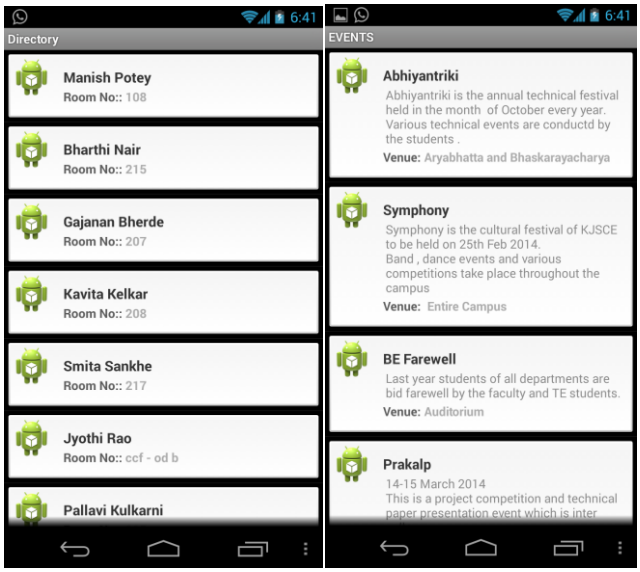

Fig. 9.Directory and Event List.

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H. Notifications

In this project, the user receives notifications of upcoming events. Whenever a new event is added in the database by the admin, user receives a notification containing the information about the event. Notification is done using Google Cloud Messaging(GCM) service.Using this service one can send data to your application whenever new data is available instead of making requests to server in timely fashion. Integrating GCM in your android application enhances user experience and saves lot of battery power.

PHP is used as server side programming language and MySQL as server side database.

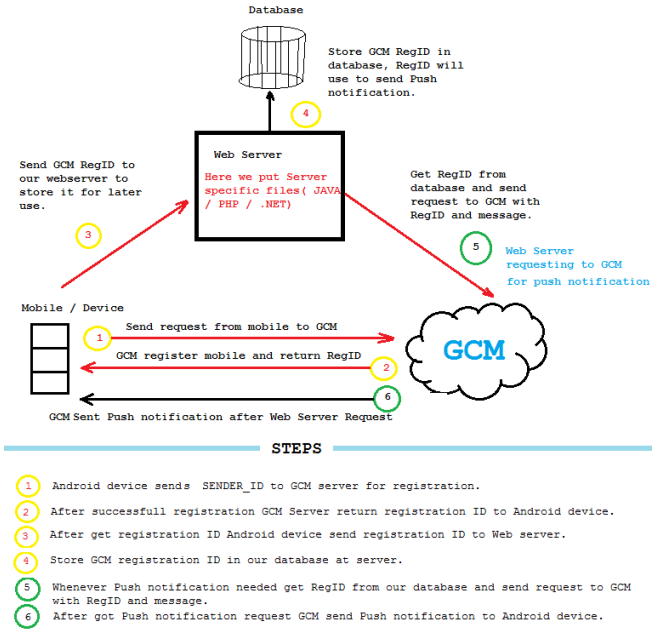

Fig. 10.Notification Process Using GCM.

When a new event is added in event list, database of event is updated. This generates a trigger which sends a notification to all the registered users. The notification received is in the following format.

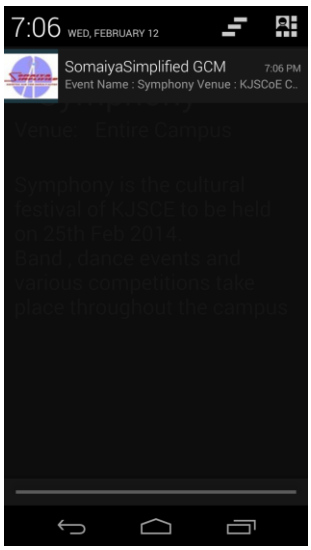

Fig. 11.Notification of upcoming Events.

III. CONCLUSION

This project thus helps the user in navigation of the college campus, thus helping him to get to know about the campus. Along with this the user will get notifications regarding various events happening throughout the campus. Timetable and the professor directory are also available to the user.

Future work:

On similar lines, using Wifi, indoor navigation of the college building can also be done. For this floor maps can be implemented. New features to help users on campus could be added to this application. For example people could get access to helpful institutions on campus like the college library. Students could access information about their loaned books or get notifications if a required book is available.

Currently the directory has to be updated manually i.e. by an admin. We are in the process updating of directories fully automatically using web crawler, which will crawl the college website for new events, notices, etc. The user will be notified of these new events. Thus instead of visiting college website for event information or notices, user can easily access this information on their mobile phones directly.

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