“By Bus”, The Bus Locator Application

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Abstract - “By Bus” is an application that is developed aiming people who travel by buses. It is developed as a cross platform application so that it will be platform-independent. The paper discussed the implementation process of the application including how information was gathered regarding the problem where most of the people who travel by bus faces frequently, about what features should be given out to the users of the application that would be suitable and convenient if they travel by bus, how the application is unique compared to other similar products in the market and regarding the feedback of the users as well as the bus drivers.

Keywords — Estimated time, Cross platform, Opinion mining, Text mining, Bus seat reservation.

I. INTRODUCTION

Majority of population in Sri Lanka uses public transport. Out of those 93 % of people use buses and only 7 % is served by rail [1]. The purpose of the project is to use the available technologies and create a system which will make day-to-day passenger-bus intercommunication easier. There are buses made available for passengers travelling distances, but not many passengers have enough information about these buses. Because of that it has become a hectic mode of passage for people who uses it daily. Under current conditions, bus passengers have to wait in a bus stand without knowing what time a bus arrives, whether it has seats available and all other concerns he/she may have before getting into a bus. In order to ease their work and effort, the mobile application “By Bus” is introduced. One of its main advantages for the user would be to see the current location of the bus and predict the estimated time it will take to come to the nearest bus halt. By seeing this information, the user could plan out his current activities and leave without a hassle.

“By Bus” consists of two main interfaces which will be used by the passengers and the conductor. The passenger could reserve desired seats as well as give their opinions and ratings regarding the bus service they’ve experienced. The bus conductors and the drivers work would be minimized and the communication between them and the user would be healthier. The conductor has to confirm a reservation for it to be completed. Based on other factors such as effectiveness the conductor has the ability to decline a reservation as well. There are quite few operating systems available among the population these days. Due to that variance it is imperative to develop such application with the capacity to be used on all of these operating systems. Since it will be made in a cross platform manner, everyone could use it. A rating system is introduced as an assistance to the passengers so they can figure out the service which they are about to receive. It applies to the condition of the bus as well. People who have ridden in the bus have given comments about the service and the condition of the bus. Using these information a rating is given. Text mining and opinion mining is being used in the process of making the rating.

It is a good opportunity for passengers who don’t know the bus schedule and how long to wait till the next bus, Seating Plans etc. Drivers also will be able to get to know who are the passengers and get to know the counts and the ratings which users gave from the rating system. Because of the rating system drivers and conductors will be driven to provide a high quality service. This will affect the bus transport system in a positive way and if bus transportation is more stress free in the real world more people are going to use buses and in a way it will reduce overall traffic.

II. LITRETURE REVIEW

The system that is going to be implemented will try to overcome the limitations that a passenger face while travelling by a bus. The main areas that will be covered here are text mining, reservation systems, cross platform.

Quite number of projects have been attentive to the development of GPS based transportation systems which would minimize a user’s work. The web application system “CTA | Bus Tracker” [2] is a fine example that makes people to take transportation decisions easily. It takes the current location of the bus that a user requests and shows it in a map so the user could time his/hers arrival at a stop. [3]B. Shalaik et al. has made a similar
concept as above. K. Punjabi, P. et al. [4] states that there are systems which have been implemented with a few similar features on android mobiles that gives out an output to users as mentioned above. But these systems tend to have limitations such as not taking the users location and indicating where the nearest bus is and other expenses like installing a GPS device on the buses. [5] The TRANSIT COOPERATIVE had done a research about the current products they have implemented for bus tracking in Massachusetts. Although they tend to malfunction and have high maintenance costs. A new Smart Parking System Infrastructure and Implementation [6], The Research and Implementation of China Railway Ticketing and Reservation System(TRS) [7], "The impact of online reviews on hotel booking intentions and perception of trust" [8], are some similar reservation systems. They are real time desktop application systems that uses sensors to check reservation availability. Smart parking only consider the major cities for the application. These systems does not give exact information about the reservation, only the location is provided to the user. These systems have to use a particular database as a server. All these systems have a similar way of letting the user to select their desired seating accordingly. But these systems do contain heaps of unwanted information that is not worthwhile and they may cause the systems to crash.

There are mining tools which are similar to what our product will be using that filters and organizes large amounts of textual and structured information returned from public search engines. L. Tanabe et al. [9] states that it’s easy to integrate additional databases. A study of feature-based opinion summarization of customer reviews of products sold online is another similar tool where the summary is structured rather than another free text document as produced by most text summarization Systems is what Mining Opinion Features in Customer Reviews [10] describes about. Bing LiuThe [11] has differentiated and given out facts regarding opinion mining. He also states that it is important to mine opinions as well as text because it helps to get the user ideas about a product broadly. Online customer review analyzing is discussed on respect to the user and producer needs. It focuses on extracting relations between product features and opinions. Experimental results show the effectiveness of the proposed approaches in "Mining Feature-Opinion in Online Customer Reviews for Opinion Summarization" [12]. There are two aims of an application: obtain as many consumers as possible or convey highest quality engagement within a target market. When a majority of your targeted users are using the same platform, the choice for platform becomes easy. But when you’re providing to a huge range of users which may be using iPhone, Android, Windows Phone and others, there’s a need to design for multiple platforms. R. Curry [13] states that speed is one big advantage going platform because it can also be more efficient than building multiple native apps from scratch. And it would be more cost effective by building a cross platform solution for multiple platforms because it leverages one codebase. This is generally true unless, the application requires a lot of customization for each platform which is clearly shown Digitalcommons.colby.edu [14] and Cross-platform mobile application development 2016 [15]. There are also a number of technologies like PhoneGap and Appcelerator offering a cross-platform solution that one team of developers can more easily handle to deploy changes. Delivery.acm.org, 2016 [16] states applications are getting diverse and user bases are growing, there is no one clear platform of choice.

“By Bus” targets all these limitations and strive for a better product that will help the user to get a comfortable transport. The application “By bus” will help users to take decisions promptly and effortlessly because it will be intelligent enough to give the user choices. Real-time communication will also help the user to time his arrivals as he/she will know at what time the bus would arrive at the halt. The choice of reserving the desired seat by the user is also a feature of our work. By making this application cross platform, we tend to reach for bigger audiences.

III. METHODOLOGY

This project used the phased development methodology because the target was the end user’s satisfaction, which was accomplished in a lot of implementations of updated versions of the previous systems that were created.

In real time application development, the system won’t let users to wait for the next update. The 1st version was implemented based on user experience, suggestions and feedback. This was helpful in updating and enhancing the application by taking the above topics into consideration. Till a new version or an update comes, users can work with the old version without any difficulty. It’s hard to know all user needs and requirements in the first phase. Therefore it’s hard to implement all requirements in that phase, but in this real world scenario as soon as users worked with the first implementation, there were considerable alterations applied to the system. Therefore a versioning for the system was selected for this project.
A. Planning

Main issues that came into consideration were financial problems, Database issues, Interface integration issues and Time management.

After a thorough look a final conclusion took place about the above mentioned economical and technical problems. To ensure that the project goes smoothly, techniques such as a Gantt chart and a work Brake Down structure has been used to ease out the workload so that the application manages time, resources (Human Resources, Hardware etc.) and have a smoother control over the project.

B. Requirement Gathering and Analysis

Information and data required to the new system has been gathered through techniques such as research papers, interviews with drivers and Passengers, questionnaires, analyzing reports and by conducting meetings with supervisors etc. Documents related to research was collected and has been evaluated thoroughly. Questioning people on different levels who are currently involved with the system helped in finding requirements to build the new system. Simple questionnaire has been given out to bus drivers, passengers from different areas to obtain diverse opinions from them. Finally, analyzing took place only after getting enough prospective on the problem thoroughly before the design phase. The team was able to recognize user expectations in this phase.

C. Design

This is the high level architecture diagram selected for the “By Bus” application.

![Figure 1: Software Architecture Diagram](image)

The application on the phone runs on adobe PhoneGap layer which gives out the cross platform option for all kinds of phone devices as well. It contains the “By Bus” application. The PhoneGap layer is connected to 3 servers such as the Database server to check whether there are any changes or any updates in the application, the IIS server which hosts the asp.net web application and the Mail server that helps out the application notifications such as registrations etc. The SMS gateway uses the database server to send out messages to users because it contains all the details regarding it.

Two main components are present in design at the beginning that is the two interfaces for the system made available to the end users. The interface turns out to be pleasant and appealing for both the developer and the customer. The interface design system was developed using Html5, Css3, Java Scripts as well as J-Query Libraries. The pages are fully responsive and the system does not take much memory therefore it runs faster. Since the design is easy to understand, it was relatively easy to implement, test and maintain. Each function was designed with high cohesion and low coupling (Functional Dependency).

D. Implementation

The system was implemented in a cross Platform manner. The integrated development environments (IDE) such as Visual Studio and Phone Gap were used. Main programming language used was C# (Asp.net). The system was hosted on Internet Information Services (IIS) and it used Microsoft SQL Server Business Intelligence (MSSQL) for Data base purposes. SMS Alert algorithms was coded using C# language.

There are two main algorithms in the system. One is either to calculate a time estimation for a bus to reach its destination or to calculate the passenger waiting time.
After the user enters the destination, the application will figure out the user's location by taking its GPS from the device used. The application will then use a Google API to get an estimate arrival time for the bus to arrive at the halt. This output from Google is combined with our unique equation that will fine tune and calculate the final output of the estimated time of arrival.

The other algorithm is implemented to determine the current rating of a given bus.

### E. Testing

Testing has been divided into two main parts as functional testing and non-functional testing. Functional testing uses integration and system testing while non-functional testing used performance testing and security testing.

Unit testing examined and fixed the individual software modules or components that made the application or the system. Each module function was tested by a specific unit test features written in the same programming language as the module.

The system testing part of a testing methodology involves examining the entire system for errors and bugs. This test is carried out by checking the hardware and software components of the entire system (that have been previously unit tested and integration tested), and then testing it as a whole. Load testing was also used. It verified that the system can operate at the required response time when subjected to its expected load, and stress testing found out the failure point(s) in the system.

Security was tested after the implementation. Rise in cyber-crime and the awareness of the risks associated with software vulnerabilities, application security is now something that needs to be designed and developed at the same time as the desired business functionality. Security testing has inspected the software for confidentiality, integrity, authentication, availability, and non-repudiation. Individual tests have been conducted to prevent any unauthorized access to the software code.

### IV. RESULTS AND DISCUSSIONS

#### A. Evidence

The following images refer to the actual screenshots of the “By Bus” application.
Ratings will be generated automatically according to the comments that are given out by the passengers.

The estimate time of arrival for the nearest bus stop will be calculated and given out to the user.

B. Discussion

By bus application system was primarily designed for only one bus route as a commencement stage for the application to be developed with its unique features. With the versioning of the system, effective new features will be added to the application. Two or more users can come into a clash if they reserve the seat at the same time. Then the option would be given out to the bus conductor to sort it out according to the first come first serve basis.

V. RECOMMENDATIONS

This application is mainly preferred to Luxury bus services as there is a less hassle when it comes to services. If a bus driver/conductor wishes to use the application for their profession they should seek consultancy from the developing team in order to sign them up for the application. Both passengers and drivers/conductors won’t be needing a vast knowledge of technological skills nor language skills to operate the application.

VI. FUTURE WORKS AND CONCLUSION

After the application have been running for some time and a considerable amount of collective data is available, it will be beneficial in the near future to the Sri Lankan transportation services as the data will give out informative suggestions regarding where to provide improved bus transportation in the country. After the application gets proper funding, more routes with additional buses will be added later onwards in the application. Since the application is initially developed to Luxury busses, it is hoped to be used in normal bus services as well. In order to achieve this, it is expected to have a suitable bus transportation system that runs in a particular manner or the system has to be enhanced and developed with a lot of improved carefully analyzed routine.

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REFERENCES


