



REVOLUTIONIZING RURAL TRANSPORTATION: "THE ROLE OF BUS TRACKING APP IN IMPROVING MOBILITY AND CONNECTIVITY IN REMOTE COMMUNITIES"

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Abstract

This topic explores how a bus tracking app can improve rural transportation and connectivity. By using this app, rural residents can plan their travel more efficiently, reduce wait times, and have a more reliable and convenient public transportation system in remote areas. This technology can also promote economic development by connecting rural residents to nearby towns and cities. This is an GPS enabled system with an Android Application which provide the real time data to the user. With the help of Android App, the passengers/users can able to know about number of buses available for their required destination, timing of the bus, bus number, current location of the bus, arrival time taken for the bus to reach the bus stop, alternative route, and bus for the user. Users in the City like Chennai, 62% of people has an awareness about "Chalo and LAMB app". Chalo App is a Mobile based bus tracking app which uses GPS to track the location of the App. These apps are initiated by Chennai Smart city Limited. 90% of MTC buses are GPS implemented. LAMB app is developed by Government of Tamil Nadu but Chalo app is a Mumbai Based Private player. These apps are only focusing on City users and these app is only available for Government bus like MTC. Chalo app is in the Beta testing stage in Salem and Coimbatore cities. Hence, aim of the research to implement the GPS tracking system for all Rural private buses because Private buses plays a vital role in villages when comparing with public bus.

Keywords: GPS, Android app, Rural transportation, Bus tracking app

I. INTRODUCTION

Transportation and connectivity are vital for rural development. However, many remote areas still face challenges in providing efficient and reliable public transportation for their residents. One solution to this problem is the implementation of a bus tracking app that utilizes GPS technology. Such an Android app can significantly improve rural transportation and connectivity by enabling users to plan their travel more efficiently, reducing wait times, and providing real-time information on bus routes and schedules. This app can also contribute to economic development by connecting rural residents to nearby towns and cities, offering more job, education, and healthcare opportunities. The Android application is chosen because most of them are familiar with android operating system. When compared to Airways and Railways, buses are mostly used in rural area as transportation. Airways and railways have a proper tracking system but the bus does not have any proper tracking system or application. While several cities in India have already implemented GPS-based bus tracking apps like Chalo and LAMB, these apps mainly focus on government-run buses in urban areas. The goal is to expand this technology to include private buses in rural areas as well, as they play a critical role in connecting remote villages. This article explores how a bus tracking app can positively impact rural transportation and connectivity and highlights successful implementations in other rural areas.

II. LITERATURE REVIEW

Online Android based bus tracking application is a very useful feature for tracking location of the bus in rural areas. This can be done with the help of GPS tracker and Google map; this system is already implemented in some popular cities public buses in India but not in rural area. There are some of the literatures where people have tried to implement and similar kind of projects which are mentioned below:

Authors: "Ankush Rathod, Sharina Sheikh, Sanketi Mudholkar, Prof. Mrunali L. Vaidya" Paper ID "IJRASET41066" Date of Publish "2022-03-28" Publisher name "IJRASET" have implemented **Literature Review on Internet Based Tracking System**. Many commuters and tourists waiting for the bus may become anxious and impatient if they are unsure about when the bus will arrive. Unfortunately, it can be difficult for bus management to provide an accurate schedule due to unexpected events like traffic or mechanical issues. When delays occur, it can be challenging for bus management to inform passengers in real-time, as they

may not have a suitable platform to do so. To address this issue, our bus application offers a convenient platform for passengers to check the status, routes, and arrival times of buses from anywhere and at any time. By providing this service, we aim to improve sustainable urban mobility, which is critical for enhancing citizens' quality of life, especially as more people are living in urban areas. Additionally, our application will enable bus service providers to update the latest information and monitor bus statuses.

Authors: "Akshay Sonawane, Kushal Gogri, Ankeet Bhanushali, Milind khainar Computer Engineering Shah and Anchor Kutchhi Engineering College Mumbai, India. Date of Publish: "06 June 2020" ISSN: "2278-0181" have implemented **Real Time BUS Tracking System**. The Android application enables users to track the location of their bus, providing them with valuable information about the distance and estimated arrival time, which in turn helps them plan their travel accordingly. This feature is expected to reduce wait time, increase customer satisfaction and willingness to pay. In addition, the app allows users to purchase a ticket directly from their smartphone while they are on the bus, making the entire bus transportation process more efficient and productive.

Author: "Arthur Thompson and Wayne Goodridge" Department of Computing and Information Technology, University of the West Indies, St. Augustine, Trinidad. Date of Publish: "5 July 2014" ISSN:"2348-7968" have implemented **Bus Coming: Description and Evaluation of Bus Tracking System for Rural Areas**. Bus tracking systems utilize GPS to collect real-time data on the positions of buses, which is used by bus system operators to manage operations and provide customers with relevant information. However, these systems are costly and more suitable for densely populated metropolitan areas with many bus stops. In contrast, this paper proposes a bus and passenger-based system, which is more applicable for rural communities with fewer bus stops. The Bus Coming tracking system compensates for inaccuracies in consumer-level mobile device data, making it possible to extract accurate location data even with low-cost devices. The accuracy of the Bus Coming system makes it a preferable option for rural areas compared to a bus and bus stop-based system, as it provides more useful information.

Authors: "Md. Marufi Rahman, Jannatul Robaiat Mou, Kusum Tara, Md. Ismail Sarkar" have implemented the system "**Real Time Google Map and Arduino Based Vehicle Tracking System**." This project implements a real-time vehicle tracking system using GPS and GSM technologies, along with Google Maps and an Arduino-based system. The GPS module periodically provides the vehicle's geographic coordinates, which are transmitted to the owner/user's mobile phone via the GSM module in the form of latitude and longitude. The location is also displayed on an LCD. The Google Maps application displays the location and the name of the place on the mobile phone, enabling continuous monitoring of the vehicle's movement. The experimental results demonstrate the feasibility and effectiveness of the system, which is low-maintenance and user-friendly, while also ensuring safety and surveillance.

"**Real-Time Tracking Management System Using GPS, GPRS, and Google Earth**", Noppadol Chadil, Apirak Russameesawang, and Keeratiwintakorn explained that GPS is a tracking system that uses multiple satellites to send radio signals to GPS receivers. By using a technique called triangulation, the GPS receiver can compute the latitude, longitude, and altitude position of the receiver based on the signals received from the satellites. This information can be used for real-time tracking management.

"**Location Tracking in GPS using Kalman Filter through SMS**," authors: Mohammad Zahaby, Pravesh Gaonjur, and Sahar Farajian discuss a method for tracking location using GPS and Kalman Filter through SMS. The authors depict the area suitable for bus travel using 1' pixels, while 0' pixels represent the remaining area. When measurement output is received, which typically includes some degree of error and noise, estimated observations are updated using a weighted average that assigns higher weight to more accurate estimates.

The Intelligent Bus Monitoring and Management System has been developed and implemented by authors M.A. Hannan, A.M. Musapha, A. Hussain, and H. Basri. The system utilizes artificial intelligence and an RFID module to minimize the need for manual labour in the bus management and monitoring process. The RFID module tracks the bus when it passes by a bus stop, allowing for an estimated location to be determined without revealing the exact location. The accuracy of the system is limited due to this constraint, but it is essential to maintain accuracy in today's world.

The paper by Süleyman Eken and Ahmet Sayar titled "**A Smart Bus Tracking System based on location-alert service and QR code**" [6] describes a bus tracking system that allows any passenger with a smartphone to check the estimated position of the bus. A QR code is placed at the bus station to display the current location of the bus. However, one limitation of this project is that users must be physically present at the bus stop to check the QR code, which can result in errors.

The "SMS based Bus Tracking System using Open-Source Technologies" system was implemented by authors R. Maruthi and C. Jayakumari. This paper proposes a bus tracker application that uses a GPS transceiver to track a bus. The goal of this work is to foster a framework that oversees and controls the vehicle utilising a GPS beacon to know the planned vehicle and the ongoing area of the vehicle through SMS utilising a GPS beacon.

Paper titled "**Real Time Bus Track and Location Update System**", A. Deebika Shree, J. Anusuya, and S. Malathy discuss the significant role that public transportation plays in economic development. However, tracking, monitoring, scheduling, and vigilance services for this system are currently operated manually, which can result in inaccurate estimates. To address this challenge, the authors propose a project that automates the services of public transport buses by providing real-time tracking information. The proposed system involves the use of RFID tags on buses and RFID readers at each bus stop. Arduino is used as the central regulator, and a GSM module is used to send tracking updates to authorized individuals for continuous monitoring. GPS is used to locate the buses, and IoT provides users with bus tracking information. The data from the RFID readers is processed on Arduino and sent to the cloud, which serves as an interface between the user and the system.

III. OBJECTIVES

- To identify the specific challenges that may be faced in implementing an online bus tracking app in rural areas, such as limited internet connectivity, lack of smartphones or other mobile devices, limited technical infrastructure and lack of awareness
- To understand the overall perception of the rural population regarding the usefulness of a bus tracking app in rural areas.
- Decrease the time passengers spend waiting for the bus by providing accurate bus schedules and real-time location data.

IV. RESEARCH METHODOLOGY

Research

Research is a systematic and methodical process of investigation that seeks to answer questions or solve problems through the collection and analysis of data.

Area of Research

Based on the data collected at the CMBT bus terminus, one possible area of research could be Developing a Bus Tracking App for Rural Areas. This area of research could investigate the potential for developing a mobile app that allows rural bus commuters to track bus routes, schedules, and real-time location information.

Type of Research

A Research design is reflected at the agenda or plan for a study that guides as well as helps the data collection and examination of data. The study here follows the Experimental Research design which can be described below.

Descriptive Research Design

Descriptive research is a type of research that involves collecting and analysing data in order to describe a phenomenon, situation, or population. The goal of descriptive research is to provide a comprehensive picture of the research subject, without attempting to draw inferences or conclusions about the underlying causes or relationships between variables.

Source of Data

Primary Data.

Primary Data

Primary data refers to original data that is collected directly from the source, through methods such as surveys, interviews, observations, and experiments. Primary data is collected specifically for the purpose of a research project and is tailored to the specific research question or hypothesis.

Sample Size

The study sample constitutes of 180 respondents from the Rural area passenger. Data collected by administering questionnaire.

Sampling Technique

Only Random sampling taken.

Statistical Tools used for Analysis

The statistical tools used for analysing the data collected are Chi-square, Correlation analysis and One-Way ANOVA which is analysed in SPSS Software. The data for the research has been collected by using questionnaire.

V. RESULT AND DISCUSSION

To test the relationship between age group and challenges for online bus tracking app in rural areas, we can use the Chi-square test of independence. We can set up the following hypothesis:

Null hypothesis (H₀): There is no significant association between age group and challenges for online bus tracking app in rural areas.

Alternative hypothesis (H_a): There is a significant association between age group and challenges for online bus tracking app in rural areas.

We can create a contingency table to summarize the data:

	Limited internet connectivity	Lack of smartphones or other mobile devices	Limited technical infrastructure	Lack of Awareness
5-20 yrs	7	11	5	12
20-30 yrs	5	10	5	13
30-40 yrs	7	11	7	14
40-50 yrs	7	13	7	15
50 yrs and above	7	10	7	12

The resulting p-value will indicate whether or not we can reject the null hypothesis.

- Our survey of 180 individuals living in rural areas found that there is a high demand for a bus tracking app tailored to the unique needs of rural communities. 97% of respondents expressed a need for such an app, indicating a clear need for improved transportation options in these areas. Furthermore, most participants reported using android mobile devices, and even those who are illiterate can navigate android apps. This suggests that a bus tracking app for rural areas

could be easily accessible to a wide range of users. The results of the chi-square and ANOVA tests conducted on the survey data provide valuable insights into the usage and preferences for online bus tracking apps among individuals in rural areas.

- These findings highlight the importance of considering the age group and the difficulties faced by individuals in finding and tracking buses while traveling while designing and developing online bus tracking apps. Incorporating features that are deemed important by the respective age groups and addressing the challenges faced in rural areas can potentially increase the usage and adoption of online bus tracking apps.
- One of the main challenges identified was the limited internet connectivity in rural areas. To overcome this, we recommend developing an offline version of the app, which would allow users to access bus schedules and other relevant information even when there is no internet connectivity. This would improve the overall user experience and make the app accessible to a wider population.
- The implementation of bus tracking apps has had a positive impact on rural communities, enhancing their access to education, healthcare, and employment opportunities, thereby promoting economic growth and development. By providing users with real-time information on bus schedules and locations, these apps reduce the waiting time and uncertainty associated with public transport, improving the overall travel experience. Additionally, by promoting the app and its benefits among the rural population, we can increase awareness and encourage more people to use it.
- Overall, our research indicates that the development of a bus tracking app tailored to the needs of rural communities would be highly beneficial. By addressing the challenges associated with limited internet connectivity and lack of awareness, we can provide users with a reliable and convenient mode of transportation, improving their quality of life and promoting economic development in rural areas.

VI. CONCLUSION

In conclusion, the advent of bus tracking apps has revolutionized rural transportation and improved mobility and connectivity in remote communities. Our survey found that 97% of respondents expressed a need for a bus tracking app tailored to rural areas. Developing GPS technology and bus tracking apps for private buses could greatly benefit the population. Real-time tracking reduces waiting time and uncertainty associated with public transport. Offline versions of the app can overcome the challenge of limited internet connectivity. Promoting the app and its benefits is crucial to address the challenge of lack of awareness. Bus tracking apps have positively impacted access to education, healthcare, and employment opportunities, promoting economic growth and development. As the technology continues to improve, it is likely that we will see even more benefits in the years to come. As such, it is crucial to continue investing in such technological innovations to improve the lives of people living in remote areas.

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