**CHAPTER 2**

**LITERATURE SURVEY**

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| **Ref. No.** | **Author** | **Methodologies Used** | **Result** |
| 1. | Faraz Ameen Nechikkadan,  Jijesh Modon,  (2021) | Data is constantly updated to the server and real-time data is continuously provided to the user on the client device. | Utilizing a dynamic server-client model, our project ensures seamless real-time data updates, enhancing user experience by delivering up-to-the-minute information directly to client devices. |
| 2. | Eddie Chi-Wah Lau  (2008) | A wireless AP is used for system networking. Apache server, IVR and two base stations are connected together thru CAT5 Lan cable while the wireless configuration is for the smart phone testing. | In our bus tracking system, we employ a wireless Access Point (AP) for network connectivity. The integration of an Apache server, IVR, and two base stations through CAT5 LAN cable facilitates robust communication, complemented by wireless configurations tailored for efficient |
| 3. | Khalifa Salim,  Ibrahim M. Idrees  (2013) | The GPS data are sent using Get method of HTTP protocol, the data at server side are stored in a database tables and can be retrieved as request for position browsing on map. | Our bus tracking system utilizes the HTTP protocol's GET method to transmit GPS data. The server stores this data in database tables, enabling seamless retrieval upon request, facilitating accurate position browsing on the map. |
| 4. | Junaid Ali,  Shahid Nasim  (2009) | The monitoring software is developed for a user friendly GUI with visual indication of location on Google Earth and easy to understand controls. Continuous or intermittent updating of location is possible as demanded by the situation and status of the monitored vehicle. | Our bus tracking system features a user-friendly GUI monitoring software that provides visual location indications on Google Earth. The intuitive controls allow for flexible updating of vehicle locations, catering to varying demands and situations for continuous or intermittent tracking. |
| 5. | Tomas Gerlich,  James Biagioni  (2011) | With the help of built-in sensors, such as GPS, WiFi, and accelerometer, the application automatically detects when the user is riding in a transit vehicle. On these occasions, it sends periodic, anonymized, location updates to a central tracking server. | Leveraging built-in sensors like GPS, WiFi, and accelerometer, our system seamlessly identifies transit rides. During these instances, the application autonomously transmits periodic, anonymized location updates to a central tracking server, enhancing real-time monitoring efficiency. |
| 6. | Md Marufi Rahman,   1. R. Mou,   (2016) | In this work, real time Google map and Arduino based vehicle tracking system is implemented with Global Positioning System (GPS) and Global system for mobile communication (GSM) technology. GPS module provides geographic coordinates at regular time intervals. Then the GSM module transmits the location of vehicle to cell phone of owner/user in terms of latitude and longitude. | Our project integrates real-time Google Maps with an Arduino-based vehicle tracking system, utilizing GPS and GSM technologies. The GPS module captures geographic coordinates at regular intervals, and the GSM module transmits the vehicle's location to the owner/user's cell phone, providing precise latitude and longitude details. |
| 7. | M. A Hafiizh Nur,  Sugondo Hadiyoso,  (2020) | In this paper, an integrated online system is designed to provide information, including bus arrival time, bus position, and the number of passengers on the bus. This information system is a website application that is connected to the Firebase real-time database so that all data can be accessed in real-time and then displayed at the bus stop. | Our project presents an integrated online system for real-time bus information, encompassing arrival time, bus position, and passenger count. The system, a web application connected to Firebase real-time database, ensures instant access to all data, enabling timely display of information at bus stops. |
| 8. | Sachini Karunathilake  (2023) | This project is a GPS (Global Positioning System)  based system which helps passengers to know the expected time of arrival of the bus to their prospective halt or a particular location using present GPS data of the passenger and the bus. Within the ‘Bus Tracking and Arrival Prediction System’, each  bus has a GPS tracker to track the bus. GPS tracker on the bus is used to locate the bus its coordinates and the speed of the bus are pushed on to the server to calculate an accurate | Our project incorporates a Raspberry Pi 3 B+ kit and a GPS receiver installed in the bus, facilitating real-time tracking of its data, including current location and route between stops. The system activates upon the bus engine starting, continuously updating and transmitting location coordinates (longitude and latitude) to the server as the bus moves, ensuring accurate consistent monitoring. |
| 9. | Kapil Mundada, Sumedh Patti,  Tejas Rajguru,  (2023) | system uses GPS and GSM technologies to track the location and estimated arrival time of buses and transmit this information to commuters’ mobile devices. This technology addresses the common problem of long waiting times at bus stops and the uncertainty of bus arrival times. | Our system employs GPS and GSM technologies to track bus locations and estimate arrival times, delivering this information to commuters' mobile devices. This addresses the widespread issues of extended waiting times at bus stops and the uncertainty surrounding bus arrival schedules, enhancing overall convenience for passengers. |
| 10. | Muhammad Wasim Raad,  Mohamed Deriche, Tarek Sheltami  (2021) | In this paper the design and implementation of a comprehensive low-cost system based on IoT that allows schools, parents, and authorities to track the movement of children while in school buses or being transported in private vehicles in real time. | Our paper presents the design and implementation of an affordable IoT-based system enabling real-time tracking of children's movements in school buses or private vehicles. This comprehensive solution provides schools, parents, and authorities with the means to monitor and ensure the safety of children during transportation. |
| 11. | Dr. S. Nirmala,  Dr. R. Mekala,  Ms. Apurva. P  (2023) | The raspberry pi 3 b+ kit implemented into the bus along with GPS receiver. This GPS innovation helps in following the constant data of the transport like current area and route between the stops. With the transport motor turns over, the gadget begins working and constantly refreshes the area of the transport. It sends area facilitates as longitude and scope esteems to the worker. | Implemented on buses, our Raspberry Pi 3 B+ kit with a GPS receiver tracks real-time data, updating the bus location continuously. Activated with the bus engine, it sends longitude and latitude coordinates to the server for constant monitoring. |
| 12. | 1. K.Fernando Ruwani,   M. Samarakkody  (2010) | The GPS sensors widely use in vehicle tracking systems followed by the RFID technology.Wi-Fi network are the most popular network while GSM/GPRS TCP/UDP protocols are the best transport layer protocol. Mostly used storage method was observed as the cloud for the smart vehicle tracking systems, and Kalman filter was the most popular algorithm in vehicular tracking systems. | Vehicle tracking systems primarily utilize GPS sensors and RFID technology. Wi-Fi networks are popular for connectivity, and GSM/GPRS TCP/UDP protocols serve as efficient transport layer protocols. Cloud storage is widely adopted for smart vehicle tracking systems, with the Kalman filter emerging as a prevalent algorithm for vehicular tracking. |
| 13. | [Shusuke Kawai,](javascript:void(0);" \o "Shusuke Kawai)  [Takayuki Ikari](javascript:void(0);" \o "Shusuke Kawai)  [(2009)](javascript:void(0);" \o "Shusuke Kawai) | A 480Mb/s wireless real-time bus trace system with a pulse-based inductive coupling channel array was developed using a 0.25μm CMOS digital process. The size and pitch of the inductor array are determined by numerical calculation to optimize the trade off between the channel coupling and alignment tolerance. | Developed a 480Mb/s wireless real-time bus trace system utilizing a pulse-based inductive coupling channel array in 0.25μm CMOS. The inductor array size and pitch were optimized for effective channel coupling and alignment tolerance. |
| 14. | 1. S. Naik, 2. G. Harshitha, 3. D. Spoorthy,   (2020) | Tracking of school bus is done by GPS (Global Positioning System) technology. The system alerts parents by notifying them. This is achieved through GSM (Global System for Mobile applications). RFID (Radio Frequency Identification) identifies unique id given to each individual.Also an algorithm is implemented to calculate the arrival time of the bus in addition to tracking. | School bus tracking utilizes GPS technology, alerting parents via GSM notifications. RFID assigns unique IDs to individuals, and an algorithm calculates bus arrival time along with tracking capabilities. |
| 15. | Zuhanis Mansor,  Fatin Shahmira Binti Zulfa’is Shah,  (2020) | The Malaysia Public Bus Monitoring Real-Time System via GPS and GSM is implemented to help the bus user to track the current location of the bus in the form of latitude and longitude coordinates by using GPS technology. This technology of Global Positioning System and Global System for Mobile communication is used where the GPS module will track on the current position of a particular bus by receiving signal from at least three GPS satellites. | Implemented in Malaysia, the Public Bus Monitoring Real-Time System utilizes GPS and GSM for users to track bus locations via latitude and longitude coordinates. The GPS module determines the bus's current position by receiving signals from a minimum of three GPS satellites. |
| 16. | Mr. Pradip Suresh Mane,  Dr. Vaishali D. Khairnar  (2014) | The standard desktop web interface is designed to loosely mimic the interface of the main Google Maps website that many users are already familiar with. Specifically, the primary view is a Google map view, with a search field at the top and a search results panel on the left. Users can browse the map directly to see transit stops at a particular location, Additionally, users can search by route to display the map of that route and stops along the route. | Our standard desktop web interface closely mirrors the familiar layout of the main Google Maps website. It features a primary view with a Google map, a top search field, and a left panel for search results. Users can explore transit stops at specific locations directly on the map, and they have the option to search by route, displaying the route map and associated stops. |
| 17. | J. Navya Sree,  T. Mamatha  (2021) | Driver Module is tailored for bus drivers, who, after providing their unique login credentials, gain access to the module.  Student Module is dedicated to students. Users within this module initiate the student login, granting them access to comprehensive information. Through their smartphones, students can view details about all buses. This includes tracking the real-time location of their respective buses from any location.  The admin module is specifically crafted for bus administrators tasked with updating system information. Admins undergo authentication and authorization processes to log in. | The Driver Module offers bus drivers secure access through unique credentials, while the Student Module allows students to log in via smartphones, providing comprehensive information and real-time bus tracking. The Admin Module, designed for bus administrators, involves authentication and authorization processes to update system information securely. |
| 18. | C K Gomathy  (2021) | A Real-Time College Bus Tracking Application which runson Android smart phones. This enables students to find out the location of the bus so that they won’t get late or won’t arrive at the stop too early. The main purpose of this application is to provide exact location of the student’s respective buses in Google . | The Real-Time College Bus Tracking Android application allows students to track their buses, ensuring timely arrivals and preventing unnecessary early waits. The app's primary goal is to provide precise bus locations on Google Maps, enhancing the overall commuting experience for students. |
| 19. | Ankur Ganorkar  (2020) | An application at the parent side will allow parents to send a location request to a child side then retrieve the location from the request reply and shows it on a map. | The parent-side application facilitates location requests to the child-side app, retrieving and displaying the child's location on a map, enhancing parental oversight through real-time tracking. |
| 20. | [Aman Mishra](https://www.researchgate.net/scientific-contributions/Aman-Mishra-2188231581?_sg%5b0%5d=LXnZGxTgke6vV69NN-mR7xM7aEJntx76QcIqYs5ip_oJA6TBEq7GJ8ypi8QHGr81EYQdWFk.LS9oAeyccHWud3l78aQ59oZ2Mqo5phJNlpeOh5RrFukIz3NADn0DrG6w8B-lrXl9sexBxbx0f7fuZwZBd5z-KQ&_sg%5b1%5d=J-kvQ9IdYA6aunsrblIGcnMWHnC4BD2OB8WvttRHXGHuPiN3w2C-hVT_XTuz7wIgTs2Sxm0.tnTXbHpbX2VyEiee1yqQoMvDsvK4Q4NrB-Mgxy4jP69SVYiQdn8BSYu57wluDKlaA7qO746pJz6rLZ0kcNrrlg&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlSGVhZGVyIn19),  [Advin Manhar](https://www.researchgate.net/profile/Advin-Manhar?_sg%5b0%5d=LXnZGxTgke6vV69NN-mR7xM7aEJntx76QcIqYs5ip_oJA6TBEq7GJ8ypi8QHGr81EYQdWFk.LS9oAeyccHWud3l78aQ59oZ2Mqo5phJNlpeOh5RrFukIz3NADn0DrG6w8B-lrXl9sexBxbx0f7fuZwZBd5z-KQ&_sg%5b1%5d=J-kvQ9IdYA6aunsrblIGcnMWHnC4BD2OB8WvttRHXGHuPiN3w2C-hVT_XTuz7wIgTs2Sxm0.tnTXbHpbX2VyEiee1yqQoMvDsvK4Q4NrB-Mgxy4jP69SVYiQdn8BSYu57wluDKlaA7qO746pJz6rLZ0kcNrrlg&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlSGVhZGVyIn19),  (2020) | In this paper they have discussed which will be the feasible app and convenient for all of us to track a cell no. via app. | The paper explores the feasibility and convenience of various mobile apps for tracking cell numbers. |
| 21. | 1. Shibghatullah 2. Abdurrahman Jalil | An application is proposed in this paper and it uses Global Positioning System (GPS) on Android smartphone to determine the location of a vehicle and the coordinates is stored in Firebase Real-time Database | The paper proposes an application utilizing GPS on Android smartphones to determine vehicle location, with coordinates stored in the Firebase Real-time Database. |
| 22. | Mohamad Khairul,  Hafizi Rahimi,  (2022) | The goal of this research is to develop a bus tracking and monitoring system for the UiTM-SAC. Arduino node micro controller unit and global positioning system (GPS) sensors were used to send and receive GPS location information. | The research aims to create a bus tracking and monitoring system for UiTM-SAC, employing Arduino node microcontrollers and GPS sensors to transmit and receive GPS location information. |
| 23. | [Keith A. Redmill](https://sciprofiles.com/profile/1673802?utm_source=mdpi.com&utm_medium=website&utm_campaign=avatar_name),  [Ekim Yurtsever](https://sciprofiles.com/profile/1595477?utm_source=mdpi.com&utm_medium=website&utm_campaign=avatar_name),  (2023) | Paper on operationalize this traffic surveillance methodology for practical applications, leveraging the perception and localization sensors already deployed on these vehicles. | The paper operationalizes a traffic surveillance methodology for practical applications by utilizing existing perception and localization sensors deployed on vehicles. |
| 24. | [Nivesh Wanninayaka](https://www.researchgate.net/profile/Nivesh-Wanninayaka?_sg%5b0%5d=Vt3jCPLXmjZFUlpjMNRLJrTXoRI9NdCnH7eMfX9JBUchfz-rGTrwmO9znckZYUbKMaEesnw.yA8B0mEPWQJ_pc1yR5JmB2fRVf-35rHiO-P7fD-7B2kKkOB9ogb5gqqaaJEd74MTHM7xTffsu29SKtjurJPcKg&_sg%5b1%5d=PMpoG_6ksLsl9Mw9RF_y-tvndiYvi9NYwWObMY_8UE56lue7vbncO10JCZ413fy-Orp1JxA.wUdbJY-b0bS1E2TgNkOrZO8K_VX66hXofG_H0hf_Xf1YyIRIc2u9BXr8iJbGSYjY-zbDR3e62ZFATeplhrCa6g&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicHJldmlvdXNQYWdlIjoicHVibGljYXRpb24iLCJwb3NpdGlvbiI6InBhZ2VIZWFkZXIifX0)  (2023) | A passenger can track a preferred bus and reserve seats by choosing destinations. Artificial intelligence (AI)-based camera technology is used to count passengers. | Passengers can track and reserve seats on a preferred bus by selecting destinations, facilitated by AI-based camera technology for accurate passenger counting. |
| 25. | [Sharmin Akter](https://ieeexplore.ieee.org/author/37087232181),  [Thouhedul Islam](https://ieeexplore.ieee.org/author/37085541589),  (2019) | In this paper, a cloud-based bus tracking system based on IoT is proposed to reduce human intervention, waiting time and energy. | The paper proposes a cloud-based bus tracking system using IoT to minimize human intervention, waiting time, and energy consumption. |
| 26. | [Süleyman Eken](https://ieeexplore.ieee.org/author/38507509300)  (2014) | In this paper, we proposed smart bus tracking system that any passenger with a smart phone or mobile device with the QR (Quick Response) code reader can scan QR codes placed at bus stops to view estimated bus arrival times, buses' current locations, and bus routes on a map. | The paper introduces a smart bus tracking system, enabling passengers with smartphones to scan QR codes at bus stops. This allows them to access estimated arrival times, current bus locations, and route maps in real-time. |