

IOT Based Vehicle Tracking And Monitoring System

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VISTAS

Abstract- Mymensingh is the capital of Mymensingh Division in central Bangladesh. Ensuring water sanitation and hygiene in Mymensingh is vital for community health, requiring effective measures and collaboration between authorities, organizations, and residents for sustainable implementation. The objectives of this study were to investigate the water supply and sanitation status of Mymensingh City. Data were collected primarily based on a reconnaissance survey with the help of a structured questionnaire. A cross-sectional survey design was employed to collect data on variables related to water, sanitation, and hygiene in the area. Many homes rely on submersible pumps and deep tube wells for drinking water, while access to piped water is limited. Inadequate water supply and limited access to clean water contribute to waterborne illnesses and negatively impact public health. Sanitation infrastructure in Mymensingh City Corporation varies, with reliance on septic tanks and pit latrines, while limited sewage systems and waste management exist. Inconsistent hygiene practices contribute to waterborne illnesses, highlighting the need for improved infrastructure and behavior change interventions. Improving the drainage system, implementing effective measures for waste management, and promoting hygiene education programs are essential for minimizing waterborne diseases and enhancing residents' quality of life.

Keywords: Internet of Things (IoT), Internet of Vehicles (IoV), Traffic Management, Greedy Algorithm, Global System for Mobile Communication (GSM), GPS, Route Distance, Developing Nations, Urban Arterial

I.INTRODUCTION

With the rapid increase in urban population and vehicle ownership, managing transportation systems has become a significant challenge. Traditional traffic management and public transportation solutions often struggle with inefficiency, congestion, and lack of real-time information. To address these challenges, the Internet of Things (IoT) emerges as a transformative technology by connecting smart devices and enabling seamless communication between them. This project, IoT-Based Vehicle Tracking and Monitoring System, focuses on leveraging IoT and vehicular ad-hoc networks (VANETs) to create an intelligent, real-time vehicle tracking solution. By embedding vehicles with GPS, GSM modules, and sensors, the system allows vehicles to communicate critical information like location, speed, and fuel

levels to owners, centralized servers, and emergency services. The project employs a Greedy Routing Algorithm to optimize data transmission paths and ensure efficient traffic management, addressing common issues like network congestion and location inaccuracies.

Built using VB.NET for the frontend and SQL Server for the backend, the system offers a robust, real-time platform for public transportation tracking and traffic management. It aims to improve urban mobility, enhance commuter experience, and contribute to safer, smarter cities.

II. LITERATURE SURVEY

[1] Internet of Things (IoT) in Transportation: connects vehicles, sensors, and communication modules to monitor and manage real-time traffic

conditions. IoT enables efficient data collection from vehicles, improving route planning, safety, and congestion management. [2] Internet of Vehicles (IoV): IoV is an extension of IoT specifically applied to vehicles. It supports Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), and Vehicle-to-User (V2U) communications for seamless traffic monitoring. [3] Use of Greedy Routing Algorithms: Greedy algorithms are used for optimal packet forwarding based on node proximity to the destination. These algorithms minimize end-to-end delay and ensure faster data delivery in dynamic vehicular environments. [4] Vehicular Ad-hoc Networks (VANETs): VANETs allow vehicles to form temporary networks without relying on central infrastructure. Challenges identified include frequent topology changes, network disconnections, and maintaining reliable communication at high vehicle speeds. [5] Role of GPS and GSM Modules: GPS modules provide precise location tracking of vehicles. GSM modules are used for transmitting location and status data to central servers or vehicle owners in real-time. [6] Traffic Management and Safety Enhancements: Real-time vehicle tracking helps in early detection of accidents, traffic congestion, and emergency situations. Integration with emergency services like police and ambulance improves response times and overall public safety. [7] Existing Limitations: Traditional vehicle tracking systems face issues like high implementation costs, data loss, low prediction accuracy, and system vulnerabilities to cyberattacks. Existing solutions often lack efficient handling of destination mobility and optimal pathfinding. [8] Proposed Solutions: Introduction of backbone nodes for connectivity maintenance during node movement. Use of two-phase destination discovery and hop-greedy routing to dynamically adapt to network changes and ensure reliable communication.

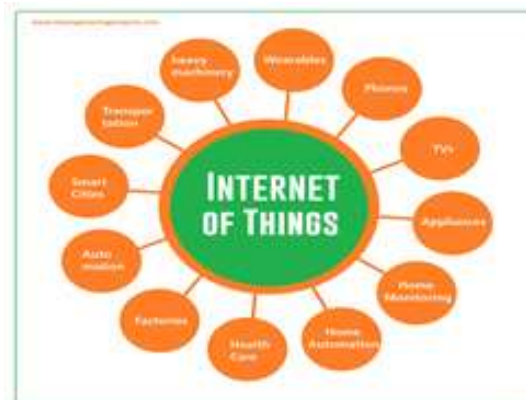
III.IMPLEMENTATION

The IoT-Based Vehicle Tracking and Monitoring System is implemented by integrating both hardware and software components to ensure seamless real-time tracking and monitoring.

Vehicles are equipped with GPS and GSM modules that continuously collect and transmit data such as location, speed, and fuel level to a centralized IoT server. The server, developed using VB.NET for the frontend and SQL Server as the backend, receives this data through socket programming and manages it efficiently in the database. The system uses a Hop Greedy Routing Algorithm to optimally route the data packets from the vehicles to the server, minimizing transmission delay and handling network failures with the help of secondary backbone nodes. The server also processes this data to generate real-time traffic alerts, which are communicated to vehicle owners and emergency services like police and ambulances. Users can access the tracking information remotely via a client interface, ensuring effective monitoring and quick response to traffic situations. The entire communication infrastructure relies on TCP/IP socket connections to ensure reliability. Thus, the system effectively addresses challenges in traditional traffic monitoring by providing a robust, scalable, and real-time vehicle tracking solution..

Software requirements:

Operating System: Windows



IoT-Based Vehicle Tracking and Monitoring System: General IoT Concept Diagram (showing devices connected via cloud/network). Internet of Vehicles (IoV) Diagram (vehicles communicating with server and other vehicles). Smart Transportation System Image (GPS tracking, traffic monitoring). Vehicle-to-Infrastructure (V2I) Communication (vehicle interacting with traffic signals, server). IoT Architecture Layers (Sensor layer, Network layer, Application layer)

Scope:

Tracking vehicle position, speed, and fuel levels using IoT sensors. Transmitting real-time data to a centralized server via wireless communication (GSM, GPS).

Providing users with vehicle status updates remotely through a client application. Alerting authorities about critical traffic conditions or emergencies.

Implementing efficient data transmission using the Hop Greedy Routing Algorithm.

Non-Functional Requirements:

Reliability: The system should function 24x7 without failure.

Scalability: Capable of tracking multiple vehicles at once.

Security: Secure transmission of data between vehicles and server (authentication and data encryption suggested).

Performance: Quick response to client queries and real-time updatesV. CONCLUSION & RECOMMENDATIONS

- XP/7/8/10 Front End: VB.NET
- Back End: SQL Server
- Database Server: Microsoft SQL Server 2008 or higher
- IDE: Visual Studio (VB.NET)
- Programming Languages: VB.NET, C#
- Networking Protocol: TCP/IP (Socket Programming)

Functional Requirements:

Real-time location tracking of vehicles.

Upload vehicle data to the IoT server automatically.

Download and display vehicle data for users and authorities.

Provide real-time traffic alerts.

Manage multiple vehicles simultaneously.

Store vehicle data securely in the database.

Usability: Simple and user-friendly interfaces for administrators and users.

Maintainability: Modular code to easily update or add features.

Constraints:

Real-time GPS accuracy may vary depending on weather and environment.

GSM network availability may affect data transmission.

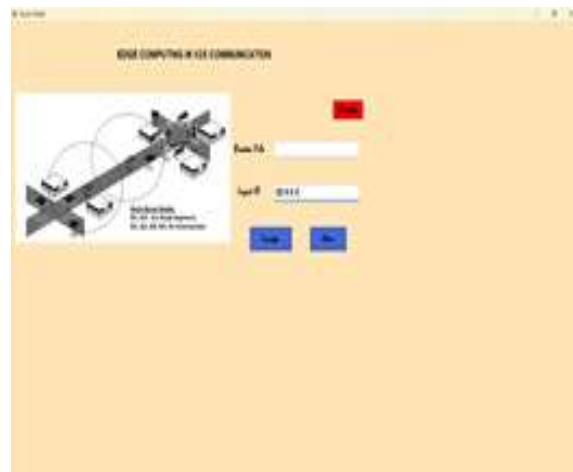
Initial system setup (hardware installation in vehicles) is required.

Assumptions and Dependencies:

Vehicles are assumed to be equipped with working GPS and GSM modules. There is continuous internet and mobile network coverage. Users must have access to a Windows-based client system.

V.SCREENSHOTS

1.Source Node



2.Data sent from destination



3.Traffic Prediction



4.Source & Destination:



5.Traffic Prediction source to destination: maintaining reliable communication even in dynamic network conditions.



The system enhances road safety, reduces traffic congestion, and improves the response time of emergency services by delivering accurate, real-time traffic alerts to users and authorities. Furthermore, it offers a user-friendly interface for clients to monitor vehicles remotely and securely. The use of VB.NET for the frontend and SQL Server for backend database management ensures a stable and scalable platform.

Overall, the project meets its primary objectives by delivering an effective, intelligent, and cost-efficient solution for modern urban traffic challenges. It lays a strong foundation for future enhancements such as predictive traffic analytics, integration with smart city infrastructures, and advanced security features, promoting smarter and safer transportation systems.

6.Destination Location:



7. Destination location another location forward.

REFERENCE

- [1]. "Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application" *IEEE Xplore* – Discusses integration of GPS and GSM with IoT for real-time tracking.
- [2]. "An IoT based Intelligent Vehicle Monitoring and Tracking System" *ScienceDirect or Springer* – Covers hardware architecture and cloud connectivity for live tracking and analytics.
- [3]. "Development of IoT-based Vehicle Monitoring System Using NodeMCU" – Often appears in student journals and repositories. Useful for understanding hardware components like GPS module, NodeMCU, and sensors.
- [4]. "Smart Vehicle Tracking System using Arduino and GPS" – A project-based paper that can be useful if you're doing implementation.
- [5]. "IoT Based Smart Vehicle Tracking System" by N. Yadav et al. *Published in various open access journals or conference proceedings.*