

Chapter 9

An Industry–Focused Traffic System Utilising Internet of Things

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ABSTRACT

Radio frequency identification technology (RFID) and time series forecasts are used to create a dependable IoT-based traffic system. The system regulates city traffic. The suggested method estimates junction traffic volume over time using LSTM neural networks. RFID technology improves data collection accuracy and reliability. Data preparation includes outlier identification to remove anomalies. Training the LSTM model on preprocessed data reveals traffic volume trends. The trained model predicts traffic volume using historical data. Prediction performance is quantified by MAE, MAPE, and R2. The proposed approach is tested using four intersection traffic data. Results indicate that LSTM-based traffic volume estimation works. The optimal design is determined by evaluating system performance for 12-to-168-time steps. The experimental findings suggest that the proposed method can accurately anticipate traffic volume, helping traffic managers enhance flow. RFID and time series projections bolster traffic system reliability.

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1. INTRODUCTION

The management of transportation and the control of traffic are essential components of urban infrastructure. These elements have a direct influence on the effectiveness, safety, and sustainability of transportation networks. As a result of the rapid advancement of technology, there has been a rise in the amount of interest shown in the use of innovative solutions to meet the challenges posed by inefficiencies and traffic congestion. One such strategy is the incorporation of Internet of Things (IoT) technology into traffic systems, which enables the collection, evaluation, and use of real-time data with the purpose of producing the best possible results in terms of traffic management. We present an Internet of Things (IoT)-based robust traffic system in this study (Menon, V., et al., 2022). This system enhances the flow of traffic and increases the overall efficiency of transportation by leveraging the power of IoT and several predictive modelling approaches. Our system utilizes time series forecasts in conjunction with Radio Frequency Identification (RFID) technology in order to enhance its capabilities in the areas of traffic control and monitoring. The development of a comprehensive framework that makes accurate projections of future traffic trends by making use of historical data on traffic and predictive modelling is our key objective. By studying and gaining an understanding of historic traffic patterns, we are able to accurately predict the occurrence of traffic congestion and make well-informed decisions regarding how to best adjust the timing of traffic signals, make effective use of available resources, and successfully alleviate congestion. When it comes to making accurate projections, we rely on a method known as time series analysis. The past traffic data gathered from a variety of crossings is the primary source of input for our forecasting algorithm. The data are preprocessed using stringent procedures to eliminate outliers, which ensures that the results will be accurate and predictable. Following this step, univariate time series forecasting techniques are utilised in order to create forecasts regarding future traffic patterns. Along with improvements to traffic control and monitoring, the RFID technology that our system utilizes also enables us to make more accurate predictions of time series. Vehicles are outfitted with radio frequency identification (RFID) tags, which enables ongoing tracking and identification (Gupta, A. K., et al., 2023). Traffic managers now have the ability to adjust signal timings, dynamically change traffic flow, and react fast to changing traffic situations thanks to real-time vehicle data and projected traffic patterns. In order to demonstrate that the system we propose actually works, we must first conduct a great deal of research and testing on it (Pandey, B. K., et al., 2023). We employ performance measures like as mean absolute error (MAE), mean absolute percentage error (MAPE), and coefficient of determination (R-squared) to examine the accuracy and dependability of our predictions. For example, MAE stands for mean absolute error, while MAPE and R-squared stand for mean absolute error and mean absolute percentage error respectively (Pandey, B. K., et al., 2023).

The results indicate that our Internet of Things-based traffic system is able to accurately forecast traffic patterns and boost the efficiency of traffic management. Utilizing Internet of Things technology and predictive modelling techniques, this research makes a contribution to the field of transportation management. By utilizing the real-time data and insights provided by internet of things and radio frequency identification technologies, traffic managers are able to make more educated decisions that optimize traffic flow, minimize congestion, and increase overall transportation efficiency. The architecture that was proposed has the potential to revolutionize conventional traffic management systems, which would lead to transportation networks that are both more intelligent and more environmentally friendly (Swapna, H. R., et al., 2023) (Malhotra, P., et al., 2021).

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