Development of Smart Transit System: A Systemic Analysis

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Abstract-Smart transit system is an important part of city transportation, which is an interdisciplinary industry, including traffic engineering, operation research, and computer science. To provide smart services for passengers while applying the new technologies, it is necessary to build an optimal transit network and transit service. A smart transit system is processed from strategic planning, tactical planning, operational planning, transit evaluation to marketing and policy. For each stage, large quantities of related literature have been introduced from different perspectives. Transport is an important part of nation's economy. In the interims, public transport has always been the primary mode of transport for most of the population, and India's public transport systems are one among the most heavily used in the world. We discussed about the vehicular growth and modal split in India and the needs for choosing Smart Transit System as the best option for cities in India as one of the public transport system.

Keywords- Smart transit system, traffic engineering, transit service, Functions of Transport

1. Introduction

Transportation is the backbone of urban development. It effectively promotes the operation of urban areas by providing access and mobility. Passengers have an overwhelming influence on the operation of the city. As it grows, it needs to increase mobility.

By encouraging private transportation services such as automated rickshaws, private buses, taxis or public transportation systems, mobility can be improved in two ways. We can choose a public transport system rather than a private transport system because urban expansion and poor land use planning have a major impact on traffic congestion, air pollution and greenhouse gas emissions. Public transport helps reduce sprawl by attracting development around bus stops, and this development also encourages passengers to support public transport.

As a result, traffic and community planning officials around the world are considering improving public transportation to solve urban transport problems. Their interest in public transportation has rekindled, reflecting people's desire for environmental protection and alternatives to highway blockage and urban expansion. There are many transportation technologies that solve these problems, such as subway rail transit, light rail (LRT), monorail, etc., but these technologies are uneconomical, non-flexible, and have high capital and operating costs.

These various issues have prompted transport agencies to revisit existing technologies and adopt innovative approaches to cost-effectively improve service quality.

2. Functions of Transport

1. Transport helps in the development of industries that require faster marketing of the product. Fish and green vegetables such as fast market transport can be moved quickly to consumers.

2. Transportation helps to increase the demand for goods. Shipping allows you to easily contact new customers in new locations and introduce them. Today, for transportation, the market has become a domestic or international market.

3. Transportation generates local benefits. Geographical and seasonal factors keep the industry away from the market and there is no demand for this product. Recovers space between transmission production centers and consumer centers.

4. Transportation produces time utility. Subsequent transportation has also begun to create time benefits. It is made possible by the improvement of the transportation speed. It helps to distribute the product in the shortest possible time.

5. Transportation helps to stabilize prices. By moving goods from surplus areas to deficit areas, transportation can have a significant impact on the price stability of some goods. This balances the elements of demand and supply with sand and stabilizes and levels commodity prices.

6. Transportation ensures that goods flow evenly to consumers throughout the consumption period.

7. By means of transportation, consumers can benefit from products produced abroad. This improves the living standard, which is an important factor in the further development of marketing and economy.

8. Transportation identifies competition, which reduces ambiguity. Prices were also reduced due to mass production of transport facilities. Only transportation can achieve the benefits of mass production.

9. Transport enhances labor and capital mobility. People in one place can move to another place and find work. Even capital, machinery and equipment can only be imported from abroad by transport.

3. Means of Transport

Transportation is classified according to roads, vehicles, electricity usage and terminals.

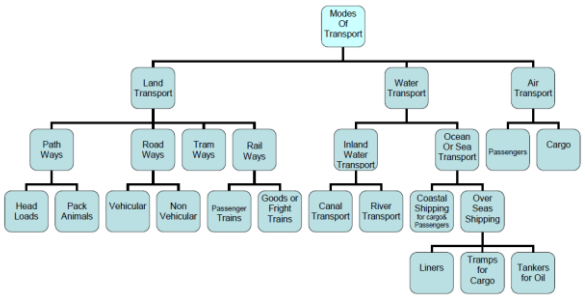

Fig 1. Means of Transport

4. Background

Sutar *et al.* (2016) with rapid population growth, the number of vehicles on the road is also increasing, and problems associated with traffic management, especially public transport, are increasing. Accidents and other traffic related issues are also on the rise. The Intelligent Transport System (ITS) integrates existing technology with existing infrastructure and provides solutions to most of them. Mobile technology and mutual cellular network accessible for efficient transmission management enables real-time car tracking. Intelligent public transport system can wait for buses. The spread of smartphones and the increase in their power are one of the most attractive options for developing IoT applications at very economical prices. Here we describe a method based on a combination of GPS and technologies such as Android to reduce public transport passengers. Provides users with clear information about the current location of the closest bus on the mobile app near the bus stop. Using existing Android APIs and technologies such as 3G networks and SMS-based services on existing mobile phones reduces the cost and size of the hardware required and delivers better output.

Their conclusion is that they believe that traffic management is not a separate issue but a global issue that needs to be solved in a smart way. In this paper, we introduce an effective intelligent public transport management system framework that dynamically tracks the location of all buses and estimates when the next bus will arrive at the bus terminal. Every time the bus sends an update to the server, it is estimated to be updated regularly. Distribute this information to passengers who use the smartphone app or send a request via SMS as needed. Transportation problems can be mitigated by more and more people choosing efficient and economical public transportation as a means of transportation. With information on demand services, commuters can plan their trips in advance, save time and improve personal productivity. The confusion of the bus terminal arriving next time is also resolved by the bus display module, which regularly displays the route details. In short, this system helps commuters, drivers and managers of transportation systems in a very convenient way.

Agarwal *et al.* (2015) this study introduced the basic concept and application of artificial intelligence system (AIS) in the development of smart city intelligent transportation system in India. With the continuous development of urbanization, the government now recognizes the need to develop a smart city that can meet the challenges of urban life and is also a magnet to attract investment from India. The smart city transport system is accessible, safe, environmentally friendly, fast, more comfortable, and more affordable without affecting future needs. India's cities do not have intelligent transportation systems in India, which causes problems such as inefficiency of public transportation, serious traffic congestion, increased traffic accidents, lack of parking space, and a sharp rise in energy costs. Therefore, development of intelligent transportation system is very important for smart city because of environmental, economic and social equity concerns. Artificial intelligence is an important technology to solve these problems. Therefore, there is an urgent need to use artificial intelligence systems to develop intelligent traffic systems to better understand and control smart city operations. Therefore, the main purpose of this study is to introduce some basic concepts of artificial intelligence and its application in the development of intelligent urban intelligent transportation system in India. The conclusion of this study is that smart cities need to develop intelligent public transport systems, intelligent traffic management and control, intelligent travel information systems, intelligent parking management, and secure mobile and emergency systems using artificial intelligence systems about it. This study is expected to pave the way for the development of Smart City's Intelligent Transportation System in India.

Debnath *et al.* (2014) In addition to addressing the challenges of rapid urbanization and increasing traffic congestion, the development of intelligent transportation systems has received much attention recently. There have been many promising initiatives over the years. Despite these measures, there is still no lack of understanding of the correct definition of intelligent transportation system. Therefore, it is difficult to determine appropriate indicators of "intelligence." Based on the intelligence system intelligence, this paper proposes a comprehensive and practical urban citizen benchmark framework. The proposed method is described using a set of data collected from 26 cities around the world through network search and communication with relevant transport authorities and agencies. As a result, London, Seattle and Sydney are one of the smartest transportation cities in the world. In particular, Seattle and Paris have high ratings for smart private transport services, and London and Singapore have high ratings for public transport services. It seems that London is the biggest in terms of emergency transport services. An important value for the proposed geographical framework is a balanced analysis between the cities to promote integration.

Pelletier *et al.* (2011) Public transport is increasingly smart card using automatic toll tool system. Although their primary purpose is to collect revenue, they also produce very detailed information about flying flights. These data are very useful for mobility planners, from the everyday routine of the transport system, in the network's strategic long-term plan. This analysis will discuss some aspects of using smart card data in public transport. First of all, we have secured privacy and legal issues associated with the hardware and information systems necessary to run these devices, smart card data, and data storage and encryption expansion. Next, we will consider the use of three-degree use of administrative data: strategy (long term planning), strategy (service development and network development), and operation (passenger data and Performance indicators). Smart card commercial experiences held worldwide were reported. Finally, we will present the most comprehensive smartphone data research methods in the field, including execution and implementation timelines, system scheduling and passenger survivors. In this paper, we report the use of smart card payment system in public transportation. While smart cards are constantly evolving in technology, smart cards have now shown to be

mature in this area. In addition to the functioning of rent collections, smart card systems can also be used to provide data to planers and researchers. This continuous flow of passenger behavior data can help the strategic strategies of transport agencies, and improve operating efficiency.

Mbatha *et al.* (2019) South Africa's public transport has been formalized in the last few years to provide transportation suitable for travel. However, it is difficult for commuters to arrive at their destination at the target station regularly using public transportation. One of the identified challenges is the lack of integration between different public transport agencies in Gauteng, South Africa. Previous studies have shown that there is a spatial connection between these systems. Nevertheless, this research seeks electronic integration beyond physical integration. Thus, this study examines how mobile information delivery and payment systems integrate Gauteng's high-speed trains and high-speed transport systems (BRTs) to create a convenient public transport system for commuters. Thus, integrated mobile payment systems and integrated mobile information delivery have been introduced to BRT systems and high-speed trains. Qualitative research is designed to enable collection, analysis, and data presentation. Gather information using exploratory analysis, comparative analysis, and content analysis. Preliminary results show that the formal public transport system (high-speed train and BRT system) is not integrated and the use of the mobile payment system has not yet been developed. This paper concludes with an understanding of the importance of integrated transit systems and the possibility that these systems will work together to facilitate viable transport networks. This study recommends the use of integrated mobile technology for public transport because it is safe, fast, reliable and convenient for commuters and authorities.

John *et al.* (2019) The Intelligent Transport System (ITS) is part of the internet of things (IOUT). It provides information about the communication between vehicles, infrastructure and intelligent transportation. Protecting real-time communication transport systems between vehicle cars (V2V), inter vehicle infrastructure (V2I), inter vehicle infrastructure (I2V), and inter-vehicle infrastructure (I2I) it is important to improve mobility and performance. Real-Time Database has Intelligent Traffic Management System (ATMM), advanced passenger information system (ATIS), Advanced Vehicle Control System (AVCC), Commercial Vehicle Operation (CVO), Advanced Public transport systems (APTS) have developed different models of different countries like useful systems (RTSs) according to their conditions. There are some limited study studies and processes in India. The full commitment to IT'S cannot be developed from the Indian perspective. In this regard, traffic conditions, fleet management and infrastructure requirements require significant upgrades. The following main cases are investigated in ATMM tests conducted in China (2009), Bangalore and ATIS in Hyderabad, Admiralty of Bangalore, Chennai and Indore. Bus Rapid Transit (BRT) has spread throughout India as an alternative to Pune, Ahmedabad and Chennai. Electronic toll collection systems (ECCs) and advanced parking management are their applications which have special advantages in India. The concepts of ultra-low power Bluetooth technology, 5G networks, and cellular IoT create many opportunities to implement ITS in India.

Lu *et al.* (2018)Urban transportation systems are an integral part of urban transportation and are interdisciplinary industries including traffic engineering, operations research and computer science. In order to provide intelligent services to passengers while applying new technology, it is necessary to establish the best public transport network and bus services. Intelligent transportation systems are processed from strategic planning, tactical planning, operations planning, and transportation assessment to marketing and policy. At each stage, a large number of relevant documents are introduced from various points of view. The purpose of this study is to document key smart city traffic models, themes and implementations for future reference and study at each stage. For the planning part, this article first summarizes the goals, constraints, algorithms, and semantics of the models currently in use, and categorizes the goals and constraints into traditional and new categories. When comparing the two categories, the themes and potential studies were clearly captured. Methods for solving these models are mainly proposed using genetic and simulated annealing algorithms, which help to fill gaps in further research. Despite the model update, there is a summary of the study application trends, such as integrated network design, strategic and operational planning constraints, and timetable recoverable in strategic planning. To improve the transportation system and services, the reliability of service, service availability, timely powerful and energy consolidation models are presented. This distinguishes the difference between ideal and real services. The finance section discusses some flexible fare planning, investments and business strategies. The conclusion highlights the future scope of smart urban transport, including passenger demand management, travel information services, facility and service optimization, and shared mobility to make passengers more convenient and environmentally friendly.

Naik *et al.* (2017) In this study, we will introduce the optimal number of electric buses and their failure analysis in an intelligent public transportation system using solar energy. Electric buses are used for large-scale transportation in Guwahati, Assam, India. A charging point is provided via the city loop to charge the electrical bus. Each charge point includes a large capacity energy storage device (ESD) and solar equipment to ensure the smooth functioning of the transport system. The optimal number of electric buses is determined as a function of load, ESD, solar power plants, and the total number of passengers. Simulations were performed to show the system's response to the optimal number of electrical buses present in the system and failures. Each charge point includes a fuzzy logic controller that controls the flow of power between the grid, ESD, and the solar power plant.

López-López *et al.* (2017) The electrical infrastructure of the DC electrified public transport system (MTS) is under consideration. Improvements to the MTS infrastructure are usually addressed through optimization studies. These optimizers usually take a long time to get a solution, mainly due to traffic conditions that must be considered. You can reduce the optimization time by increasing the sampling time used to capture the traffic scene. However, due to fast speed and breakthrough in MTS, it is not clear how much time samples can increase. In most cases, this parameter is set to only 1 second. To resolve this issue, this paper suggests a compression algorithm that can completely reduce the number of images in a traffic scene, and can get good information about energy-saving accuracy. The proposed traffic scene compressor is applied in two stages: The first step is to find a cluster like snapshot in non-compatible traffic view; the second step is to search for direct rectangular studies. This may include a set of traffic models. Train status and power. The results obtained show that the

compressor can achieve an 80% optimization time reduction for a given traffic scenario with a total energy saving error of less than 5%.

They concluded that this paper addresses the computational burden of MTS infrastructure optimization research. The new traffic scene compressor described in this paper can reduce the effective time sampling of traffic on MTS lines. You can use compressors to include more complex flow models in optimization studies to improve accuracy over the same optimization time. The traffic scene compression algorithm contains the clustering phase that contains the same image in a compatible view. In the second phase, a series of better load curves can be imported directly into the study of MTS infrastructure and construction curves can be found. The compressor can achieve accurate energy savings, accounting for only 20% of the total number of snapshots in uncompressed traffic scenarios. The compressor results are significantly improved over the customary subsampling method used to reduce the number of snapshots in simulation. The achievable compression rate reduces simulation time by 80% and achieves high accuracy standards.

Yu *et al.* (2016) Buses have significantly reduced the quality of public transport services, such as poor on-time performance and long waiting times. In order to mitigate bus bunching, this paper proposes a prediction framework for capturing irregularities in stationary horizontal inter-vehicle routes based on the transmission of smart card data. Past inter-vehicle distances, passenger demand, and travel times are used to simulate fluctuations in inter-vehicle distances for subsequent stations. A least squares support vector machine regression is established to detect bus bunching using the predicted car head time pattern. Two bus lines were demonstrated to perform effective performance in Beijing. Compared to other adult prediction algorithms, prediction methods can successfully identify more than 95% bus boning events. In addition, even if the predicted lead time is increased, the detection accuracy is not significantly reduced. The proposed framework does not standardize the plan at all by taking some corrective action, but prevents potential bus gatherings and is timely to inform passengers when the next bus arrives Provide accurate information. This feature significantly increases the volume of passengers being transported and reduces the cost of operating transportation authorities.

Berti Suman (2018) this partner analyzes the determination and challenge of managing (smart) urban public health risks using sensor data generated below. This criticizes the traditional public health risk management approach to investigate the potential benefits of governance-based risk sensitivity. The failure of the model to top defines intelligent changes in the urban environment, which can encourage the public health risk and utility in new cities. The core questions included in this contribution are: How can urban sensor networks and data infrastructure possibilities help to healthier cities intelligently and avoid environmental risks? The central goal of this paper is to consider the opportunity to combine top-down and bottom-up detection methods. For this purpose, check the complementary potentials of the upper and lower sensing. The public awareness process has been discussed as a development of sensor-based approach to identifying new public domain and risk management. The hidden challenges behind this versatile transition are destroyed.

Nuworsoo *et al.* (2009) this study assesses the benefits and costs of intelligent transportation technology at San Luis Obispo Transit, a small-scale transportation business. In 2001, the California Department of Transportation tested the deployment of a new program called "Effective Deployment of Advanced Transit Systems (EDAPTS)." Field Survey aims to use low-cost Intelligent Transport System (IT) technology in small and medium transport. The system was developed using digital communication links, open source design, solar real time arrival markers, and innovative data links to improve transport services and security, for a total investment of $ 150,000 ($ 2007). An evaluation was conducted in 2007 to determine the economic rationality of the program and to evaluate commercialization cases. Cost-benefit analysis of 5-year, 7-year, and 10-year lifespan of EDAPTS components using discount rates of 5%, 7%, and 10%. Conservative analysis excludes consumer surplus from benefits, and the ratio of income to cost is 3.7 to 6.1. For consumer surplus, this ratio is in the range of 4.5 to 7.5. This implies that a $ 1 investment in EDAPTS will bring close to $ 4 to the group. As the cost-effectiveness ratio is significantly over 1.0 in all cases, the result is that EDAPTS provides an economical, intelligent transportation solution for small to medium-sized transportation that seeks a low cost and easy to deploy ITS solution.

5. Conclusion

The public transport system provides basic services for the sustainability and livability of any city. One of the main challenges facing public transport agencies is to provide consistent and punctual bus services or reliable services that are actively recognized by the public. Over the past decade, transportation planning has shifted its focus from moving car targets to broader environmental and social goals, by providing and improving transportation options that provide access to destinations, regardless of car ownership. With the support of huge amounts of money, this paradigm shift has prompted cities and transportation agencies to adopt various strategies to improve transportation service operations in order to attract new passengers and retain existing passengers. This is done without a clear understanding of the actual impact of the strategy on the quality of service or people's perceptions.

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