

PUBLIC TRANSPORT OPTIMIZATION

New application and businesses are created continuously with the help of technology through the internet. IoT(Internet of Things) can assist in integration of communication, control and information processing across various transportation systems. In public transportation, there is lack of real time information. The public transit usage can be improved if real time information of the vehicle such as the seating availability, current location and time taken to reach the destination are provided with easier access. It would also be helpful for the passengers to find alternate choices depending on their circumstances. As excessive long waiting often discourage the travelers and makes them reluctant to take buses.

A smart information system has been proposed where the travelers get prior information about current location, next location of bus and crowd level inside the bus. This system is designed using ARDUINO UNO, IR Sensor and GPS Module. An Intelligent Transport System (ITS) removes the barriers for public transport usage and creates the positive impact about the bus journey.

PROJECT DEFINITION :

A public transport optimisation project is a project that aims to improve the efficiency and effectiveness of a public transport system. This can be done in a variety of ways, such as:

- **Optimising bus routes:** This can involve adjusting bus routes to reduce travel times, increase service frequency, or improve coverage.
- **Optimising timetables:** This can involve adjusting bus timetables to reduce waiting times and improve connections between different routes.
- **Optimising vehicle scheduling:** This can involve scheduling buses in a way that reduces costs and improves efficiency.
- **Improving passenger information:** This can involve providing passengers with real-time information about bus locations and arrival times.
- **Encouraging modal shift:** This can involve encouraging people to switch from cars to public transport by making public transport more convenient and affordable.

Public transport optimisation projects can be complex and challenging, as they need to take into account a variety of factors, such as passenger demand, traffic conditions, and budget constraints. However, the benefits of public transport optimisation can be significant, as it can lead to reduced travel times, improved service frequency, and increased ridership.

Here are some specific examples of public transport optimisation projects:

A city could implement a real-time bus tracking system to provide passengers with information about bus locations and arrival times. This would help passengers to reduce their waiting times and plan their journeys more effectively.

A transit agency could use data analytics to identify underutilized bus routes and adjust them accordingly. This would help to improve the efficiency of the bus network and reduce costs.

A government could introduce a new fare structure that encourages people to switch from cars to public transport. For example, the government could offer discounted fares to passengers who travel at off-peak times.

Public transport optimisation projects can be implemented at a variety of scales, from individual bus routes to entire public transport networks. The scale of the project will depend on the specific goals of the project and the resources available.

Public transport optimisation projects can have a significant impact on the quality of life for residents of cities and towns. By improving the efficiency and effectiveness of public transport, these projects can help to reduce travel times, improve air quality, and create more livable communities.

DESIGN THINKING :

PROJECT OBJECTIVES :

The project objectives of public transport optimisation will vary depending on the specific needs of the community or transit agency. However, some common project objectives include :

- **Reduce travel times:** This can be achieved by optimising bus routes, timetables, and vehicle scheduling.
- **Increase service frequency:** This can be achieved by adding more buses to the fleet or by adjusting bus timetables.
- **Improve coverage:** This can be achieved by expanding bus routes to new areas or by increasing the frequency of service in underserved areas.
- **Reduce costs:** This can be achieved by optimising bus routes, timetables, and vehicle scheduling, as well as by reducing the number of empty seats on buses.
- **Improve passenger satisfaction:** This can be achieved by reducing travel times, increasing service frequency, improving coverage, and providing passengers with better information.
- **Encourage modal shift:** This can be achieved by making public transport more convenient and affordable than using cars.

In addition to these general project objectives, public transport optimisation projects may also have more specific objectives, such as :

- **Reduce carbon emissions:** This can be achieved by using more fuel-efficient buses and by optimising bus routes to reduce travel times.
- **Improve accessibility for people with disabilities:** This can be achieved by making buses more accessible and by providing real-time information about bus locations and arrival times.
- **Support economic development:** This can be achieved by improving access to public transport for workers and businesses.

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IOT SENSOR DESIGN :

IoT sensors can be used to collect a variety of data that can be used to optimize public transport. Some examples of IoT sensors that can be used for public transport optimization include :

- **GPS sensors:** GPS sensors can be used to track the location of buses and other public transport vehicles in real time. This data can be used to optimize bus routes, timetables, and vehicle scheduling.
- **Passenger counting sensors:** Passenger counting sensors can be used to track the number of passengers on buses and other public transport vehicles. This data can be used to identify underutilized and overutilized routes and to adjust service accordingly.
- **Traffic condition sensors:** Traffic condition sensors can be used to collect data on traffic conditions, such as speed and congestion. This data can be used to optimize bus routes and timetables to avoid congested areas.
- **Weather sensors:** Weather sensors can be used to collect data on weather conditions, such as temperature and precipitation. This data can be used to adjust bus schedules and to provide passengers with information about weather delays.
- **Real-time bus tracking:** GPS sensors can be used to track the location of buses in real time. This data can then be used to provide passengers with information about bus locations and

arrival times. This information can help passengers to plan their journeys more effectively and to reduce their waiting times.

- **Demand-responsive bus service:** Passenger counting sensors can be used to identify areas where there is high demand for bus service. This data can then be used to adjust bus routes and timetables to meet the needs of passengers.
- **Traffic-adaptive bus routing:** Traffic condition sensors can be used to monitor traffic conditions in real time. This data can then be used to adjust bus routes to avoid congested areas. This can help to reduce travel times for passengers.
- **Predictive maintenance:** IoT sensors can be used to monitor the condition of buses and other public transport vehicles. This data can then be used to predict when maintenance is required, which can help to reduce downtime and improve the reliability of public transport services.

REAL-TIME TRANSIT INFORMATION PLATFORM :

Real-time transit information is a valuable tool for both transit agencies and passengers. By providing real-time information about bus locations and arrival times, transit agencies can help passengers to plan their journeys more effectively and to reduce their waiting times. This can lead to improved customer satisfaction and increased ridership.

Here are some examples of how real-time transit information is being used to optimize public transport around the world:

- In London, England, the Transport for London (TfL) website and mobile app provide real-time information about the arrival times of buses, trains, and other public transport vehicles. This information is used by millions of passengers every day to plan their journeys and to reduce their waiting times.
- In New York City, the Metropolitan Transportation Authority (MTA) provides real-time information about the arrival times of buses, trains, and subways. This information is available on the MTA website and mobile app, as well as at bus stops and subway stations.
- In Singapore, the Land Transport Authority (LTA) provides real-time information about the arrival times of buses and trains. This information is available on the LTA website and mobile app, as well as at bus stops and train stations. Real-time transit information is a powerful tool that can be used to optimize public transport and to improve the customer experience. By providing passengers with real-time information about bus locations and arrival times, transit agencies can help passengers to plan their journeys more effectively and to reduce their waiting times.

INTEGRATION APPROACH :

The integration approach of public transport optimization involves using a variety of data sources and technologies to improve the efficiency and effectiveness of public transport systems. This can be done by :

- **Collecting data from a variety of sources:** This can include data from GPS sensors on buses and trains, passenger counting sensors, traffic condition sensors, and weather sensors.
- **Using data analytics to identify patterns and trends:** This data can be used to identify bottlenecks in the public transport system, to identify areas where there is high demand for service, and to predict future demand.
- **Using optimization techniques to develop solutions to problems:** This can involve optimizing bus routes and timetables, scheduling vehicles efficiently, and providing passengers with real-time information.
- **Implementing and evaluating solutions:** Once solutions have been developed, they need to be implemented and evaluated to ensure that they are effective.

Here are some specific examples of the integration approach of public transport optimization:

- **Real-time transit information:** Real-time transit information can be integrated with bus and train timetables to provide passengers with more accurate arrival times. This can help passengers to plan their journeys more effectively and to reduce their waiting times.
- **Traffic-adaptive bus routing:** Traffic condition sensors can be integrated with bus routing software to optimize bus routes in real time. This can help to reduce travel times for passengers and to improve the reliability of public transport services.
- **Demand-responsive bus service:** Passenger counting sensors can be integrated with bus scheduling software to adjust bus routes and timetables to meet the needs of passengers. This can help to improve service frequency in areas where there is high demand.
- **Integrated ticketing systems:** Integrated ticketing systems allow passengers to use a single ticket to travel on multiple modes of public transport. This can make it easier and more convenient for passengers to use public transport.

The integration approach of public transport optimization is a powerful tool that can be used to improve the efficiency and effectiveness of public transport systems. By integrating data from a variety of sources and using optimization techniques, transit agencies can develop solutions to problems that can lead to reduced travel times, improved service frequency, and increased ridership.