Public transport optimization

The task to design efficient public transport networks can be described as five interconnected

1.Route design : It involves determining the paths that vehicles will follow within a network. The general design of a transit network is the highest level activity, undertaken only rarely or when major new systems rail or express bus are introduced. The network design then feeds an element of route design and stop layout, in which the more specific physical facilities for the routes and stops or stations are implemented.

improvements over the existing route network. The resulting algorithm is applied to an input dataset generated from real-world data, with results showing significant

There are also online tools like Metro Designer that can help you draw the perfect transit map design.

- WSAN(wireless sensor-actuator networks)

2.Vehicle frequency setting : It involves determining how often vehicles will arrive and depart at each stop on the route. The most common theory for setting frequencies on bus routes is the square-root rule, which is based on the minimization of the sum of total passenger wait time costs and total operator cost.

Most public transport systems run along fixed routes with set embarkation/disembarkation points to a prearranged timetable, with the most frequent services running to a headway “every 15 minutes” as opposed to being scheduled for any specific time of the day.

During the COVID-19 pandemic, frequency setting models were developed to distribute the available vehicles over original lines and short-turning sublines while considering the pandemic-imposed capacity. These models were tested on high-demand bus lines and demonstrated that revenue losses due to social distancing can be reduced when implementing short-turning service patterns.

- PCM (powertrain control module)
- TCP(transmission control module)
- Real time network transfer

3.Timetable development : It involves setting out information on public transport service times. Both public timetables to assist passengers with planning a trip and internal timetables to inform employees exist.

It may show all movements at a particular location or all movements on a particular route or for a particular stop.

A timetable can be produced dynamically, on request, for a particular journey on a particular day around a particular time, or in a timetable that gives an overview of all services in a particular category and is valid for a specified period.

Schedule synchronization is a useful strategy for reducing bus waiting time and improving service connectivity.

A study developed an extended vehicle scheduling model, taking into account the interests of passengers and operators in attaining optimization of timetable synchronization integrated with vehicle scheduling and considering the passenger waiting cost.

4.Vehicle scheduling : Vehicle scheduling is a crucial step of the public transport planning process because it results in the number of vehicles required, thus it is directly related to fixed cost and labor cost. It is desirable, therefore, to minimize the number of vehicles used and operational cost.

The vehicle scheduling problem (VSP) is concerned with determining the optimal allocation of vehicles to carry out all the trips in a given transit timetable. The objective is to minimize the operation cost related with the usage of vehicles and fuel consumption**.**

REAL TIME NETWORK TRANSFER : In this we have the Industrial Applications In Industry 4.0, long-range wireless communication adds to the cost efficiency and reduces the manpower. The architecture involves sensor nodes, a microcontroller connected to GSM/GPRS, and the remote database.

- WIFI
- BLUETOOTH
- GPRS/GSM
- ESP32(module)