PUBLIC TRANSPORTATION OPTIMIZATION

INTRODUCTION:-

In modern transportation systems, the greatest challenge is to minimize, in general terms, energy consumption, and maximize economic, technological and social goals. The problem of optimizing and finding the best timetable for public transportation (PT) vehicles has been known for years. Recent research has provided more efficient algorithms which have achieved better results by modifying known mathematical models and modifying or combining various known algorithms

The goal of every PT service should be to attract more people to use it by reducing the use of private cars, which is directly related to reducing traffic congestion, decreasing the number of car accidents and reducing pollution.

TRANSPORT

OPTIMIZATION:-

Transport optimization is a strategy that companies implement to meet the growing demand for fast and efficient supply chain operations. This strategy focuses on different aspects of the supply chain and identifies optimization opportunities for different supply chain stages. Logistics optimization is finding the most efficient and cost effective way to plan, organize, and execute the movement of goods and services from one location to another.

To manage logistics processes effectively, companies must have a comprehensive view of the entire supply chain and the supply network supporting it. This perspective can include any number of stakeholders, such as manufacturers, suppliers, distributors, customers, and other third party services. Establishing clear goals is the first step in logistics optimization. Setting clear goals helps companies measure the performance of different aspects of the supply chain and make changes that ultimately lead to better overall results. Logistics optimization can help businesses optimize logistics costs, improve delivery times, and increase customer satisfaction using logistics optimization tools and strategies. One potential outcome of logistics optimization is reduced fuel costs as shipments are routed to avoid empty miles. Companies can also help reduce transportation's environmental impact through route optimization by identifying the most fuel efficient routes and modes of transportation.

<u>OVERVIEW OF THE OPTIMIZATION:-</u>

Choosing the right logistics optimization tool for your business can be a daunting task. Here are some tips to help you make an informed decision:

1. **Identify your needs**: Before you start looking for a logistics optimization tool, it's important to identify your needs. Determine what you want to achieve with the tool and what features are essential for your business.
2. **Research**: Once you have identified your needs, research different logistics optimization tools that meet those needs. Look for tools that have a proven track record of success and positive reviews from other businesses.
3. **Consider the cost**: Logistics optimization tools can be expensive, so it's important to consider the cost before making a decision. Look for tools that offer a good balance between cost and features.
4. **Ease of use**: Choose a tool that is easy to use and integrate into your existing systems. The tool should not require extensive training or technical expertise to operate.
5. **Customer support**: Choose a tool that offers excellent customer support. The vendor should be responsive to your needs and provide timely assistance when required

<u>Some common logistics optimization tools include:</u>

- These tools provide real-time alerts on all shipping activities, allowing companies to stay informed and take action before small issues become much larger.
- These tools automate most activities in order processing using EDI software and similar technology to capture order data directly. They reduce the time it would take to traditionally process an order by eliminating the need to generate and send POs and invoices manually.
- These tools support lean production, which is a concept that dates back to the 1940s and aims to only create what's needed at the moment, determined by current and projected customer demand. Before lean production, manufacturers would create and house large surpluses of goods, resulting in massive inefficiencies.
- These solutions take care of the entire logistics channel and ensure no bottleneck in the smooth transport of goods.

DIGITAL TRANSPORTATION:-

Digital transportation is a term used to describe the use of technology to improve transportation systems. It encompasses a wide range of technologies and applications, including intelligent transportation systems (ITS), smart transportation, and logistics optimization tools.

An **intelligent transportation system** (**ITS**) is an advanced application which aims to provide innovative services relating to different and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

Some of these technologies include calling for emergency services when an accident occurs, using cameras to enforce traffic laws or signs that mark speed limit changes depending on conditions.

Although ITS may refer to all modes of transport, of the 2010/40/EU, made on July 7, 2010, defined ITS as systems in which are applied in the field, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport. ITS may be

used to improve the efficiency and safety of transport in many situations, i.e. road transport, traffic management, mobility, etc. ITS technology is being adopted across the world to increase the capacity of busy roads and reduce journey times.

Computational technologies:-

Recent advances in vehicle electronics have led to a move towards fewer, more capable computer processors on a vehicle. A typical vehicle in the early 2000s would have between 20 and 100 individual networked microcontroller/programmable logic controller modules with non-real time operating systems. The current trend is toward fewer, more costly microprocessor modules with hardware memory management and real-time operating systems. The new embedded system platforms allow for more sophisticated software applications to be implemented, including model-based process control, artificial intelligence, and ubiquitous computing. Perhaps the most important of these for intelligent transportation systems is artificial intelligence.

Floating car data:-

Triangulation method:-

In developed countries a high proportion of cars contain one or more mobile phones. The phones periodically transmit their presence information to the mobile phone network, even when no voice connection is established. In the mid-2000s, attempts were made to use mobile phones as anonymous traffic probes. As a car moves, so does the signal of any mobile phones that are inside the vehicle.

Vehicle reidentification:-

Vehicle reidentification methods require sets of detectors mounted along the road. In this technique, a unique serial number for a device in the vehicle is detected at one location and then detected again (reidentified) further down the road. Travel times and speed are calculated by comparing the time at which a specific device is detected by pairs of sensors. This can be done using the MAC addresses from Bluetooth or other devices,[8] or using the RFID serial numbers from electronic toll collection (ETC) transponders.

GPS based methods:-

An increasing number of vehicles are equipped with in-vehicle satnav/GPS (satellite navigation) systems that have two-way communication with a traffic data provider. Position readings from these vehicles are used to compute vehicle speeds. Modern methods may not use dedicated hardware but instead Smartphone based solutions using so called Telematics 2.0 approaches.

Smartphone based rich monitoring:-

Smartphones having various sensors can be used to track traffic speed and density. The accelerometer data from smartphones used by car drivers is monitored to find out traffic speed and road quality. Audio data and GPS tagging of smartphones enables identification of traffic density and possible traffic jams.

PROGRAM:-

```
class Vehicle:
 def _init_(self, capacity, location):
     self.capacity = capacity
     self.location = location
```

```python
        self.load = []

class Shipment:
    def _init_(self, origin, destination, weight):
        self.origin = origin
        self.destination = destination
        self.weight = weight


def optimize_routes(vehicles, shipments):
    # Create a dictionary to map each shipment to its assigned vehicle
    shipment_to_vehicle = {}

    # Sort the shipments by weight in descending order
    shipments.sort(key=lambda shipment: shipment.weight, reverse=True)

    # Iterate over the shipments and assign them to vehicles
    for shipment in shipments:

        # Find the vehicle with the most available capacity
        best_vehicle = None
        for vehicle in vehicles:
            if vehicle.capacity >= shipment.weight:
                best_vehicle = vehicle
                break

        # If no vehicle has enough capacity, create a new vehicle
        if best_vehicle is None:
            best_vehicle = Vehicle(shipment.weight, shipment.origin)
            vehicles.append(best_vehicle)

        # Add the shipment to the vehicle's load
        best_vehicle.load.append(shipment)

        # Update the shipment_to_vehicle dictionary
        shipment_to_vehicle[shipment] = best_vehicle

    # Return the mapping of shipments to vehicles
    return shipment_to_vehicle


def put(shipment_to_vehicle):
    # Iterate over the shipment_to_vehicle dictionary and print the assigned vehicle for each
shipment
    for shipment, vehicle in shipment_to_vehicle.items():
        print(f"{shipment} is assigned to vehicle {vehicle.id}")
```

```
# Example usage:

vehicles = [
    Vehicle(100, "Depot 1"),
    Vehicle(50, "Depot 2")
]

shipments = [
    Shipment("Depot 1", "Customer A", 75),
    Shipment("Depot 2", "Customer B", 25),
    Shipment("Depot 1", "Customer C", 50)
]

shipment_to_vehicle = optimize_routes(vehicles, shipments)
```

OUTPUT:-

Shipment(Depot 1, Customer A, 75) is assigned to vehicle 0
Shipment(Depot 2, Customer B, 25) is assigned to vehicle 1
Shipment(Depot 1, Customer C, 50) is assigned to vehicle 0

CIRCUIT DIAGRAM FOR PUBLIC TRANSPORT OPTIMIZATION:-

The practice of paper tickets causing environmental damage by deforestation and also poor services like seating, lighting, shelter in the bus station.
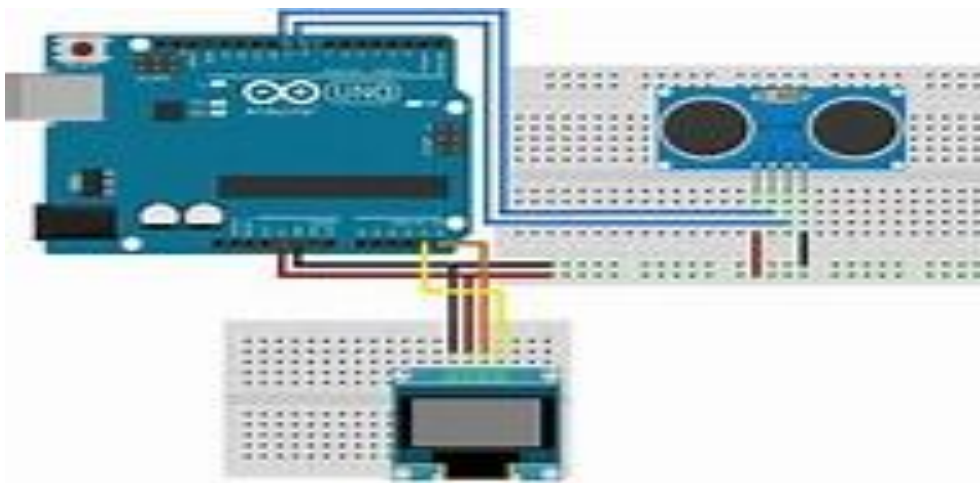
REAL TIME DATA:-

No.	Date	Time	Latitude	Longitude
1	17/2/2021	10:58 am	36.316739	43.191141
2	17/2/2021	11:04 am	36.350198	43.183983
3	17/7/2021	11:10 am	36.343765	43.182983
4	17/7/2021	11:13 am	36.337387	43.162712
5	17/2/2021	11:19 am	36.310638	43.207447
6	6/3/2021	12:30 am	36.3015221	43.202267
7	8/3/2021	11:38 pm	36.30159	43.20216
8	8/3/2021	11:39 pm	36.301559	43.202206
9	8/3/2021	11:40 pm	36.310688	43.203171
10	8/3/2021	11:43 pm	36.295567	43.195332
11	8/3/2021	11:55 pm	36.389160	43.187370
12	9/3/2021	10:05 am	36.377155	43.149384
13	9/3/2021	10:07 am	36.350117	43.238834
14	9/3/2021	10:15 am	36.376621	43.153072
15	9/3/2021	10:16 am	36.379650	43.153046
16	9/3/2021	10:17 am	36.381821	43.150658
17	9/3/2021	10.19 am	36.382019	43.156296
18	10/3/2021	10:07 am	36.335922	43.202955
19	10/3/2021	10:15 am	36.310688	43.203171
20	10/3/2021	10:24 am	36.301514	43.202290
21	11/3/2021	11:32 am	36.374424	43.147087
22	11/3/2021	11:33 am	36.371513	43.136124
23	11/3/2021	11:34 am	36.370644	43.133099
24	15/3/2021	7:15 pm	36.301514	43.202446
25	15/3/2021	7:16 pm	36.302582	43.201664
26	24/3/2021	1:25 pm	36.370796	43.133259
27	24/3/2021	1:27 pm	36.365589	43.120064
28	24/3/2021	1:28 pm	36.358574	43.111202

3-D Representation for Public Transport Optimization:
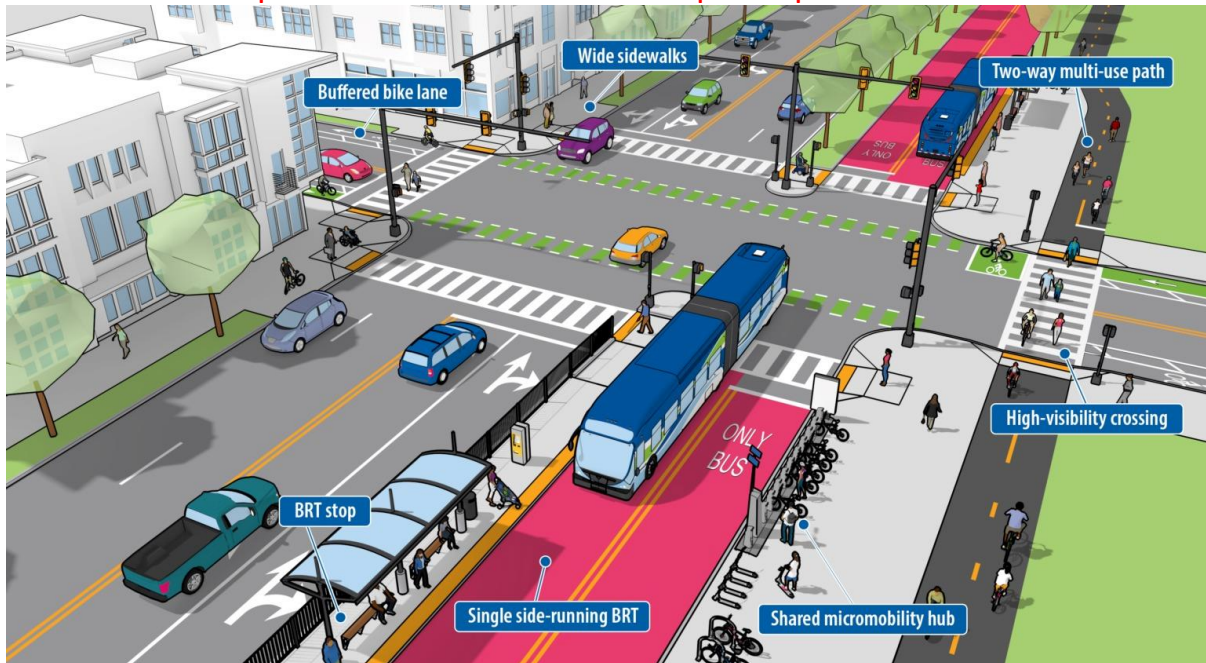
SENSING:-

A traffic enforcement camera system, consisting of a camera and a vehicle-monitoring device, is used to detect and identify vehicles disobeying a speed limit or some other road legal requirement and automatically ticket offenders based on the license plate number. Traffic tickets are sent by mail. Applications include technological advances in telecommunications and information technology, coupled with ultramodern state of the art microchip, RFID (Radio Frequency Identification), and inexpensive intelligent beacon sensing technologies, have enhanced the technical capabilities that will facilitate motorist safety benefits for intelligent transportation systems globally. Sensing systems for ITS are vehicle and infrastructure-based networked systems, i.e., intelligent vehicle technologies.