CHHATRAPATI SHAHU MAHARAJ SHIKSHAN SANSTHA'S

COLLEGE OF POLYTECHNIC,

KANCHANWADI, PAITHAN ROAD,

AURANGABAD

A

PROJECT REPORT

ON

"SMART TRANPORTATION SYSTEM"

Submitted By

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UMESH C. PADUL

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Computer Engineering Third Year

SUBMITTED TO:

DEPARTMENTOF COMPUTER ENGINEERING

YEAR 2018-2019

A

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FOR THEDIPLOMAIN COMPUTER ENGINEERING

SUBMITTED BY

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UNDER THE GUIDANCE OF

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DEPARTMENTOF COMPUTER ENGINEERING

CSMSS COLLEGE OF POLYTECHNIC,

AURANGABAD

2018-2019

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Certificate

This is to certify that Project Report Entitled

"SMART TRANSPORTATION SYSTEM"

Has been submitted by following students in final year COMPUTER Engineering For the partial fulfillment of "Diploma in COMPUTER Engineering" of MSBTE Mumbai is record of their own work carried out by them during academic session 2018-2019

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ABSTRACT

Smart Transportation Systems (STS) is an established route to resolve, or at least minimize traffic problems. STS encompass all modes of transportation - air, sea, road and rail, and intersects various components of each mode - vehicles, infrastructure, communication and operational systems. Various countries have developed strategies and techniques, based on their geographic, cultural, socio-economic and environmental background, to integrate the various components into an interrelated system. In general, any of the STS applications uses a Traffic Management Centre (TMC) where data is collected, analyzed and combined with other operational and control concepts to manage the complex transportation problems. Typically, several agencies share the administration of transport infrastructure, through a network of traffic operation centers. There is often, a localized distribution of data and information and the centers adopt different criteria to achieve the goals of traffic management. This inter-dependent autonomy in operations and decision-making is essential because of the heterogeneity of demand and performance characteristics of interacting subsystems.

The major objective of STS is to evaluate, develop, analyze and integrate new sensor, information, and communication technologies and concepts to achieve traffic efficiency, improve environmental quality, save energy, conserve time, and enhance safety and comfort for drivers, pedestrians, and other traffic groups. The adoption of location and information based technologies into vehicles, infrastructure, traffic management and traveler information services have shown dramatic improvements in the safe, and efficient mobility of people and freight in USA, European nations, Japan, Middle East and Canada.

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1. INTRODUCTION

1.1 Introduction

An important metric for economic growth of any country is its burgeoning vehicle ownership. However, the indirect effect of vehicle ownership is acute traffic congestion. India has, in the past decade, seen an astronomical increase in vehicle ownership and associated road blocks and traffic snarls in its metropolitan cities. The variety of vehicles in India – two, three and four wheelers, in addition to a large pedestrian population, complicates the situation.

The principal reason for traffic congestion in India is that the road space and infrastructure have not

Improved on par with the traffic. The seriousness of the problem is reflected in the report of World Bank that estimates the economic losses incurred on account of congestion and poor roads alone run as high as $6 billion a year in India. The direct solution for this problem by improvements in infrastructure is constrained by space availability and other logistic problems. There is, therefore, an urgent need to explore and develop better traffic management options to ease traffic congestion.

Smart Transportation Systems (STS) is a tested route to mitigate traffic congestion problems. STS can be broadly defined as the use of technology for improving transportation systems. The major objective of STS is to evaluate, develop, analyze and integrate new technologies and concepts to achieve traffic efficiency, improve environmental quality, save energy, conserve time, and enhance safety and comfort for drivers, pedestrians, and other traffic groups. An overview of STS can be schematically represented as shown in Figure 2. State-of-art data acquisition and evaluation technology, communication networks, digital mapping, video monitoring, sensors and variable message signs are creating new trends in traffic management throughout the world. The synergy of data acquisition, analysis, evaluation, and information dissemination helps in developing an all-encompassing system of traffic organization that enables information sharing among the managers and users of traffic.

Although the origin of formal STS dates back to the 1970s, the first STS world congress in Paris, in 1994, catalyzed the development and application of STS to develop and improve the existing traffic control systems in many countries around the world. STS activities aim at the development of a sustainable, multi- modal surface transportation system that will establish a connected transportation environment among vehicles, the infrastructure, and portable devices. Such a cooperative setup leverages technology in order to maximize driver safety and mobility while improving environmental performance and focusing on deployment. STS encompass all modes of transportation - air, sea, road and rail, and intersects various components of each mode - vehicles, infrastructure, communication and operational systems. Various countries develop strategies and techniques, based on their geographic, cultural, socio-economic and environmental background, to integrate the various components into an interrelated system.

1.2 Necessity of the system

STS can help transport planners to achieve policy objectives in many different ways. It can help to tackle congestion, pollution, poor accessibility and even social exclusion. It can also help to

Reduce journey times and improve reliability – either in actuality, or simply by changing people's perceptions. And it can improve the efficiency with which transport systems function. In certain circumstances – for example, parking guidance systems – it can help to support economic and retail vitality.

When thinking about STS, it is vitally important to consider it, not as an end in itself, but as a means to achieve your (transport) policy objectives. It is possible that in some circumstances STS may not be the best means of achieving transport policy objectives, but in other circumstances, it will. The trick is to select it for the latter situation, not the former.

Examples of STS

This Unit will provide some detailed examples of STS in action, including costs and evaluations, where available. However, in this introduction it is worth giving an idea of some of the applications of STS.

- Real time information, both for public transport and private road transport, so that users have up-to-the minute information on services, where they are, and on incidents/delays and how to avoid them. On the roads, such information can also improve safety.
- The use of geographical information systems (GIS) and relational databases to keep inventories of transport infrastructure in an area (e.g. the condition of the road network) to better manage and prioritise maintenance work.

- "Smartcard" ticketing on public transport, to give the passenger the best deal for the bundle of trips that they might be making in a particular period of time, and to provide the operator(s) with detailed information about their passengers' travel habits. The latter information can be useful for apportioning revenue between operators, as well as for service planning.
- Detailed route planning information (often in real time) for both public transport and carusers.
- Parking guidance systems, to reduce parking search time.
- Public transport information in various formats (e.g. audible) for disabled people.
- Traffic signal control, in real time, to improve the efficiency of traffic flow, or to afford priority to particular user groups such as bus passengers, or pedestrians, within a network.

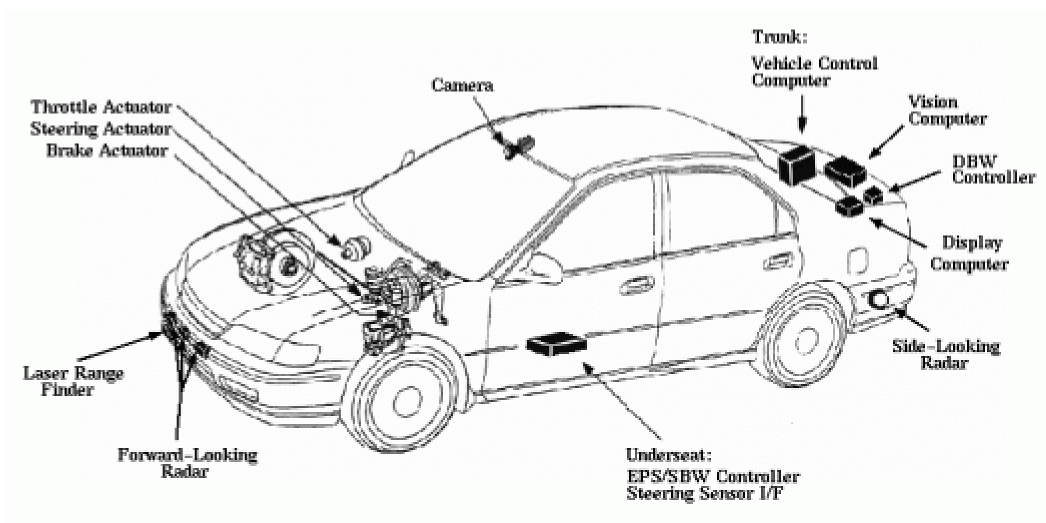


Fig 1.2 Sensors around Transport

1.3 Objective:

STS technology can play a vital role through information gathering and sharing to ensure such seamless interconnectivity. Another important approach to STS is to advance public transportation to make it more attractive than private transport. India is the second largest producer of buses, accounting for 16 percent of world's total bus production. However, the share of public transportation in Indian cities has been on a steady decline over the last few decades. Improving the quality of public transportation through STS technology will encourage more usage and therefore help in transportation management. STS in India should closely work with the energy sector in the promotion of fuel efficient transport policies and practices, including the use of alternative transport fuels.

The main social and institutional issues facing the deployment of STS in India are: an underdeveloped road network, severe budget restrictions, explosive urbanization and growth, lack of resources for maintenance and operation, less demand for automation, lack of interest among policy decision makers, and lack of user awareness. Some of specific actions required to meet the challenges to STS in India include:

Evolving a national STS standard for different STS applications and their components

Setting up a national STS clearinghouse that documents all STS projects with details on the design, implementation, lessons learned/best practices, and cost-benefit details

Setting up fully functional Traffic Management Centers for coordinating the urban and regional STS activities,

Developing and implementing automated traffic data collection methodologies,

Developing a national STS data archive,

Developing models and algorithms suitable for STS implementations

Fostering more interaction between academia, industries and governmental agencies to generate more interest and in turn projects in the STS area.

Full potential of STS can be achieved only by implementation at a network level rather than in small corridors. Overall, the existing implementations show promise and potential for the deployment of STS in India and give an initial empirical basis and data on STS deployment highlighting the data, methodological, practical and research challenges for Indian conditions.

2. LITERATURE SURVEY

2.1 The problem

Nowadays, Congestion is one of the most prevalent transport problems in large urban agglomerations, usually above a threshold of about 1 million inhabitants. By the 21st century, drivers would spend about 3 times more time in congestion as they did in the later part of the 20th century. Congestion is particularly linked with motorization and the diffusion of the automobile, which has increased the demand for transport infrastructures. However, the supply of infrastructures has often not been able to keep up with the growth of mobility. Since vehicles spend the majority of the time parked, motorization has expanded the demand for parking space, which has created space consumption problems particularly in central areas; the spatial imprint of parked vehicles is significant.

Congestion and parking are also interrelated since street parking consumes transport capacity, removing one or two lanes for circulation. Further, looking for a parking space creates additional delays and impairs local circulation. In central areas of large cities cruising may account for more than 10% of the local circulation as drivers can spend 20 minutes looking for a parking spot. This practice is often judged more economically effective than using a paying off-street parking facility as the time spent looking for a free (or low cost) parking space is compensated by the monetary savings. Also, many delivery vehicles will simply double-park at the closest possible spot to unload their cargo.

Identifying the true cause of congestion is a strategic issue for urban planning since congestion is commonly the outcome of specific circumstances such as the lack of parking or poorly synchronized traffic signals.

2.2 Solution to the problem

Based on various literatures available, the problems are identified they are logically placed in three Clusters:

1) Lack of Traffic Management System

2) Homeland Security System and Vehicles Operation

3) Vehicle to Vehicle Co-ordination and implementation of new technologies

CLUSTER 1: Lack or Traffic Management System Traffic management system is meant to handle large mass of traffic efficiently, but due to presence of large crowd of vehicles the complexity of management system increases and these systems somehow fails to handle the crowd., which results in decrease in mobility, reduced fuel consumption, higher travel time and pollution.

SOLUTION to Cluster 1: This clusters deals with the traffic management system. Hence the proposed solution to this cluster is implementation of properly programmed traffic management system that means by implementing the GPS, GIS & Remote sensing, the congestion in particular route can be easily known and hence the route can be diverted. Digitalizing and centrally controlling the traffic system, will lead to efficient and economical mobility along with sustainability to the environment.

CLUSTER 2: Homeland Security System and Vehicle Operation Homeland Security System and Vehicle Operation refer to the security and surveillance on the traffic system and vehicles. It helps in keeping the track on the trip of vehicle and real-time identification of vehicle and driver driving the vehicle. The problem identified is that there is no such efficient has been developed.

SOLUTION to Cluster 2: This cluster deals with homeland security system and vehicle operations, the proposed solution to this cluster is implementing the wireless communication network with the vehicles and infrastructure by creating an “info structure” environment: this would enable to keep each vehicle on track, by giving each vehicle a unique identity digitally. Hence within the blink of eyes the vehicle record would be on screen: this system would also enable to identify and know the previous trips of vehicle.

SOLUTION to Cluster 3: This cluster deals with vehicle to vehicle coordination, the proposed solution is implementing the wireless communication network between the vehicles by using Bluetooth, wifi, various sensors etc: this would enable vehicles to be in contact with each other, and hence collision will be eliminated.

CLUSTER 3: Vehicle to Vehicle Co-ordination and implementation of new technologies this cluster is most important from the point of implementation of STS, vehicle to vehicle coordination refers to the onboard information regarding the nearby vehicle: this would facilitate in collision control, coordinating them on the basis of the trips planned by the driver. Implementation of new technologies is rare in developing countries. Here the problem identifies is that there is no such technology implemented for public transportation system even though the technologies are available.

Various issues reported above require real time information to solve them. Therefore various technologies and techniques are proposed by various researchers in order to solve them. Various active CCTV cameras and sensors are used to provide real time information. GPS technology is combined with different image processing techniques to have more advance navigation systems. In addition to this several advance technologies such as VANETs, cloud computing, agent based computing have been introduced to make transport system more efficient and intelligent. It summarizes the techniques used by various researchers to solve transport issues. Researchers are exploring number of techniques to solve transport related issues. However till date Sensors, VANETs,

Vehicular cloud computing and Agent based techniques are found to be the best solution in current scenario. For the further improvements due to technological advancements other techniques might be effective in future using Advance GPS, Smart Traffic lights, RFID readers etc.

3. SYSTEM ANALYSIS

3.1Existing System

The **Smart Transportation System** (**STS**) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

Although STS may refer to all modes of transport, the directive of the European Union 2010/40/EU, made on the 7 July 2010, defined STS as systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport. STS may improve the efficiency of transport in a number of situations, i.e. road transport, traffic management, mobility, etc.

Fig 3.1 Collapsed Transports

3.2 Proposed System

In the proposed system, there is an Ultrasonic Sensor is used for detecting whether the trash can is filled with garbage or not. Here Ultrasonic Sensor is installed at the top of Trash Can and will measure the distance of garbage from the top of Trash can and we can set a threshold value according to the size of trash can. If the distance will be less than this threshold value, means that the Trash can is full of garbage and we will print the message "Basket is Full" on the webpage and if the distance will be more than this threshold value, then we will print the message "Basket is Empty". Here we have set the Threshold value of 50 cm in the Program code. This system will help you to track and monitor the real time level of garbage present in the Trash Bin. This will directly help to resolve the environmental problems created due to garbage or overflowing of garbage Bin.

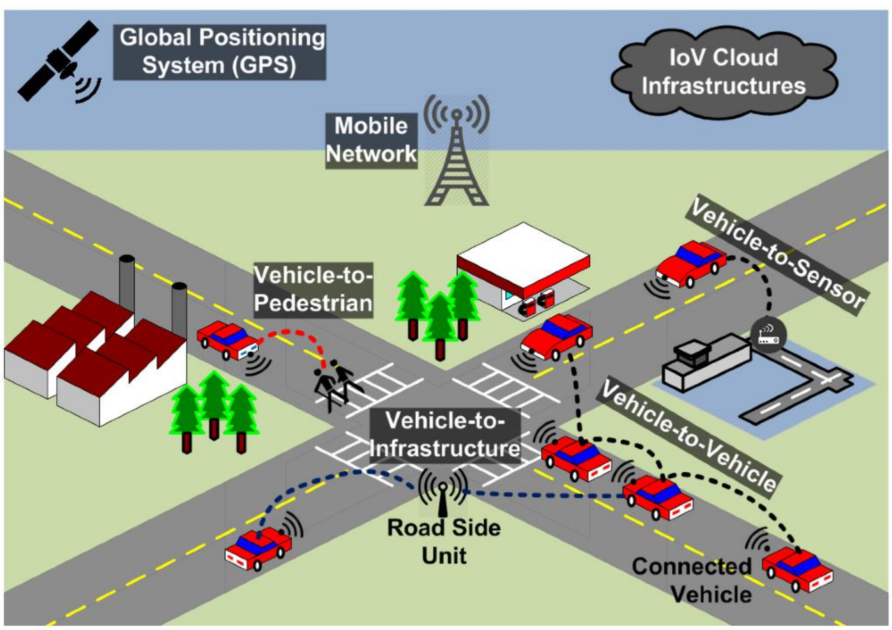


Fig 3.2 Smart Transport

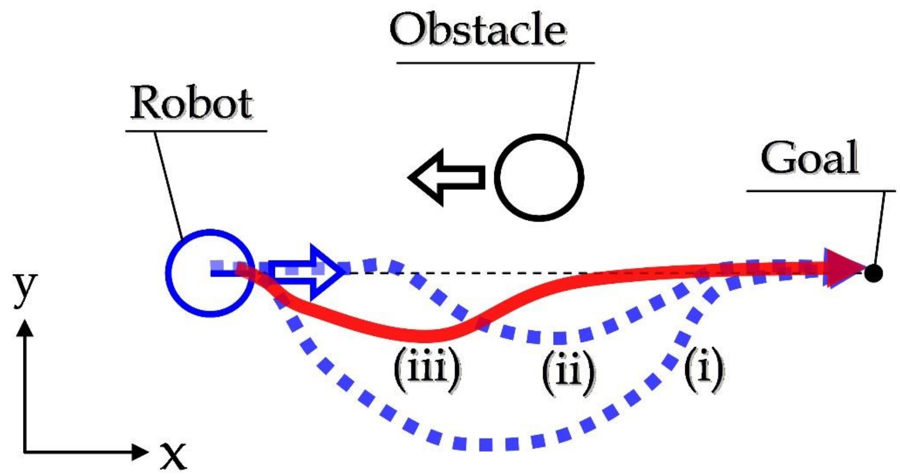


Fig 3.2.1 Obstacle Avoidance

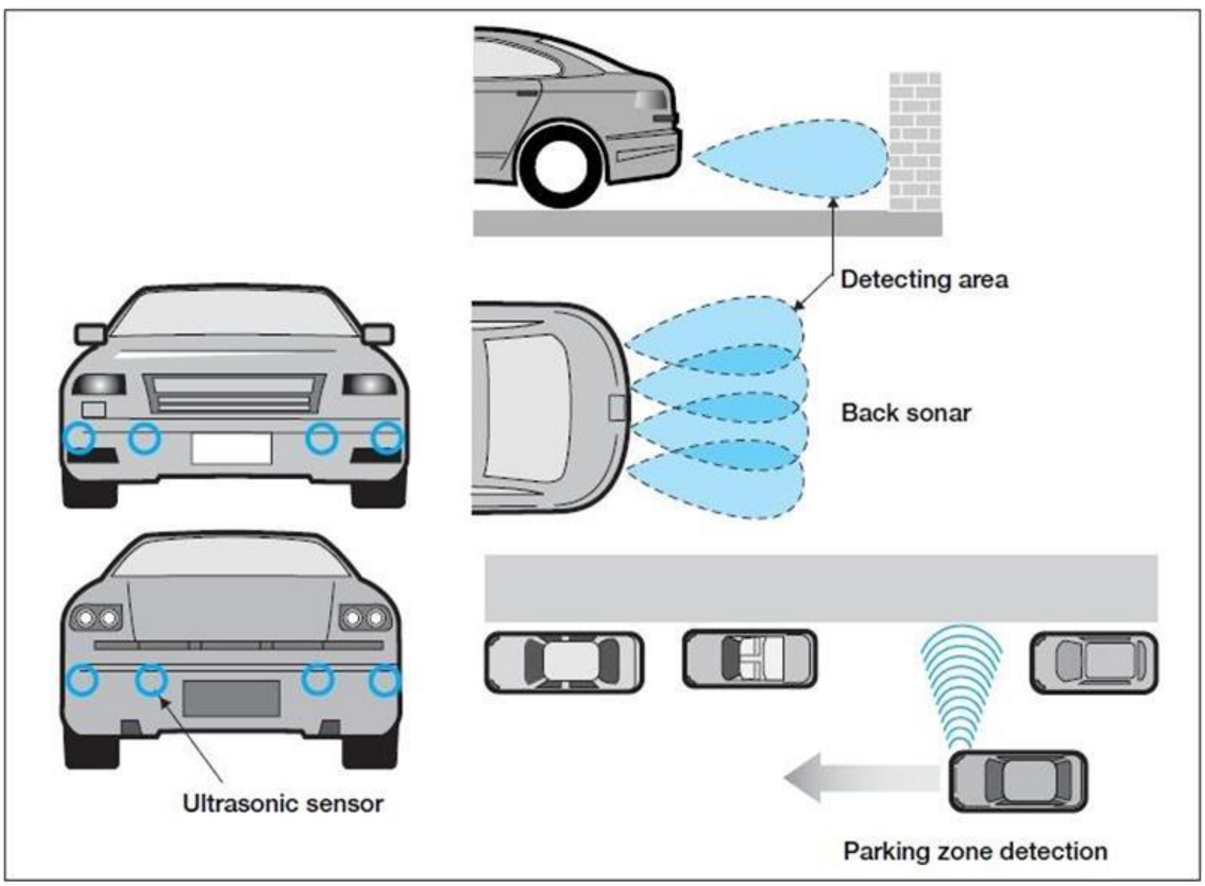


Fig 3.2.2 Distance Sensing

4. HARDWARE REQUIREMENTS

We have used the components related to electronics and mechanical technologies and that components with their description and working are as follows:

4.1 Ultrasonic Sensor (HC-SR 04)

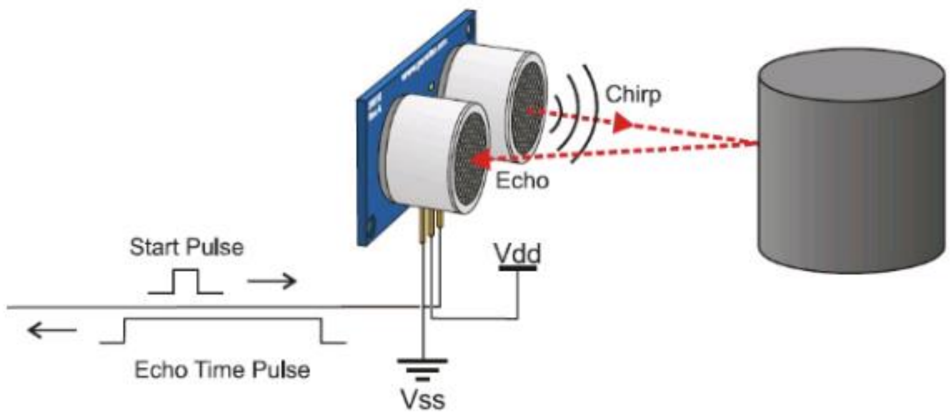


Fig 4.1 Working of Ultrasonic sensor

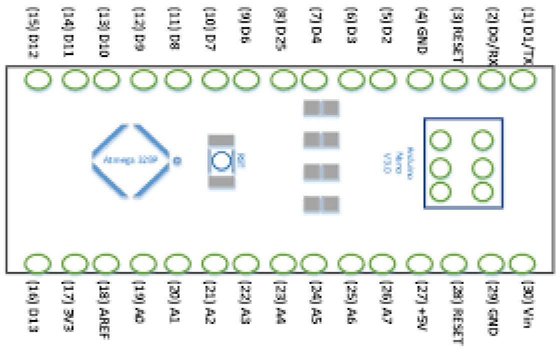
The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar.

The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received. This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object.

FEATURES

- If the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time*velocity of sound (340M/S) / 2.
- It requires 5V voltage as Input.
- Range: 2cm - 400cm.
- Ultrasonic Frequency of this sensor is 40 KHz.

4.2Arduino Nano



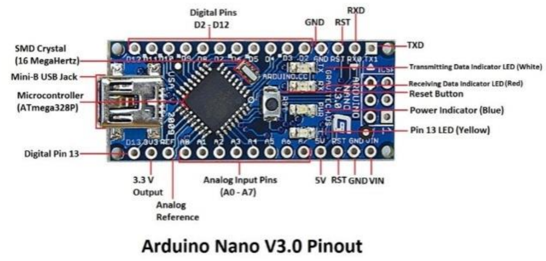


Fig 4.2 Arduino Nano

- **Arduino Nano** is a small, compatible, flexible and breadboard friendly Microcontroller board, developed by Arduino.cc in Italy, based on ATmega328p (Arduino Nano V3.x) / Atmega168 (Arduino Nano V3.x).
- It comes with exactly the same functionality as in Arduino UNO but quite in small size.
- It comes with an operating voltage of 5V; however, the input voltage can vary from 7 to 12V.
- We have used Arduino IDE Software(Open source) for programming on Arduino Nano
- Arduino Nano pinouts contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins.
- Each of these Digital & Analog Pins is assigned with multiple functions but their main function is to be configured as input or output.

- They are acted as input pins when they are interfaced with sensors, but if you are driving some load then use them as output.
- Functions like pinMode() and digitalWrite() are used to control the operations of digital pins while analogRead() is used to control analog pins.
- The analog pins come with a total resolution of 10bits which measure the value from zero to 5V.
- Arduino Nano comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage.
- There is one limitation using Arduino Nano i.e. it doesn't come with DC power jack, means you cannot supply external power source through a battery.
- This board doesn't use standard USB for connection with a computer; instead, it comes with Mini USB support.
- Tiny size and breadboard friendly nature make this device an ideal choice for most of the applications where a size of the electronic components are of great concern.
- Flash memory is 16KB or 32KB that all depends on the Atmega board i.e Atmega168 comes with 16KB of flash memory while Atmega328 comes with a flash memory of 32KB. Flash memory is used for storing code. The 2KB of memory out of total flash memory is used for a bootloader.

4.3 Servo Motors:

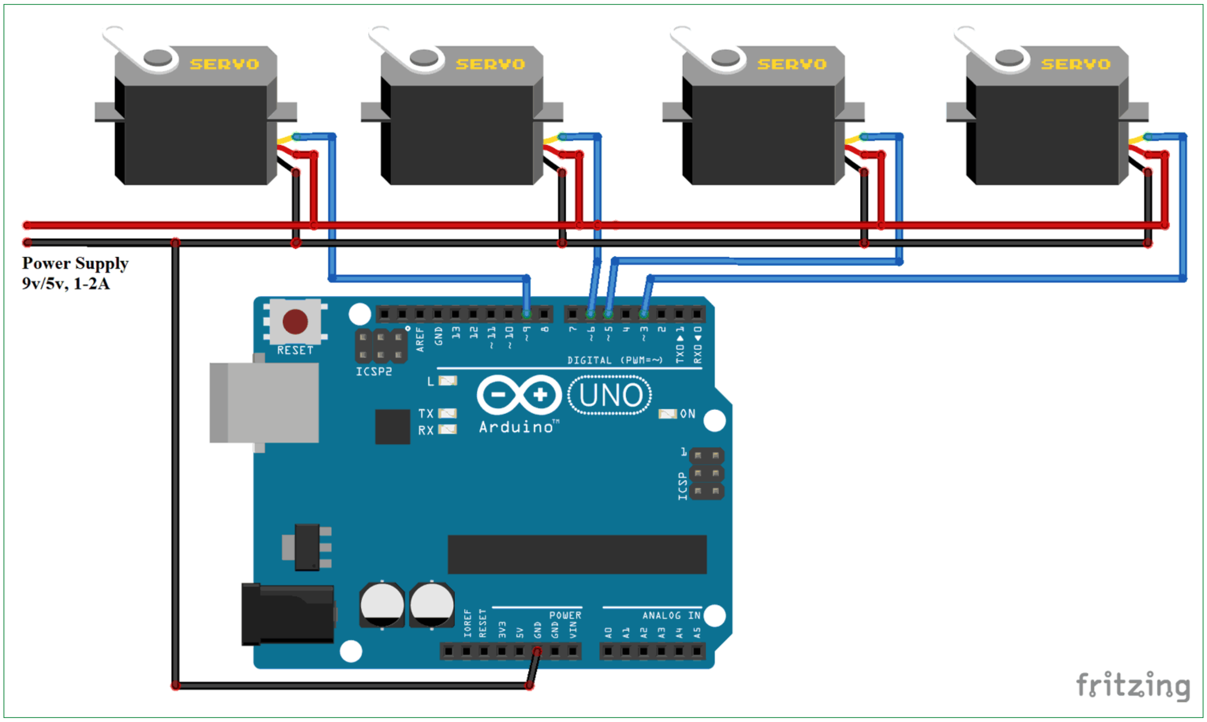


Fig 4.3 Servo Motors

Servo motors work on servo mechanism that uses position feedback to control the speed and final position of the motor. Internally, a servo motor combines a motor, feedback circuit, controller and other electronic circuit.

It uses encoder or speed sensor to provide speed feedback and position. This feedback signal is compared with input command position (desired position of the motor corresponding to a load), and produces the error signal (if there exist a difference between them).

The error signal available at the output of error detector is not enough to drive the motor. So the error detector followed by a servo amplifier raises the voltage and power level of the error signal and then turns the shaft of the motor to desired position.

SG90 Feature:

- Includes Selection of Horns and Screws for different applications.
- Weight: 9g
- Dimension: 23×12.2x29mm
- Stall torque: 1.8kg/cm(4.8v)
- Gear: Nylon gear set
- Operating speed: 0.1sec/60degree(4.8v)
- Operating voltage: 4.8v
- Temperature range: 0 - 55 Degrees Celsius
- Dead band width: 1µs
- Power Supply: Through External Adapter
- Servo wire length: 25 cm

SG90 Specification:

Model	SG90
Weight(gm)	9
Operating Voltage	3.0 – 7.2 V

Operating Speed @4.8V	0.10sec/60°
Stall Torque @4.8V	1.2 kg-cm
Stall Torque @6.6V	1.6 kg-cm
Operating Temperature (°C)	-30 to 60
Dead Band Width	7 µs
Gear Type	Glass Fibre
Rotational Degree	180
Servo Plug	JR
Cable Length	25 mm
Length (mm)	22.8
Width (mm)	12.6
Height (mm)	34.5
Shipment Weight	0.050 kg
Shipment Dimensions	8 x 6 x 4 cm

Advantages:

- High output power relative to motor size and power
- Encoder determines accuracy and resolution.
- Resonance and vibration free operation
- High efficiency
- High speed operation is possible

Disadvantages:

- Poor motor cooling
- Motor can be damaged by sustained overload.

4.4Bread Board

A breadboard is a construction base for prototyping of electronics. Originally it was literally a bread board, a polished piece of wood used for slicing bread. In the 1970s the solder less breadboard (AKA plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these. "Breadboard" is also a synonym for “prototype".

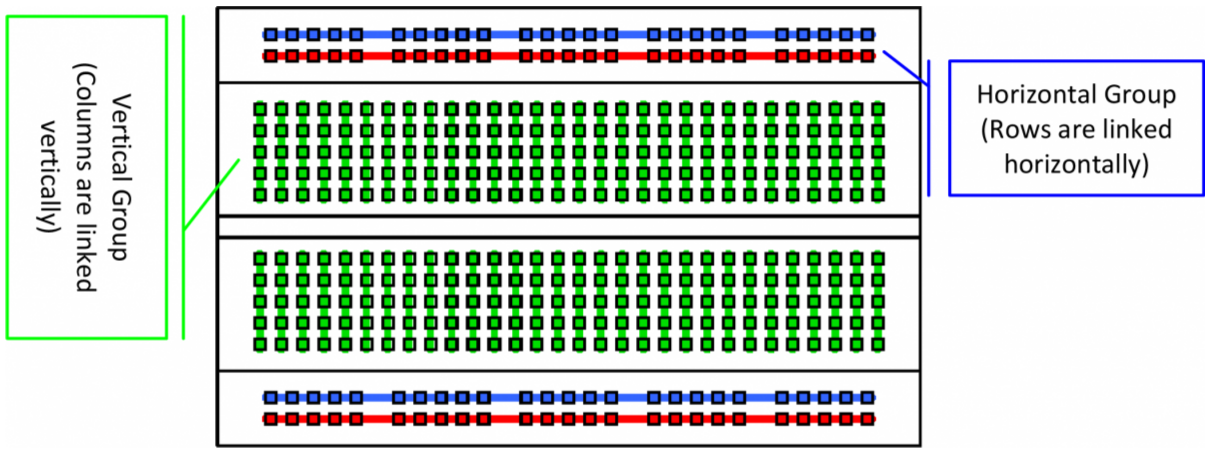


Fig 4.4Bread Board

Because the solder less breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solder less breadboards are also extremely popular with students and in technological education. Older breadboard types did not have this property. A strip board (veroboard) and similar prototyping printed circuit boards, which are used to build semi- permanent soldered prototypes or one-offs, cannot easily be reused. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

4.5 Jumper Wires

Fig 4.5Connecting Wires

Jump wire material for ready-made or homemade wires should usually be 22 AWG (0.33 mm2) solid copper, tin-plated wire - assuming no tiny plugs are to be attached to the wire ends. The wire ends should be stripped 3⁄16to 5⁄16in (4.8 to 7.9 mm). Shorter stripped wires might result in bad contact with the board's spring clips (insulation being caught in the springs). Longer stripped wires increase the likelihood of short-circuits on the board. Needle-nose pliers and tweezers are helpful when inserting or removing wires, particularly on crowded boards.

4.6 L298IC Module

Fig 4.6 L298IC Module

The L298N is an integrated monolithic circuit in a 15- lead Multiwatt and PowerSO20 packages. It is a high voltage , high current dual full-bridge driver de-signed to accept standard TTL logic level sand drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the in-put signals .The emitters of the lower transistors of each bridge are connected together rand the corresponding external terminal can be used for the connection of an external sensing resistor. An additional Supply input is provided so that the logic works at a lower voltage.

Features:

1) High operating voltage, which can be up to 40 volts;

2) Large output current, the instantaneous peak current can be up to 3A;

3) With 25W rated power;

4) Two built in H-bridge, high voltage, large current, full bridge driver, which can be used to drive DC motors, stepper motors, relay coils and other inductive loads.

5) Using standard logic level signal to control.

6) Able to drive a two-phase stepper motor or four-phase stepper motor, and two-phase DC motors.

7) Adopt a high-capacity filter capacitor and a freewheeling diode that protects devices in the circuit from being damaged by the reverse current of an inductive load, enhancing reliability

8) The module can utilize the built-in stabilivolt tube 78M05 to obtain 5v from the power supply. But to protect the chip of the 78M05 from damage, when the drive voltage is greater than 12v, an external 5v logic supply should be used.

9) Drive voltage: 5-35V; logic voltage: 5V

10) PCB size: 4.2 x 4.2 cm

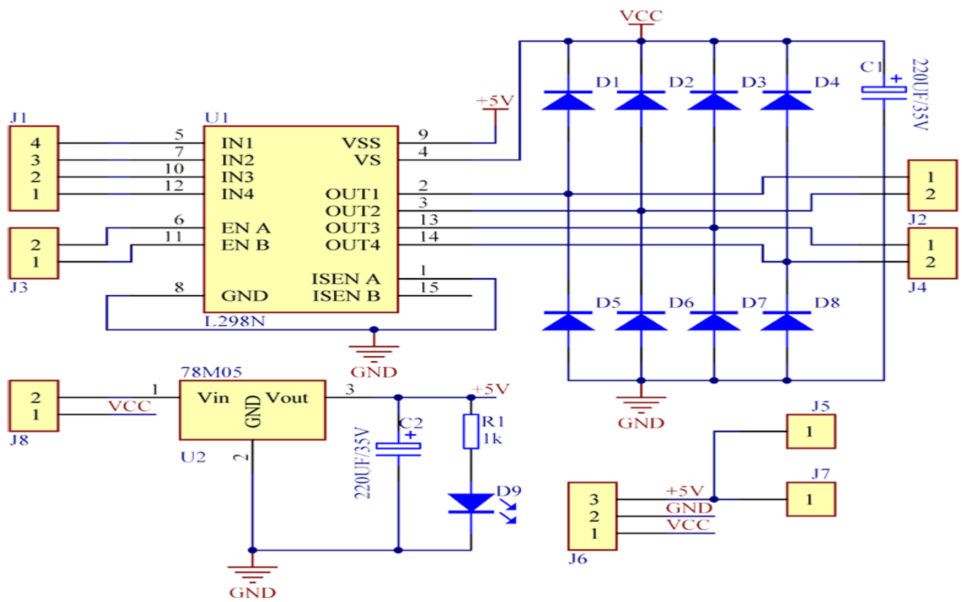


Fig 4.6.1 Schematics of L298IC Module

4.7 DC Motor

Fig 4.7 DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

Description: MXN**12**FB**12**F Brush **DC** can be the perfect solution for your application's power output needs. Review the part **specifications** provided to learn whether the size and electrical requirements are well suited to your project. You're sure to find the right **motor** for almost

- Commutation: Brush
- Continuous Current: 0.0560 amps
- Motor Configuration: **Motor** Only
- Terminal Voltage: 12 VDC

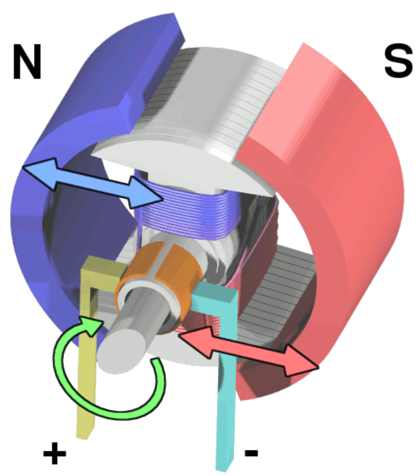


Fig 4.7.1 DC Motor Working

5. SOFTWARE REQUIREMENTS

5.1 Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, Mac OS, and Linux) that is written in the programming language Java. It originated from the IDE for the languages *Processing* and *Wiring*. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple *one-click* mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General Public License, version 2.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

6. SYSTEM DEVELOPMENT

6.1 Working of system

How Connected Vehicles Work

A system of connected vehicles is still in development, and plenty of research still needs to be done. Safety-related systems for connected vehicle technology will likely be based on Dedicated Short Range Communications (DSRC), a technology similar to WiFi. DSRC is fast, secure, reliable and operates on a dedicated spectrum. Non-safety applications may be based on different types of wireless technology. Cars, trucks, buses, and other vehicles will be able to “talk” to each other with in-vehicle or after market devices that continuously share important safety and mobility information with each other. Connected vehicles can also use wireless communication to “talk” to traffic signals, work zones, toll booths, school zones, and other types of infrastructure. The vehicle information communicated is anonymous, so vehicles cannot be tracked and the system is secure against tampering.

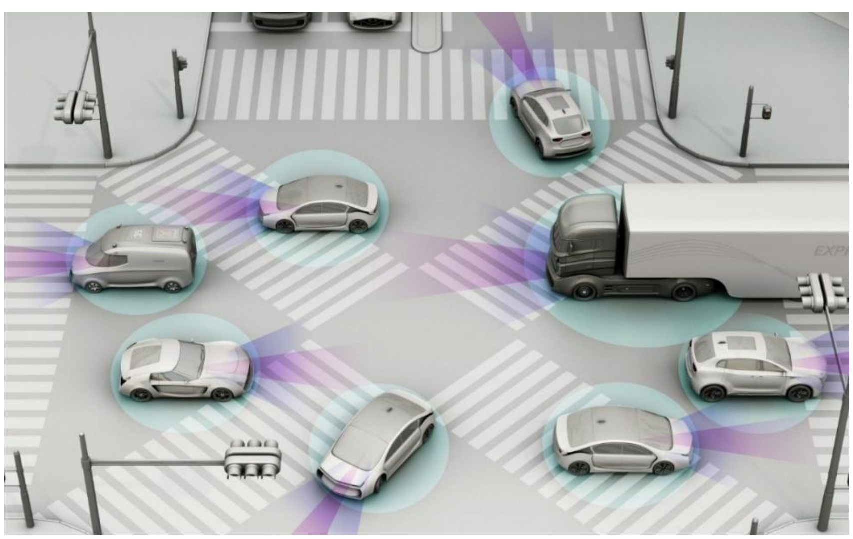


Fig 6.1 System Structure

How Connected Vehicles Will Improve Safety

Connected vehicle safety applications will enable drivers to have 360-degree awareness of hazards and situations they can not even see. Through in-car warnings, vehicle operators will be alerted to imminent crash situations, such as merging trucks, cars in the driver's blind side, or when a vehicle ahead of them brakes suddenly. By communicating with roadside infrastructure, drivers will be alerted when they are entering a school zone, if workers are on the side of the road, and if an upcoming traffic light is about to change.

Pivotal work is being conducted to guarantee that these driver warnings will not be a distraction and that people will only be made aware when they are approaching danger.

The connected vehicle system will be similar in many ways to other wireless networks and will create a dynamic transportation network based on an open platform to allow for new and creative applications. Open standards allow anyone to develop new products and applications that will work in this space.

How Connected Vehicles Will Keep People Moving

Anonymous signals in vehicles will help generate new data about how, when, and where vehicles travel—information that will then be analyzed by transportation managers to help make roads safer and less congested.

The same signals could also be shared among mobile devices and roadside sensors. This exciting new data-rich environment will also be the genesis for a multitude of new mobility applications that will help to keep traffic flowing and make it easier for people to plan their travel experience. Imagine, for instance, apps that can help you find open parking spaces, locate available taxis, guarantee you make your bus or train connection, or help a blind pedestrian cross the street. With an open source system for mobility applications there will be minimal restrictions and limitless opportunities

How Connected Vehicles Will Improve the Environment

Mitigating greenhouse gas (GHG) contributions is everyone's responsibility. The transportation sector contributes roughly 28% of the country's GHG emissions, according to the Environmental Protection Agency's Inventory of U.S. Greenhouse Gas Emissions and Sinks. Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices.

One example is how real-time information about traffic conditions will help motorists eliminate unnecessary stops and let their vehicles reach optimal fuel-efficiency. Informed travelers may also be able to avoid congestion by taking alternate routes or public transit, or rescheduling their trip—any of which can make their trip more eco-friendly. Connected vehicles also include buses, trains, and other forms of public transit. So, by providing real time information, travelers will have a realistic idea of when transit vehicles will arrive; they will also be able to improve bus and train connections, and this will help make public transportation more appealing to the average traveler.

6.2 System Architecture

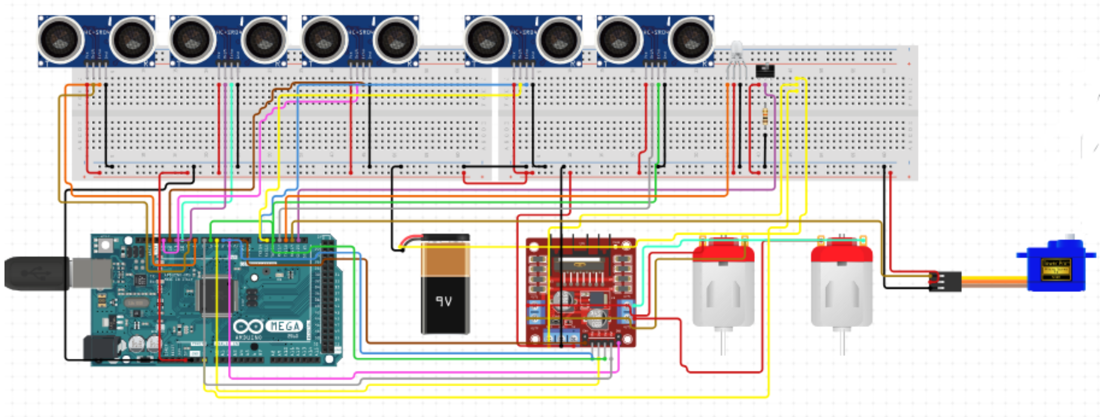


Fig 6.1 System Architecture

As shown in above figure the system is developed using above components that are Ultrasonic sensor, Arduino UNO, HC-SR04, L298N Module some jumper wires as well as Batteries to provide power supply to Arduino UNO and HC-SR04. As Arduino UNO requires 12 to 20 Volts, the battery provides 9V power to the Arduino UNO, which will transfer the 5V to the Ultrasonic sensor.

In above diagram first of all we connect the ultrasonic sensor 2 pins trigger pin and echo pin. The trig pin is input pin and echo pin is output pin of the ultrasonic sensor connect to the dual shaft motor. The power pin of the ultrasonic sensor are connects to the Arduino UNO 5v pin. And ground pin is connected to the ground pin on the Arduino UNO pin. In this we connect the 1 LED to the HC-SR04.

6.3 About System

The SMART TRANSPORTATION SYSTEM is a transportation system (STS) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

We have used 5 Ultrasonic sensors for distance measurement and depth detection respectively. Then we gave the control to the motor by using L298N module for forward and reverse movement of the transport. The servo motor was used to make left and right turns for the transport movement when any obstacle was encountered by any of the sensors. A LED was used in the system for depiction of the ups and downs on the roads.

We also used 9V power supply for additional support for power supply as the Microprocessor was using the given input power for itself. There was a dc motor attached so that the transport movement could be possible. DC motor was the reason that the automobile was able to move. We have used the base from a toy car which we disassembled and used its base for the base of our mock-up model. Most of the components were used from the waste products.

6.4 Code

```
#include <Servo.h>
Servo myservo;
int pos = 0;
const int enB = 2;
const int in3 = 4;
const int in4 = 3;

#define trigD1 14
#define echoD1 9
#define trigD2 16
#define echoD2 7
#define trigD3 15
#define echoD3 8
#define trigD4 17
#define echoD4 6
#define trigD5 18
#define echoD5 10
long duration1,duration2,duration3,duration4,duration5;
int distance1,distance2,distance3,distance4,distance5;

void setup()
{
```

```
  pinMode(enB, OUTPUT);
  pinMode(in3, OUTPUT);
  pinMode(in4, OUTPUT);

  myservo.attach(11);
  myservo.write(90);
  pinMode(12, OUTPUT);
  pinMode(trigD1, OUTPUT);
  pinMode(echoD1, INPUT);
  pinMode(trigD2, OUTPUT);
  pinMode(echoD2, INPUT);
  pinMode(trigD3, OUTPUT);
  pinMode(echoD3, INPUT);
  pinMode(trigD4, OUTPUT);
  pinMode(echoD4, INPUT);
  pinMode(trigD5, OUTPUT);
  pinMode(echoD5, INPUT);
  Serial.begin(9600);

}
int allcalculateDistance()
{
```

```
digitalWrite(trigD1,LOW);
delayMicroseconds(2);
digitalWrite(trigD1,HIGH);
delayMicroseconds(10);
duration1=pulseIn(echoD1,HIGH);
distance1=duration1*0.034/2;
Serial.print("distance1= ");
Serial.print(distance1);
Serial.println("Cm");
 if(distance1>=12)
      {
      digitalWrite(in3, HIGH);
      digitalWrite(in4, LOW);
      analogWrite(enB, 220);
      }


digitalWrite(trigD2,LOW);
delayMicroseconds(2);
digitalWrite(trigD2,HIGH);
delayMicroseconds(10);
duration2=pulseIn(echoD2,HIGH);
distance2=duration2*0.034/2;
```

```
 Serial.print("distance2= ");
 Serial.print(distance2);
 Serial.println("Cm");
if(distance2<=5)
  {
     myservo.write(180);              // tell servo to go to position in variable 'pos'
      //delay(5);
  }

 digitalWrite(trigD3,LOW);
 delayMicroseconds(2);
 digitalWrite(trigD3,HIGH);
 delayMicroseconds(10);
 duration3=pulseIn(echoD3,HIGH);
 distance3=duration3*0.034/2;
 Serial.print("distance3= ");
 Serial.print(distance3);
 Serial.println("Cm");
 if(distance3<=5)
  {
     myservo.write(0);              // tell servo to go to position in variable 'pos'
      //delay(5);
  }
```

```
digitalWrite(trigD4,LOW);
delayMicroseconds(2);
digitalWrite(trigD4,HIGH);
delayMicroseconds(10);
duration4=pulseIn(echoD4,HIGH);
distance4=duration4*0.034/2;
Serial.print("distance4= ");
Serial.print(distance4);
Serial.println("Cm");

    if(distance1<=8&&distance4>=8)
    {
    digitalWrite(in3, LOW);
    digitalWrite(in4, HIGH);
    analogWrite(enB, 220);
    }

digitalWrite(trigD5,LOW);
delayMicroseconds(2);
digitalWrite(trigD5,HIGH);
delayMicroseconds(10);
duration5=pulseIn(echoD5,HIGH);
```

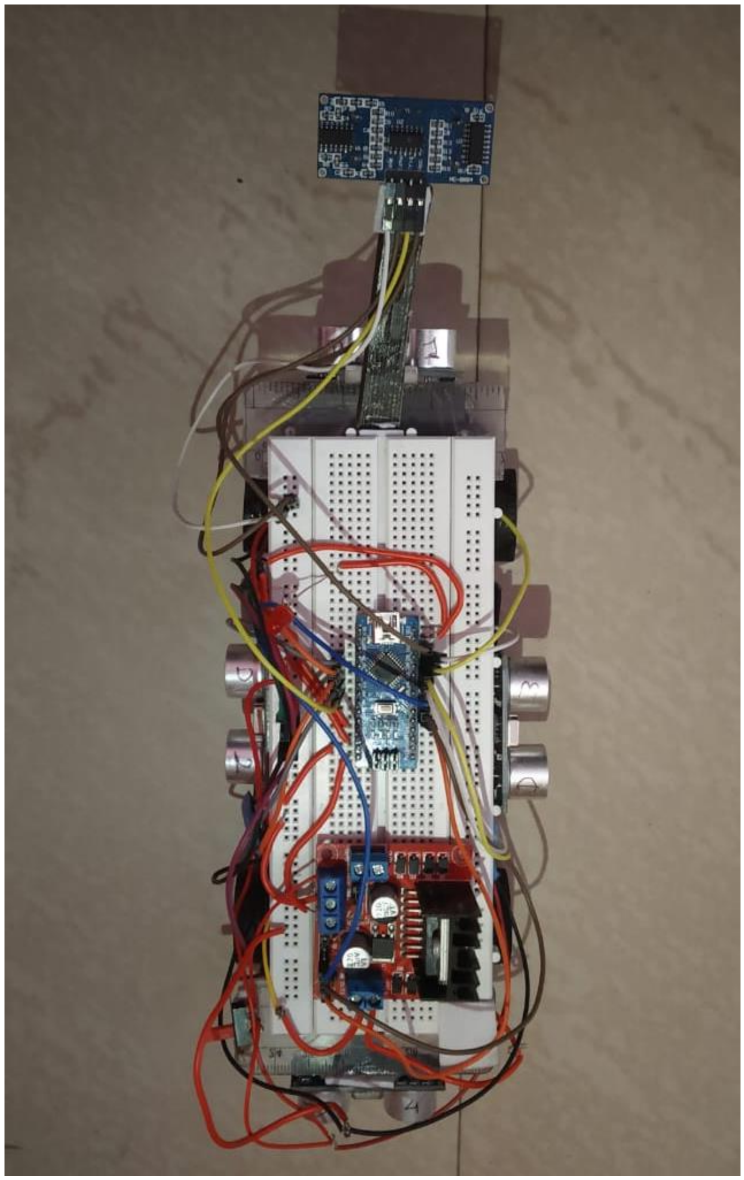
```
 distance5=duration5*0.034/2;
 Serial.print("distance5= ");
 Serial.print(distance5);
 Serial.println("Cm");
 digitalWrite(13,LOW);
 if(distance5<6)
 {
   digitalWrite(12,HIGH);
 }
 else
 {
   digitalWrite(12,LOW);
 }
  if(distance5>11)
 {
   digitalWrite(12,HIGH);
   delay(300);
   digitalWrite(12,LOW);
   delay(300);
 }


}
```

```
void loop()
{
  myservo.write(90);
  for(int i=0;i<=28;i++)
  {
    allcalculateDistance();

  }

}
```

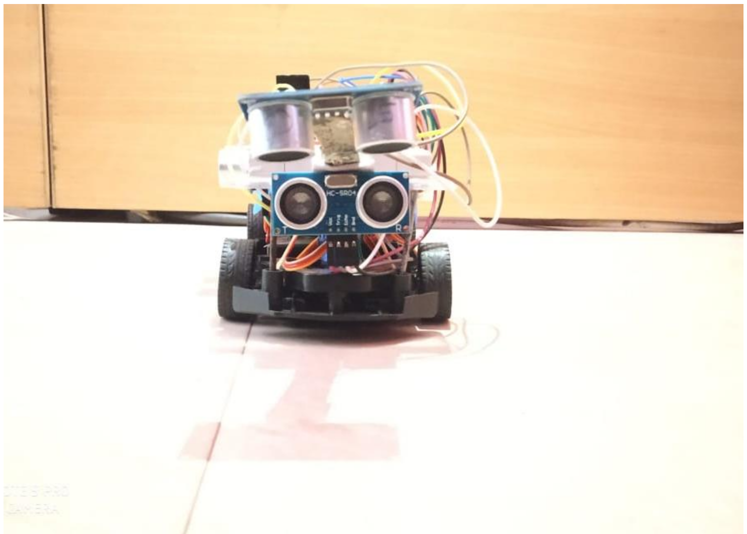
7. SCREENSHOTS & IMAGES

7.1 Screenshots from various views:

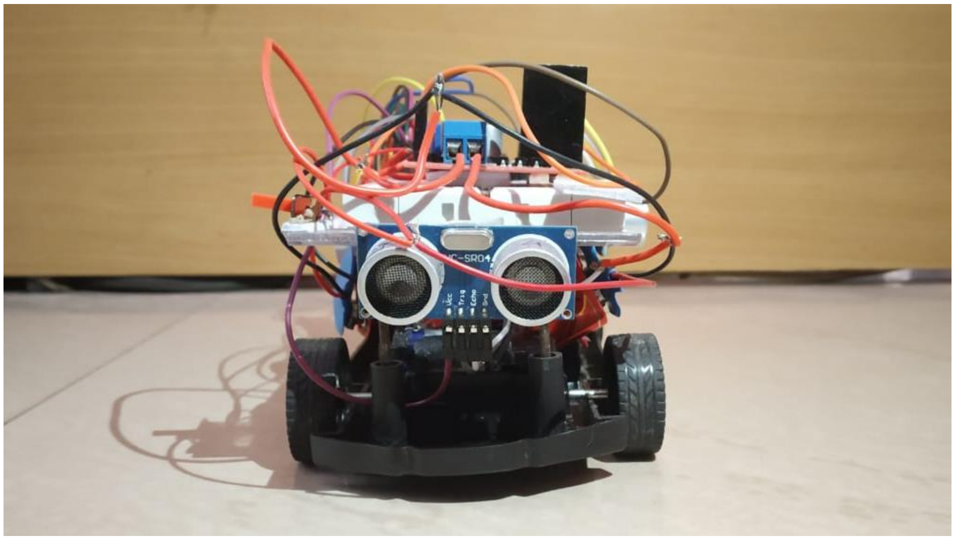
1. **Top View of Vehicle**



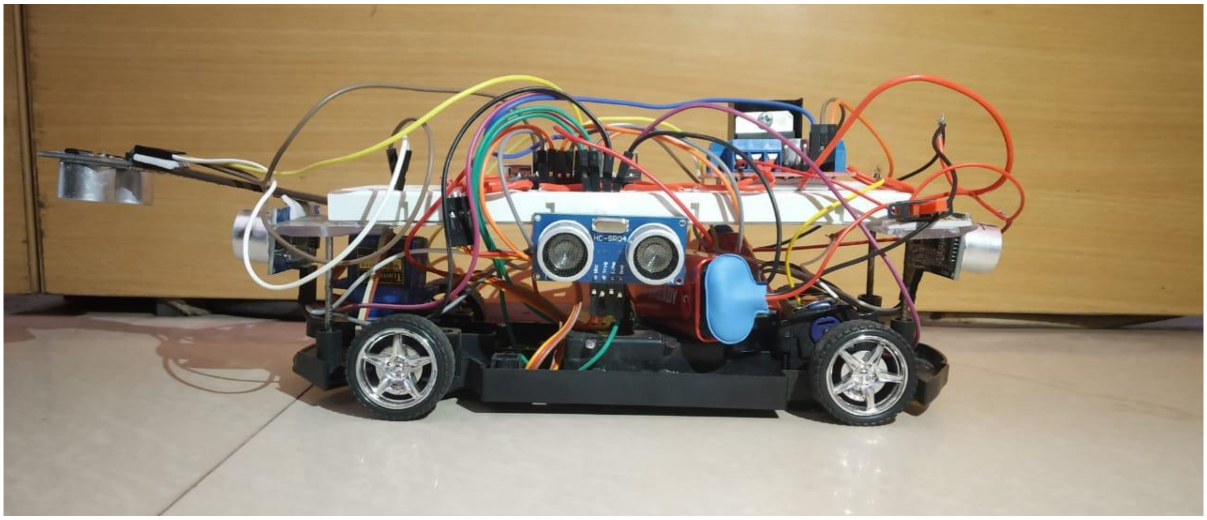
2. Front View of Vehicle



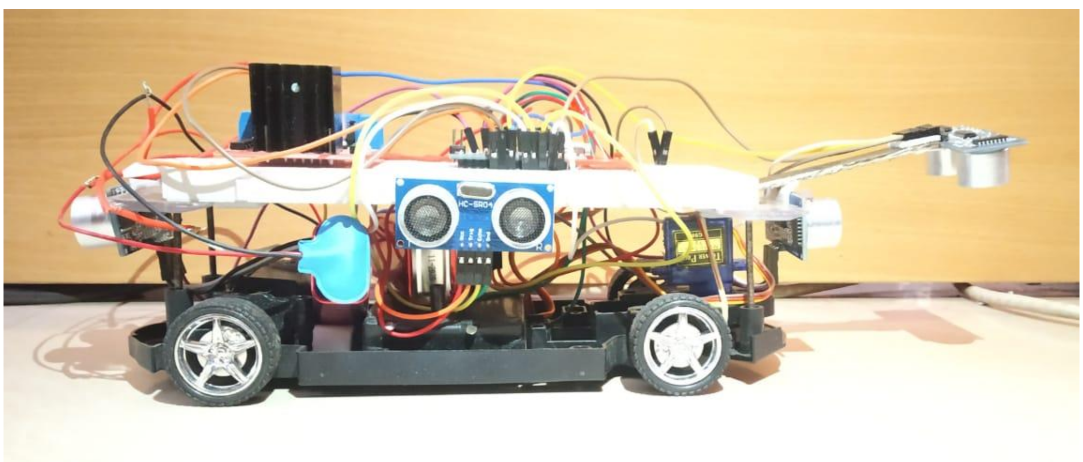
3. Rear View of Vehicle



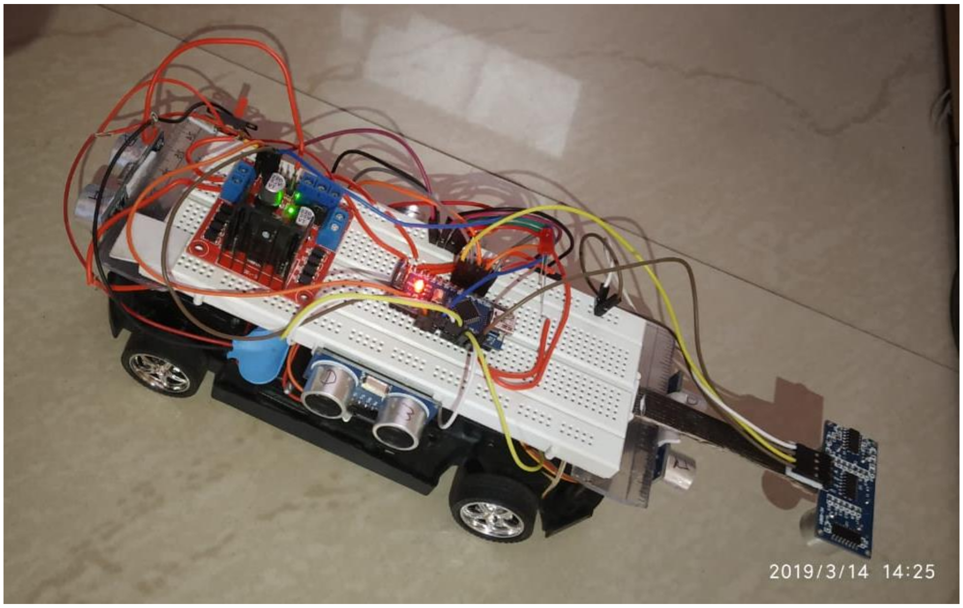
4. Left Side View of Vehicle



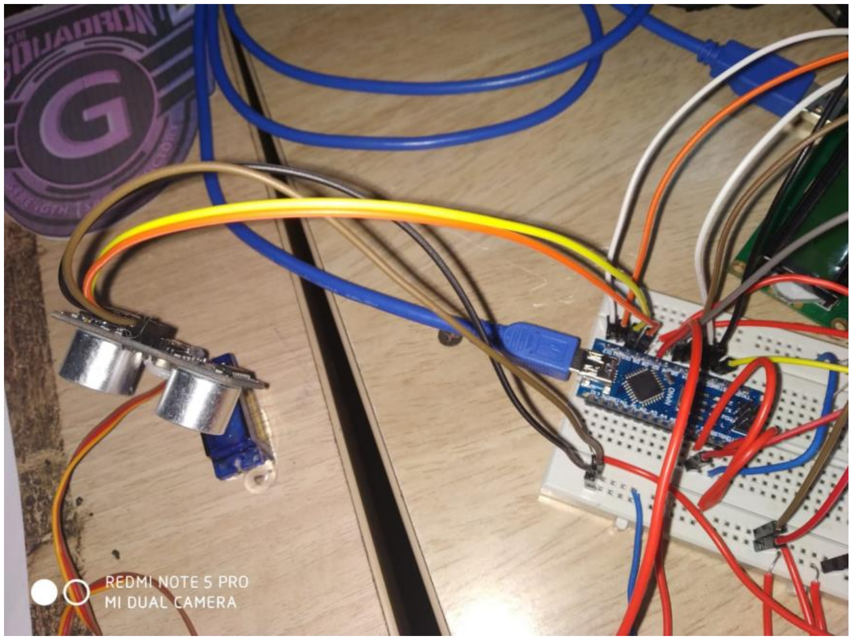
5. Right Side View of Vehicle

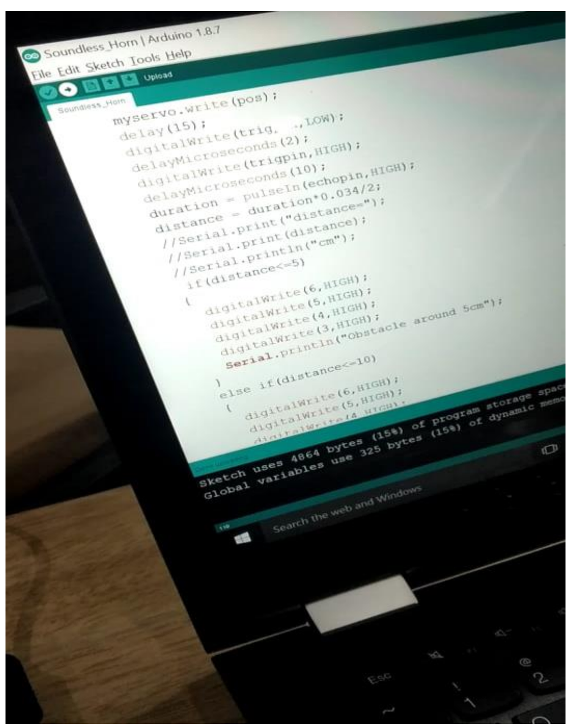


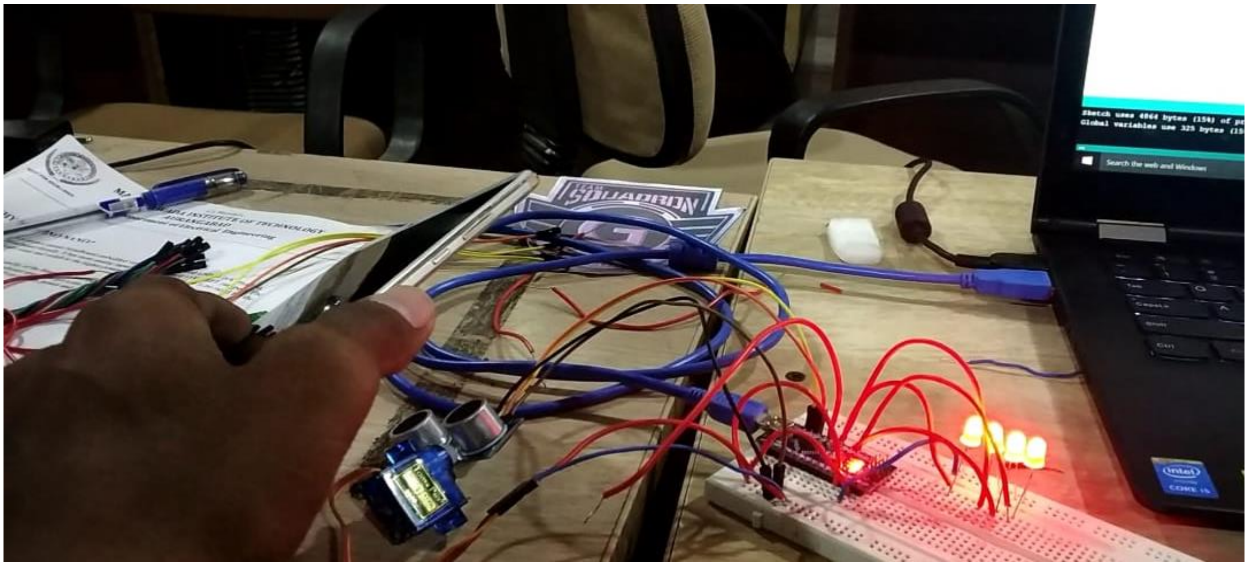
6. Vehicle in working phase

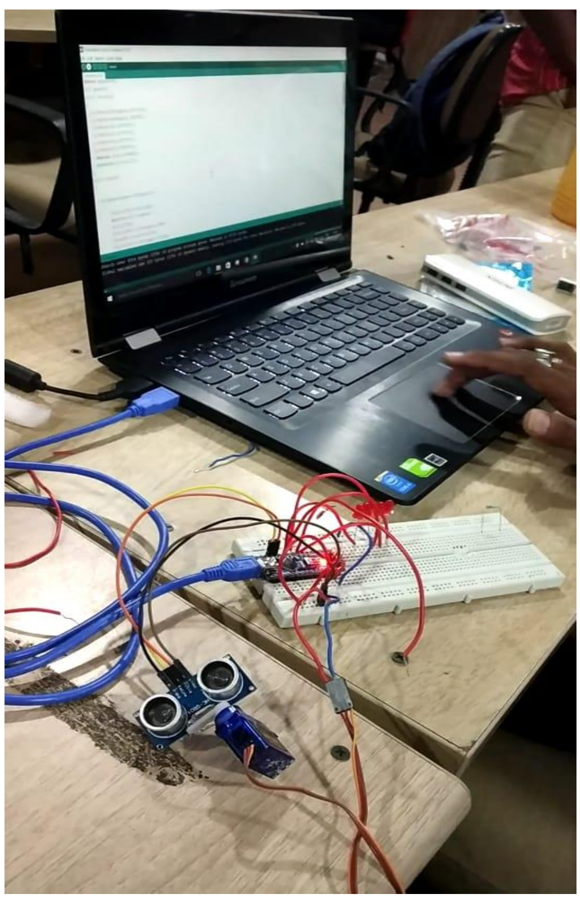


7.2 Images of the system at various stages of the project









8. CONCLUSION

STS is obviously going to play an increasingly important role in transportation. It is going to be relatively more successful in vehicle based systems and in revenue collection. As far as immediate implementation is concerned in low and middle income countries STS in public transport systems is likely to provide the biggest benefits. For congestion relief and safety, behavior adaptation is going to be the most unpredictable issue. The other important concern is level of market penetration required to make some of the technologies useable especially in low and middle income countries because of cost and in some cases issues of privacy.

The impact of sophisticated technologies and vehicle based systems can take a long time and the effects will be limited if too few cars are equipped with the necessary electronic systems. It is clear that the richer societies will experiment with and spend a large amount of funds on STS. Route guidance systems are certainly a private good, how much they contribute to the public good is open to debate. Pollution reduction and safety promotion by vehicle based technologies would be a public good. But, in those societies, where a vast majority of crash victims are pedestrians, bicyclists and motorcyclists, a technology that saves car occupants only becomes less of a public good. Choices have to be made, and the near future they point to a focus on STS in public transport systems, pollution control by vehicle based technologies and safety promotion by use of STS in limiting speeds and controlling drunk driving.

9. FUTURE OF THE PROJECT

Future solutions will warrant moving beyond just collecting data and providing information for one mode of transport, i.e. road traffic data.

The vision for future STS: to design true multi modal STS (Integrates several data streams from air, land and sea) systems capable of ‘real time’ traffic information (for example, even from car parks and parking meters). This process utilizes maturity modeling and stream computing applications (YouTube) and information gathered is disseminated through multiple delivery channels. This information can also be displayed on road signs such as the illuminated displays often seen on motorways.

According to a Press release by IBM – “The trend in transportation management is to use data to predict future traffic conditions and allow agencies to implement strategies and provide traveler information in anticipation of those future conditions,” said Christopher Poe, assistant agency director, TTI.

When it comes to addressing traffic problems today, transportation agencies are largely reactive, focusing on isolated incidents and single areas of congestion. Through innovations such as road sensors and predictive analytics, transportation systems can be made smarter, allowing agencies to be more proactive in dealing with traffic issues. For example, technologies exist today that make it possible to predict traffic conditions anywhere from an hour to 15 minutes in advance, providing drivers with valuable information on what is going to happen, rather than what has already happened – even before they get in their vehicles.

Beyond easing traffic congestion, smarter transportation systems can help reduce accidents, improve emergency response times, lead to cost savings, and increase community livability by promoting increased use of public transit. In addition, intelligent transportation projects have the potential to drive sustainable economic development through the creation of new jobs, technologies and businesses.

For example, the city of Stockholm is using IBM's streaming analytics technology to gather real-time information from GPS devices on nearly 1,500 taxi cabs to provide the city and its residents with real-time information on traffic flow, travel times and the best commuting options. The service will soon expand to gather data from delivery trucks, traffic sensors, transit systems, pollutions monitors and weather information sources. IBM is also assisting the cities of Brisbane, London and Singapore to address traffic management and congestion challenges.

10. REFRENCES

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