AUTOMATIC SAFE DRIVE ASSISTANCE

Project report submitted in partial fulfillment of the requirement of the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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TABLE OF CONTENTS

DECLARATION

We hereby declare that the work reported in the B. Tech project report entitled **"AUTOMATIC SAFE DRIVE ASSISTANCE"** submitted at Jaypee University of Information Technology, Waknaghat, India is an authentic record of our own work carried out under the supervision of **Dr. EMJEE PUTHOORAN**.

We have not submitted this work elsewhere for any other degree or diploma.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Dr. Emjee Puthooran

Date: -

Head of the Department / Project Coordinator

ACKNOWLEDGEMENT

LIST OF ACRONYMS AND ABBREVIATIONS

ASDA: AUTOMATIC SAFE DRIVE ASSISTANCE

ACC: AUTOMATIC CRUISE CONTROL

AVs: AUTONOMOUS VEHICLES

MCU: MICROCONTROLLER

I/O: INPUT OUTPUT

ACC: ADAPTIVE CRUISE CONTROL

AG: AGE GROUP

AMTTC: ADJUSTED MINIMUM TIME-TO-COLLISION

ANOVA: ANALYSIS OF VARIANCE

CCC: CONVENTIONAL CRUISE CONTROL

DAQ: DATA ACQUISITION

EG: EXPERIENCE GROUP

SUV: SPORT UTILITY VEHICLE

CO2: CARBON DIOXIDE

LIST OF FIGURES

ABSTRACT

Presently, automobile industries are till today working hard to encourage more automatic vehicles. The actual motive of proposing automatic technology is the wellbeing and security of the driver. As per a data presented, 80% of accidents occurs because of the fault of the driver. The Automatic Safe Drive Assistance (ASDA) is a system which has auto control with accident avoidance. The Automatic Safe Drive Assistance (ASDA) is based on sensor technologies. The system has ability of controlling the velocity of the car by itself to take up with the speed of vehicle ahead of your vehicle. If the vehicle that is leading reduces its speed and slow down or accelerate, then ASDA system by self matches that speed. Our project is based on correct ways of noticing the front vehicle by using a ultrasonic sensor by seeing the car and by handling the distance about the two car. Using this process, program for scheming of front vehicle's distance and monitoring the valve of ASDA occupied vehicle, development to drive constancy will be attained. The project contribution will result with fuel saving driving and with the more dependable drive system, but perfections will make it more safe and reliable.

This is a scheme that lets the car to reduce speed while getting close to another car and speed up again to the previous speed when road traffic is clean. It signals the ASDA driver or presses the brakes if there is a high danger for collision. In our project we will develop the microcontroller grounded automatic vehicle velocity control system. Currently we can observe that the figure of accidents occurs on flyovers. Mostly the reason for accident is by the mistake of the drivers. To duck this state, we propose the system which is called automatic safe drive assistance system. This system holds Ultrasonic grounded hindrance detector, every time it notices the hindrance the speed will reduce, when the distance of the hindrances gets added by itself speed gets increased. In ASDA driver need not to press the accelerators and also the breaks, which is completely monitored by the computer. Present model is semi-automatic and this system may be a completely automatic in the end.

CHAPTER-1
INTRODUCTION

Everyday news channels display terrible news about accidents on roads and the victims due to these accidents. A report declared that the destroyed assets and losses may equal to 4 % of the total GDP of the world. The idea of helping ASDA driver in car monitor to stop accident has always been a main focus of research at automobile institutions and research officialdoms.

The hint of ASDA pilot assistant goes underway along the '**cruise control instruments'** first noticed in 1970's in the USA. Once put on, this trick does its job to accelerate or to apply brake to maintain a fixed velocity. But it may not reflect the other vehicles on the road. [2]

In this day and age car businesses are as yet investing amounts of energy near progressively Automatic vehicles (The AVs). The fundamental worry of acquainting the self-governing novelty is with make safe drive by keeping away from the mishaps. As per an overview 90% of mishaps occur because of misstep of driver.

The aim of this task was to recover the sympathetic of the association between experience with Automatic Safe Drive Assistance (ASDA) and driving performance.[3]

Automatic Safe Drive Assistance (ASDA) is motorized task that allows a car automatic motor system to familiarize the velocity of car to traffic situation. A sensor attached to the front side of the car is used to notice if it gets slow moving cars are in the ASDA car path.

A story by PATH presumed that the harmed assets what's more, different expenses are close by equivalent to 4% of world's GDP. In the ongoing years numerous analysts concentrate on savvy vehicles added to explain, for example, ASDA driver trouble decrease, mishap anticipation proposed model, traffic blockage proposed model and so on. As per a review, on a usual every minute separate passes on due to incidental coincidence.

Driving seems simple errand but to drive needs clear psychological focus for noticeable period and prepare for the challenge for any circumstances in riven time and reply that partial capacity to effort time. To beat the mishaps issues and ASDA driver trouble on significant distances on interstates, here we will examine a proposed model which is known as Automatic Safe Drive Assistance (ADSA).

The main plan was to execute of voyage controller gadgets for the help of ASDA driver came in 1970. At the point when the proposed model was introduced and complete it turned on, this proposed model takes up the job at steady velocity by working the increasing speed and to apply break. In any case, the issue is its not planned by thinking about the security of different vehicles on streets. Following not many years in 2009 the Auto motor monitor is created to help the ASDA pilot for significant paths on expressways.

The proposed model is just ready to do speed control. Be that as it may, this proposed model is less gainful in the regions of traffic clog. This downside is overwhelmed by presenting the Automatic Safe Drive Assistance (ASDA). With the progression of period, presently new innovations are improving the way to drive errand which is improving technique to drive.

Innovative driving that effectively intercedes, monitors the velocity and heading of car have best impact on wellbeing of the person. Versatile voyage control which upgrade safe driving The fundamental goal of ASDA is to keep up a sheltered separation with the goal that it can maintain a strategic distance from backside impact. ASDA proposed model provides help to the ASDA driver in the errand of control of the vehicle while safe drive.

Among these the proposed model helps quickening agent, car applies break and motor to keep up an ideal time hole to the vehicle that is ahead it. An ASDA proposed model keeps up the car with that velocity preset by person when ASDA vehicle distinguishes a former car which runs at less velocity than the ASDA vehicle, which naturally controls velocity of the car to coordinate velocity of going before car which additionally keeps up with ascertains separation among two related vehicles that was preset by the concerned person.

The main contributions of the thesis are:

- An exploratory stage for versatile journey control and ASDA driver displaying.

- Contribution to the portrayal of human driver's practices utilizing dynamic Models.

- The utilization of proposed model ID strategies to acquire the ASDA driver models helpful for versatile journey control.

- Experiments in which seven drivers took part have been performed for a wide range of traffic circumstances. The gathered information have been broke down and utilized in the estimation of the ASDA driver models.

Automatic Safe Drive Assistance system is accessible in extravagance, just as more affordable vehicles. ASDA is a car highlight that permits voyage control proposed model to adjust the vehicle velocity to the circulation condition. ASDA proposed model is an better adaptation of CC proposed model where the speed of car is constrained by the development of going before vehicle by regulatory the choke regulator and breaking proposed model. A sensor proposed model added of the car to separate more slow moving cars are in the ASDA in the way of the vehicle. If a more slow going car is recognized, the ASDA proposed model will rear of the car with off state and control the liberty and time among the ASDA car and onward car.

The off Scheme distinguishes that onward vehicle is no longer in ASDA way of the car, the ASDA proposed model will fasten the vehicle that is rear to its preset voyage control velocity. The activity licenses the ASDA vehicle to self-rulingly comes back and applied acceleration with the traffic deprived of mediation from side of the driver.

This proposed model can work in rush hour gridlock zone dislike CC (Conventional Control) proposed model which can't work underneath speed of 30 [km/h]. By and large, in rush hour gridlock regions or in rush hour gridlock clog there is visit utilization of brakes and quickening agent by the act of the ASDA driver of vehicle. A few time later a lengthy drive and strain trouble in rush hour gridlock region, rather than putting brake, ASDA driver applies quickening agent or the other way around.

So in rush hour gridlock territory ACCS dispenses with the regular need of quickening agent and breaks and evade the odds of mishap by keep up the wellbeing of ASDA driver and travellers. In the past age, there was ASDA however that was just giving barely any highlights like Go and Stop.

Around then the principle goal of that ASDA proposed model to offer a visible help on less velocity or at zero. This halt and move ASDA proposed model is just genuine for fixed item which comes in region of the car. In this kind of proposed model, it is absurd to expect to set a steady speed. So in a basic manner this kind of ASDA proposed model is just pertinent in fixed targets.

Experiments on the disadvantages of ordinary ASDA and Go and Stop ACC, better-quality type of ASDA arrived. It defeats practically all the disadvantages of past proposed models. Yet at the same time there are a few constraints which can be defeated in future to make it progressively dependable and alright for the individual.
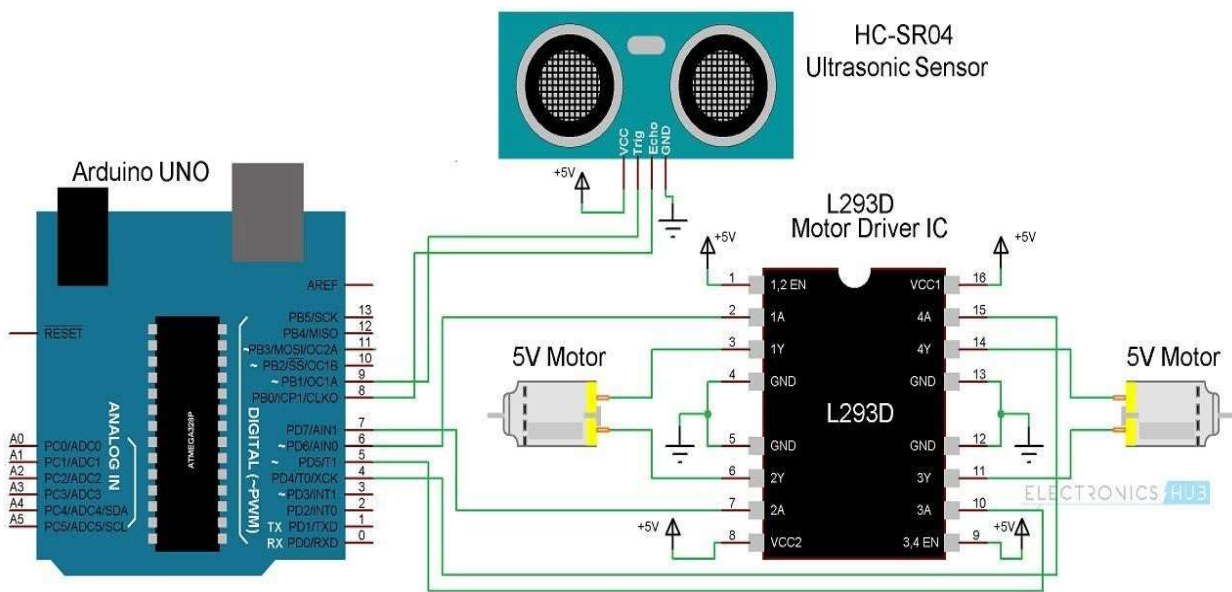
Figure 1.1: ASDA Circuit Diagram
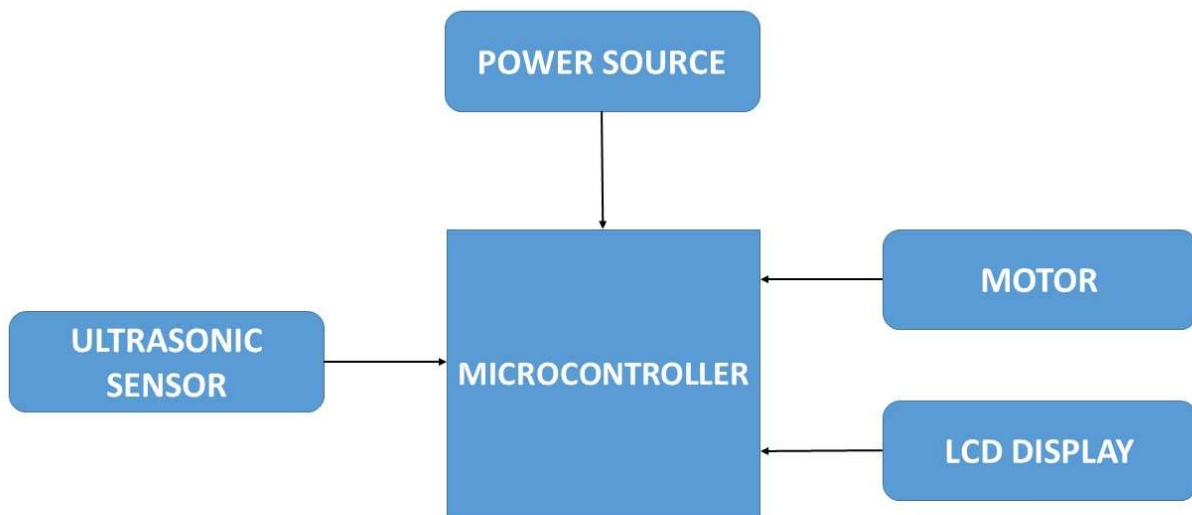
Figure 1.2: Block diagram of ASDA

1.1 BACKGROUND AND MOTIVATION

Proposed models that help a ASDA driver in rush hour gridlock circumstances and diminish the all-out ASDA driver remaining task at hand, is a developing exploration subject. Some are emotionally supportive networks said to full or halfway programmed ASDA driver for help,

Versatile voyage regulator separates self from journey regulates in its utilization of ultrasonic sensors sees progress separation and a supervisor that adapts with the velocity and separation from the car in opposite rear side. Versatile voyage control needs proper sensor novelty, actuators and gadgets and its planning configuration needs data procurement, control structure and approval methods.

The motivation for these strategies is that they target growing the driving support, diminishing auto collisions and growing the traffic stream amount. The ASDA links independently change the vehicle's speed as hinted by current methods of driving. To achieve driver, safety must take after ASDA driver conduct in rush hour gridlock.

The layout must keep away from aggravation of the ASDA driver and of the encompassing traffic. Hence, to plan a layout that looks like the regular conduct of a good ASDA driver a decent structure is required. There are some endeavours to show the drivers' longitudinal conduct, which all targets show different pieces of the ASDA driver practices.

On the condition that the structure recognizes that the opposite of rear car in ASDA in the way of the vehicle, ASDA proposed model will make fast the speed of the car to its original speed. The activity allows the ASDA car to self- ruling leave and then accelerate along with the traffic short of mediation from the so called person driving the car.

The proposed model can work in rush hour gridlock zone dislike CC (Conventional Control) proposed model which can't work beneath speed of 30 [km/h]. By and large, in rush hour gridlock zones or in rush hour gridlock clog there is visit utilization of the stopping equipment and quickening agent by the controller of vehicle. After a lengthy drive and trouble in rush hour gridlock region, rather than putting brake, ASDA driver applies quickening agent or the other way around.

So in rush hour gridlock territory ACCS kills the continuous need of quickening agent and breaks and stay away from the odds of mishap by keep up the security of ASDA driver and travellers. In the past age, there was ASDA yet that was just giving scarcely any highlights like Go and Stop.

Around then the primary target of that ASDA guidelines to offer help on less speed or at zero speed. This halt and move ASDA proposed model is just sincere for fixed item which comes in

region of car. In this kind of proposed model, it is beyond the realm of imagination to expect to set a consistent velocity. So in a basic manner sort of ASDA proposed model is just pertinent in fixed places.

In the wake of a long search on the downsides of traditional halt and move ASDA, a advance type of ASDA came. It defeats practically all the disadvantages of past proposed models. Yet at the same time there are a few impediments which can be defeated in future to make it increasingly dependable and ok for the person.

1.2 HOW DOES ASDA WORK?

In the moment when a vehicle with less speed approaching is recognized, the ASDA model identifies the vehicle, senses it, stop and control the leeway, among the ASDA car and the opposite rear vehicle. At the Off state the model identifies the opposite rear vehicle is no longer in the ASDA path, the ASDA proposed model brings back the vehicle back to preset speed.

The particular activity permits the ASDA to slow down and move slowly with traffic without any problem for the person driving. This particular technique which the ASDA speed of the vehicle is controlled is by way of motor choke control and forced brake activity.
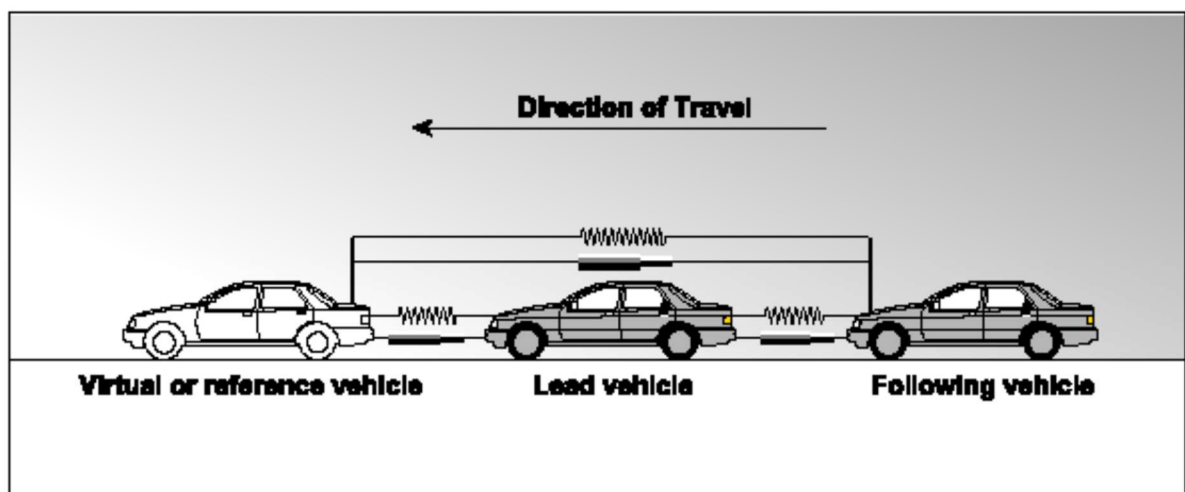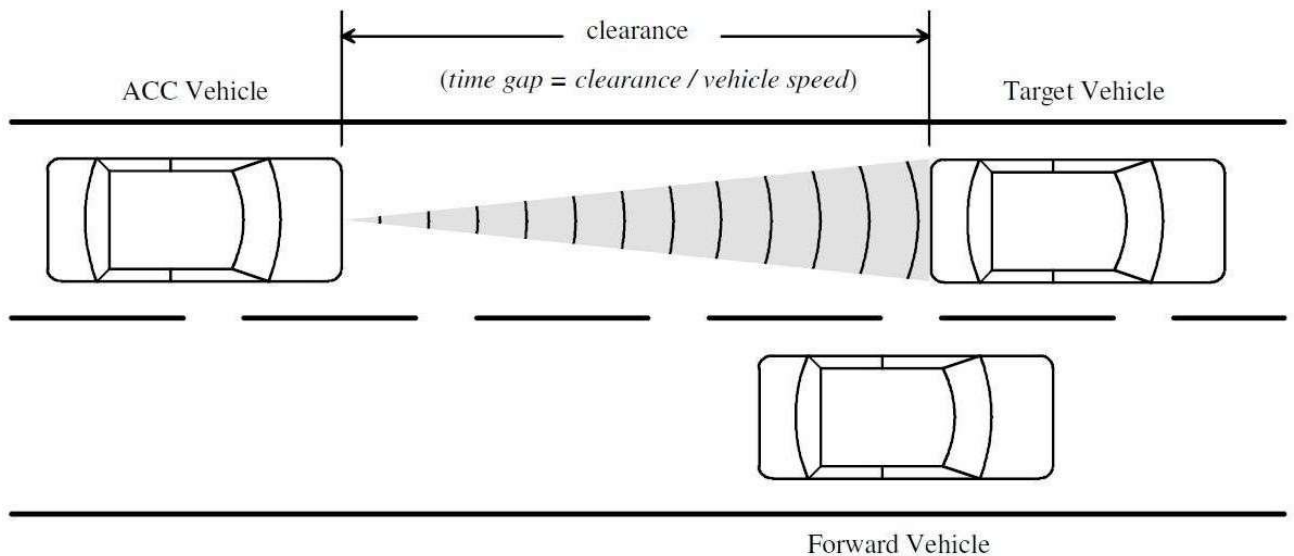
Figure 1.3 Physical Overview.

The three objectives are:

(1) Find if the ASDA driver who knows about ASDA acts appropriately to the feedback provided by a familiar ASDA system under unwanted scenarios.

(2) Check whether there is feedback facility available for drivers who currently use Automatic Safe Drive Assistance (ASDA).

(3) Take required action when there is accident or mishappening using ASDA systems.

1.3 DEFINITIONS AND THEORY

Automatic Safe Drive Assistance (ASDA): An upgrade to an ordinary voyage control proposed model which permits the ASDA to drive along a vehicle moving in the front at a fitting separation.

ASDA vehicle: The main vehicle outfitted with the ASDA proposed model.

Active Brake System: A machine capacity which makes use of the brakes without the intervention of the driver by using the tool of the brake pedal.

Clearance between Vehicle: The fixed distance maintained between the ASDA vehicle's front driving surface from another vehicle in the front.

Vehicle in front: Any vehicle before ASDA vehicle and going in the similar way and going on a similar path as the ASDA vehicle.

Set Speed: The ideal voyage monitored speed set by the person in car and is the most extreme wanted speed of the car running under ASDA control.

System States:

ASDA Off: Access to the direct 'ASDA active' state is removed.

ASDA Standby: When the system is ready to start by the driver.

ASDA Active: When the ASDA model is inactive and speed control of the vehicle.

ASDA speed control: A substrate of 'ASDA dynamic' there is no vehicle infront available to such an extent that the ASDA proposed model is control speed of the vehicle is 'set speed' as is run of the mill with customary journey control proposed models.

ASDA time gap: A substrate of 'ASDA dynamic' state which progress, among the ASDA model and the target vehicle is controlled.

Target vehicle: The vehicles moving in front of the ASDA vehicle that is close to the ASDA vehicle.

Time gap: Time interim between the ASDA car and the target car.
Time hole = freedom/ASDA vehicle speed.

1.4 AUTOMATIC SAFE DRIVE ASSISTANCE (ASDA) DESIGN

As clarified to start with the principle concern and target of executing of this kind of proposed model in vehicle, is the wellbeing of individual by keeping a required distance and brought about by ASDA driver botch. ASDA deals with the rule of figuring the separation and velocity of the car in front by the utilization of installed sensor.

These sensors may be an ultrasonic sensor. In ASDA proposed model, sending and gathering time is the catch of estimation of separation. Using Doppler impact, move in recurrence of sent back bar is estimated as velocity. On the basis of velocity and separation estimation, applying brakes and choke should be possible to keep the car in a protected zone. The time and recurrence diagram is appeared to ascertain the separation and speed.
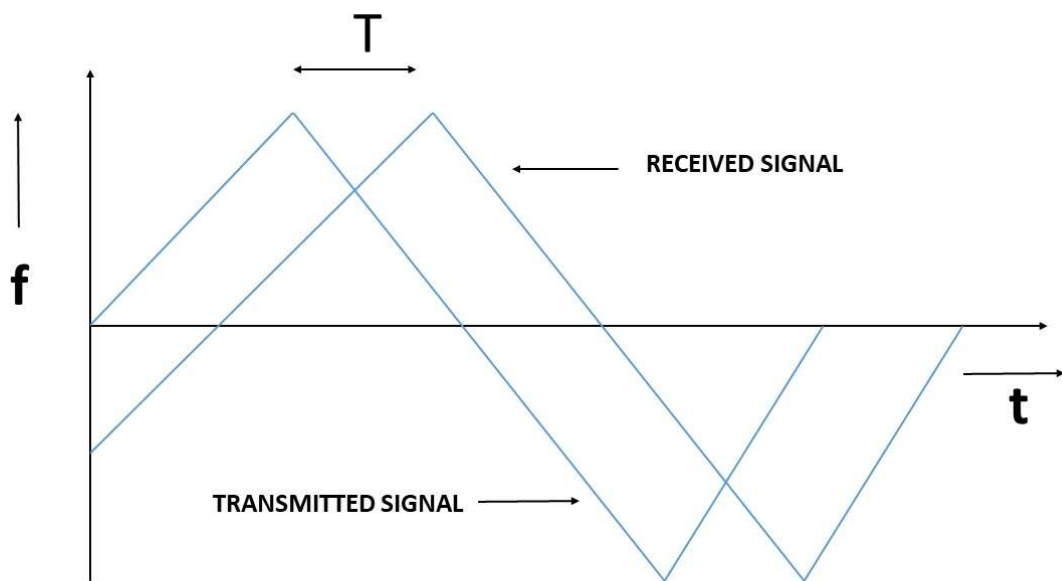
Figure 1.4: Working principle of ASDA system

ASDA proposed model is grouped into two kinds: RADAR ASDA and LIDAR ASDA.

Radar proposed model comprises of a Radar sensor placed before the sample vehicle to identify the nearness of vehicle in front. This proposed model has three covering radar light emissions recurrence 77-78 [kHz]. This sort of proposed model can distinguish car up to a separation of 125m. The principle bit of leeway of this proposed model lies in its ability to work in unusual climate.

LIDAR ASDA proposed model are laser-dependent proposed model. It has a light emission that is smaller than a water drop. The principle bit of leeway of this proposed model is more affordable and simple to introduce. Utilizing ASDA proposed model are barely any normal and helpful terms.
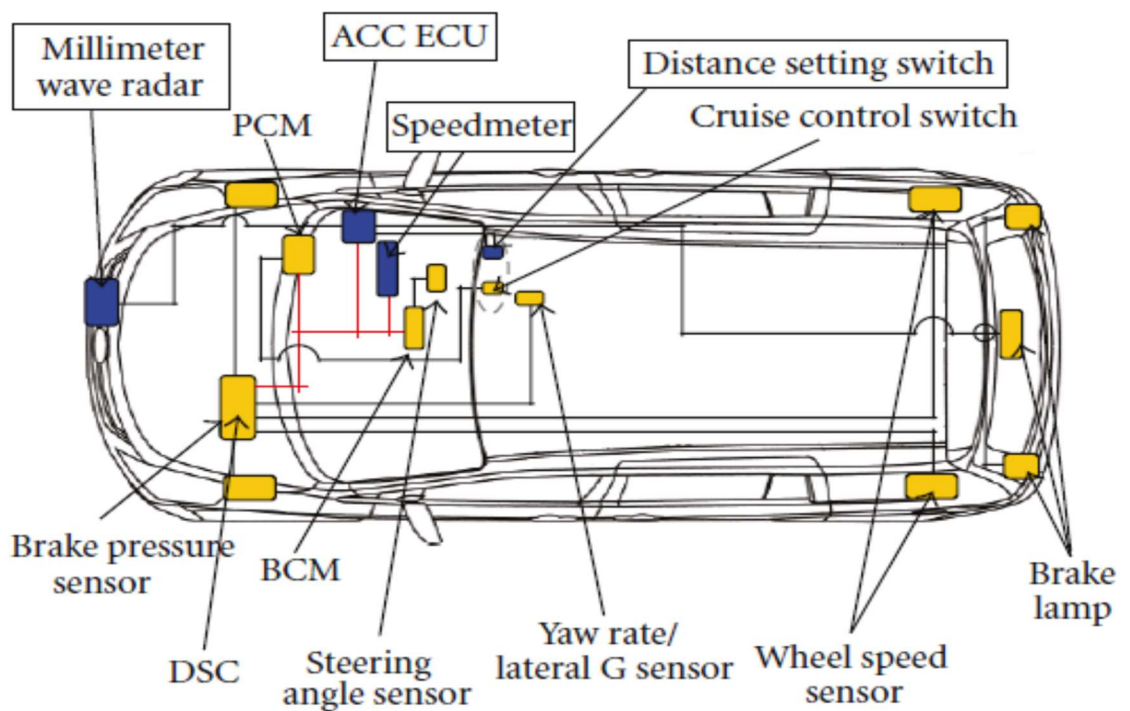
Figure 1.5: ASDA Vehicle Unit Components

Estimation of the protected separation is introduced by accompanying condition: ((Vs x t), Vs = speed of ASDA car, t = reaction time). The ASDA model is spoken to beneath referenced parameters:

- Pre-set the estimation of speed of the car and keep up.

- Reading of separation and speed of the car ahead.

- Observing and acting on the speed of ASDA prepared vehicle.

- It can change the predefined speed of vehicle by automatic application of the brakes when some obstacle is detected.

- Apply legitimate capacity in bad climate state.

- Perform great at the middle of speed of 20 – 150 km/h.
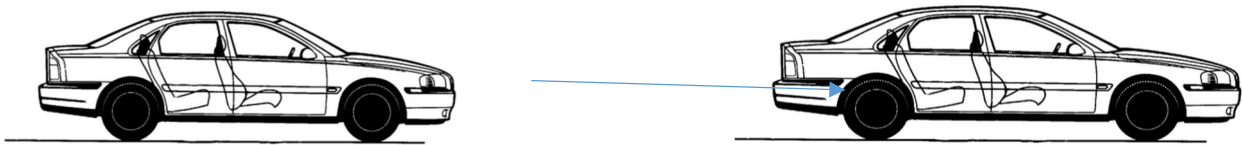
Figure 1.6: ASDA Car following
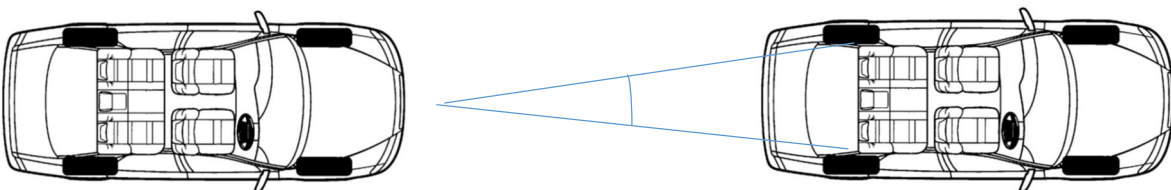
Figure 1.7: The visual angle in car following

CHAPTER 2

COMPONENTS OF AN ASDA SYSTEM

2.1 MICROCONTROLLER (ARDUINO)

A microcontroller is a small integrated circuit developed to monitor a particular task in an Embedded network. A typical microcontroller includes a processor, storage and input/output facility on a single integrated chip.

How do microcontrollers work?

A microcontroller is installed within our proposed model to control a fixed task in a device. It does this by decoding signals that it gets from its I/O facilities and its focal processor. The small data that the microcontroller receives is stored in its information library, where the processor works on it and uses the guidelines put away in its library to understand and apply the given information. It at that point uses its I/O facilities to give and institute the proper functioning. Microcontrollers are applied in a wide cluster of propped models and gadgets. Gadgets frequently use microcontrollers that are required according to its functioning.

For instance, a vehicle may have numerous microcontrollers that control different individual proposed models inside, for example, the electronically monitored slowing mechanism, footing control, fuel infusion or suspension control. All the microcontrollers speak with one another to educate the right activities. Some may speak with a progressively perplexing focal PC inside the vehicle, and others may just speak with different microcontrollers. They send and get information utilizing their I/O peripherals and procedure that information to play out their assigned undertakings.

2.1.1THE ARDUINO UNO:

Arduino is monitored by USB port which is connected by 9volts cell. But there is no scientific theory that it is fixed between that range. It can vary between 7 to 20 volts. It is similar to the likes of the Arduino Nano and Leonardo. The gear position outline is conveyed under a common guideline. Format and method of creation for some of the gears are online available and can be used for free.

UNO means number one in Italian and was taken from there which marked the arrival of the software that is Arduino Software. The Uno board was the first of this USB-based Arduino sheets. It is the adaptation 1.0 of the Arduino IDE of Arduino, that is now advanced to more current discharges. The ATmega328 board appears with pre-customized and transferring new code to it without the use of an outer equipment for the software engineer. While the Uno proves the use of first STK500. It appears from every previous board the series and the FTDI USB-to-sequential ASDA driver chip. It uses the Atmega16U2 customized as a USB-to-sequential converter.

Figure 2.1: Arduino UNO R3

2.2 LCD DISPLAY

We see LCDs every day. Laptops, mobile, TV, watches and many more use some kind of LCD to display. An LCD system that uses liquid crystal to produce an image that we can see. The 16×2 LCD is very common in circuits. The 16×2 is nothing but 16 characters per 2 lines. In the LCD each character is put to display in a 5×7pixel matrix.

Highlights of 16×2 LCD.

- Voltage allowed is 4.7V to 5.3V
- Current allowed is 1mA
- Can display alphabets as well as numbers.
- Has two rows and each row has the capacity to which can print 16 number of characters.
- Every character is made up of a 5×8pixel box.
- Allowed to perform on both 8-bit and 4-bit.

Figure 2.2: LCD Display

2.3 ULTRA SONIC SENSOR

The ultrasonic sensor is a device that can detect the distance of an obstacle by sending and receiving ultrasonic sound waves.

It use transducer to send and receive ultrasonic sound waves that bounces back the signal from the position of an obstacle.

Sound waves reflects and produces patterns. A regular sensor has a transmitter and beneficiary, although an ultrasonic sensor uses an ultrasonic component for both outflow and receiving back. This helps bringing down of the sensor top. The separation can be found using:

Separation S = 1/2 ×Te ×Cs

Where S is the separation, Te is the time between the emanation and received, and Cs is the sonic speed. The accompanying signals shows run of the mill attributes empowered by the identification system. Transparent object noticeable Complex formed items discernible Presence discovery is halted in any event, for targets.

2.3.1 NEED OF AN ULTRASONIC SENSOR.

Ultrasonic sound is a strong and useful proposed device and can be used anytime anywhere. It can avoid collision for a machine, can be moved fast with conscience.

Ultrasonic is very common in use, they are very useful in implementation of bin sensing applications, water level observing, drone applications and more.

Ultrasonic rangefinders are very useful to detect collision

Long range detection of targets with varied surface properties.

Ultrasonic are free from:

- Light and Smoke

- Dusty features

- Colour as distraction

- Most Materials (except for soft surfaces)

- Ultrasonic sensors are better as compared to infrared sensors as they are not affected by smoke or black materials, but they are affected by soft. It's good and reliable system.
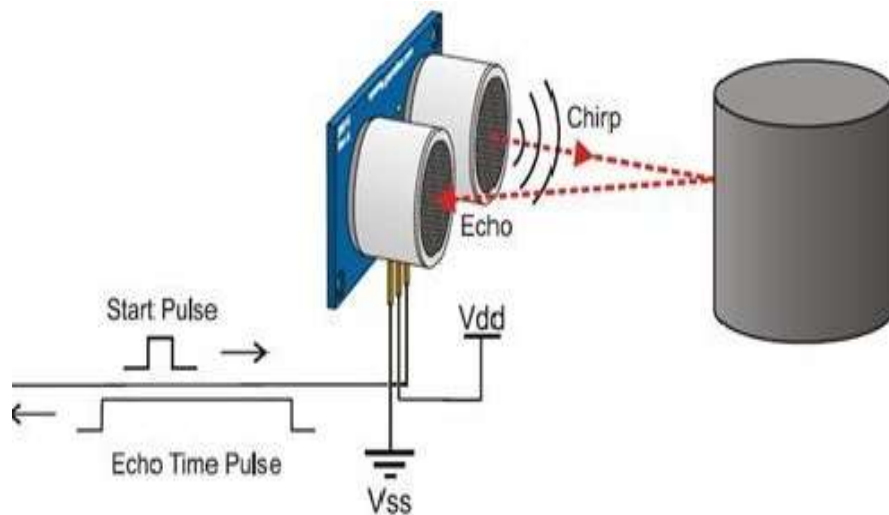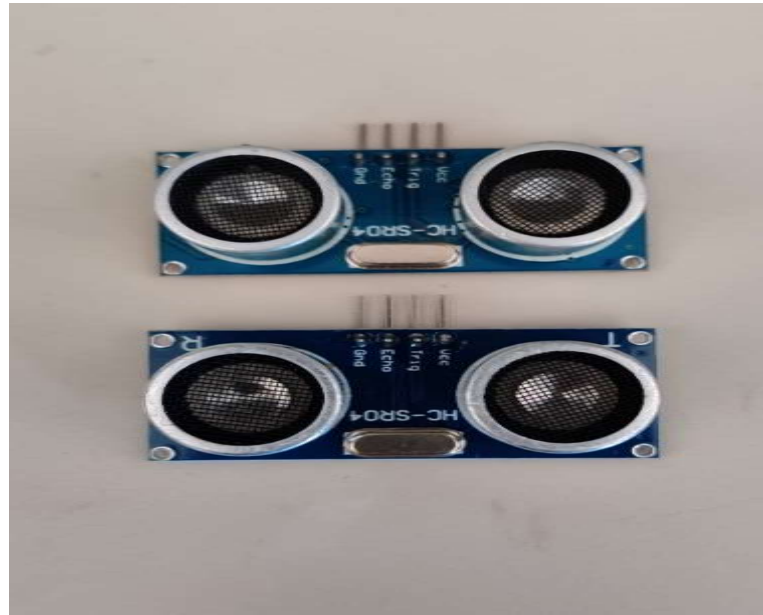
Figure 2.3: Ultra Sonic Sensor

2.4 DC MOTOR

The DC motor performs the function of turning machines that coverts electrical energy forces to mechanical. The most commonly known source depend on the delivered powers by attacking fields. There are a variety of DC engines section to sometimes change the current stream in some fraction of the motor.

They are the main in their field, as they could be fueled from DC. Its speed can be monitored and used may be as a variable gracefully voltage or alternating currents. DC motors are used everywhere from toys to big devices. The general engine can work on DC and light weight for small uses. Bigger DC engines are used in cars. Lifts etc.

Figure 2.4: 5V DC Motor

2.5 BOT SKELETON

2.5.1 CHASSIS AND WHEELS is a proposed model which cares about the body of a bot. It is a vehicle frame which holds all the elements of the bot.

Figure 2.5: Chassis and Wheels

2.5.2 BATTERY (9V DC) is a common battery that was used in the transistor radios. It has a shape of rectangle and curve on ends and an enraptured situated at the top.

Figure 2.6: Battery

2.5.3 CONNECTING WIRES AND TOOLS Jumper are just normal wires with pins at each end, which helps them connect two parts without using soldier They usually use the bread boards and other tools which makes it easy to change and reuse. It just the most common tool.

Figure 2.7: Connecting wires and tools

2.6 LIDAR IS LIGHT DETECTION AND RANGING.

- Use to produce light sign.

- Full form of RADAR is Radio Detection and Ranging

- It is worked by emanating vitality into space and recognizing the reverberation which helps signal reflect.

- RADAR helps the vehicle's back receive the sound system camera continuously monitors.

- It incorporates wave in millimeter connected to a 640x480 pixel sound system.

CHAPTER- 3
AUTOMATIC SAFE DRIVE ASSISTANCE SYSTEM

3.1 SYSTEM ARCHITECTURE AND BASIC MODELLING
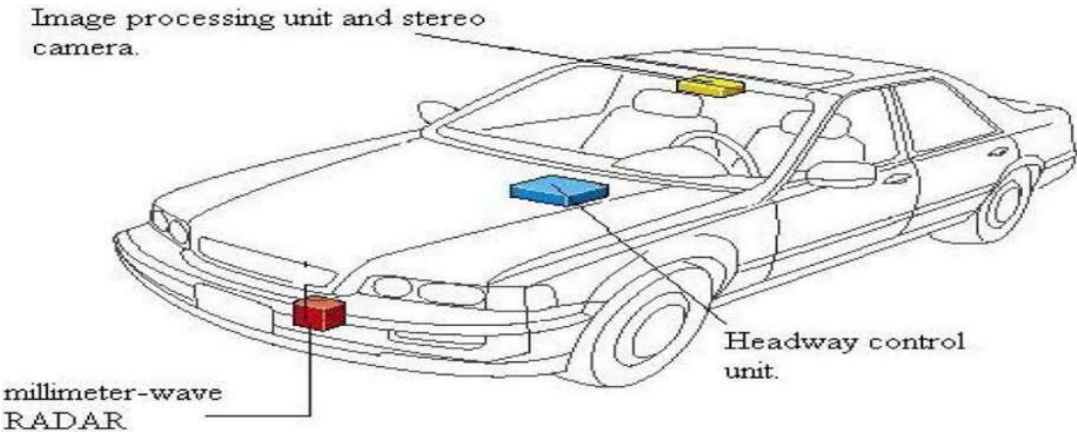
Figure 3.1: Prototype of a car with sensor arrangements
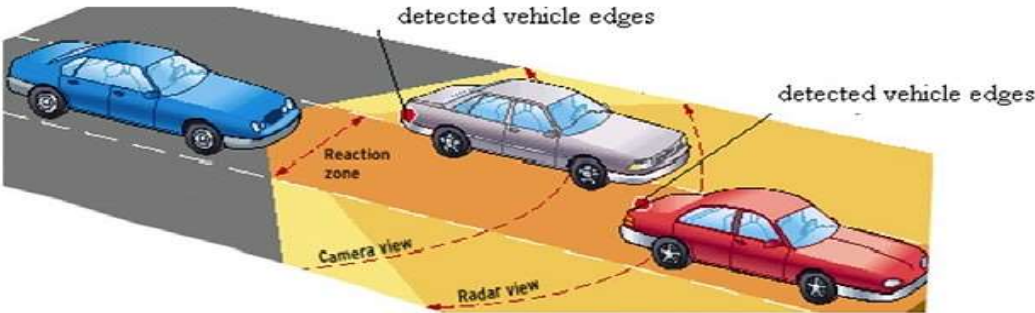
Figure 3.2: Representation of the components in our system design.

3.2 DIFFERENT STATES (MODES) IN AUTOMATIC SAFE DRIVE ASSISTANCE(ASDA) SYSTEM

- Automatic Safe Drive Assistance (ASDA) off mode

- Automatic Safe Drive Assistance(ASDA) standby mode

- Automatic Safe Drive Assistance(ASDA) active state mode.

  It has two modes given below:

  - ASDA speed control

  - ASDA time gap
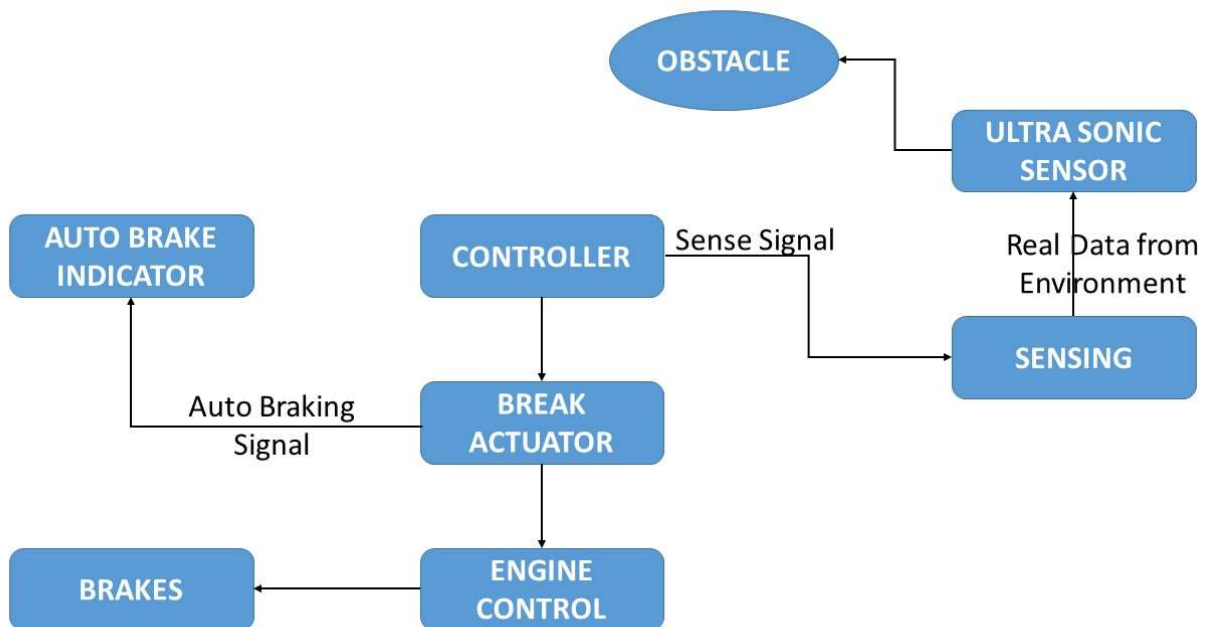
Figure 3.3 Block diagram when vehicle is stopped
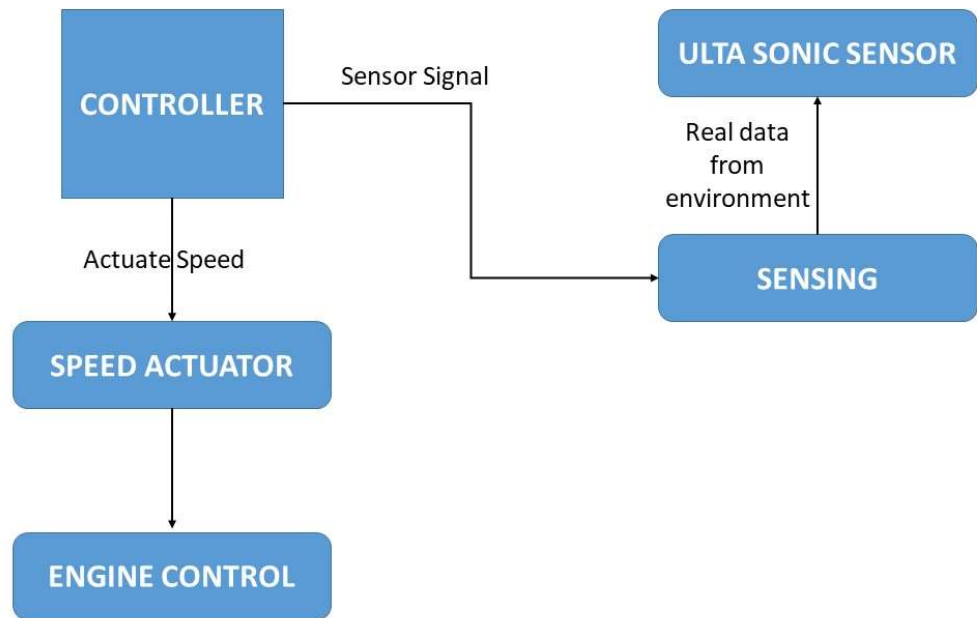
Figure 3.4 Block diagram when vehicle is accelerated

CHAPTER- 4

PROTOTYPE AND WORKING

As per the detailed description of **AUTOMATIC SAFE DRIVE ASSISTANCE** system in previous chapter we have arrived at a prototype of Automatic Safe Drive Assistance system.

The prototype of Automated water monitoring system consists of following components:

- Skelton of ASDA
- Microcontroller (Arduino UNO R3)
- Wheels
- DC Motor (5 V)
- L293D Motor ASDA driver IC
- LCD Display (16*2)
- Ultrasonic Sensor (HCSR-04)
- Power supply (5 volts)
- Breadboard
- Connecting Wire
- Jumper Wire

4.1 DESIGN AND IMPLEMENTATION
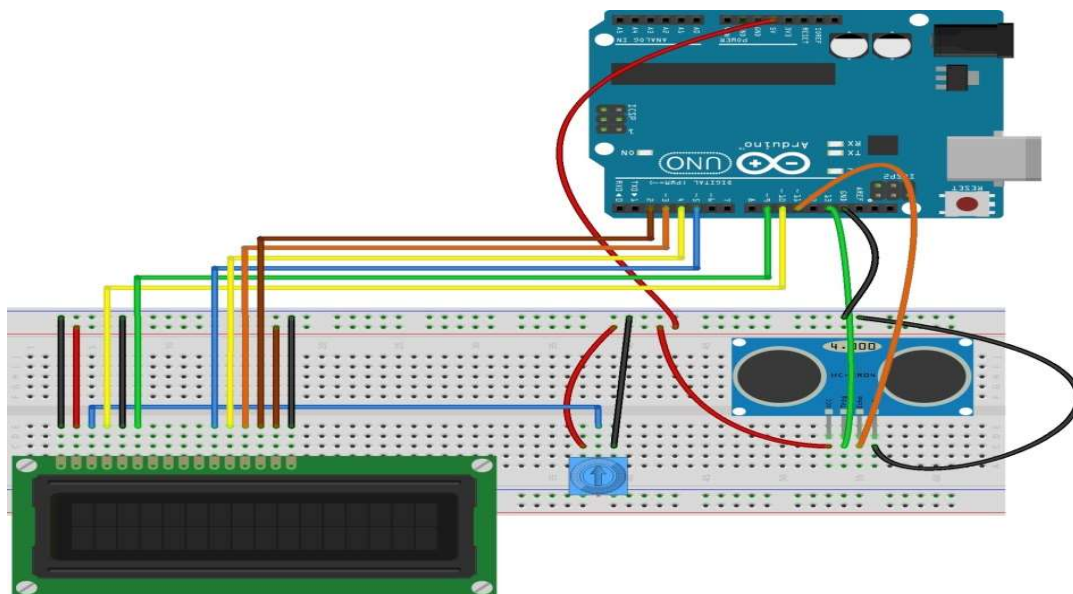
Figure 4.1: Circuit diagram depicting the Ultrasonic Depth Sensor and LCD Display

Ultrasonic Depth contains four pins. They are 1st: Vcc, 2nd : Gnd, 3rd: Trig, 4th: Echo. The Trig and Echo has pin 9 and 8 respectively. The Vcc and Gnd pins are linked with Vcc and Gnd of MCU. Profundity beam is gathering crude information i.e., the water overflow estimation, and sends it to the MCU in simple signs structure.
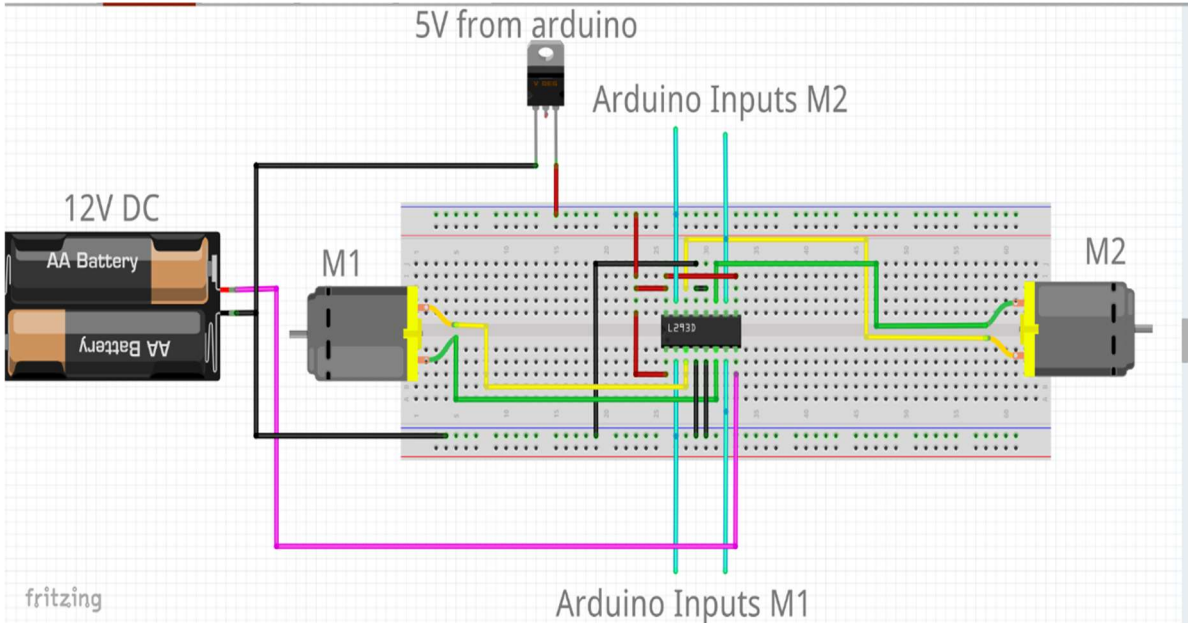
Figure 4.2: Connection Diagram of L293D Motor ASDA driver IC

L293D has 16 pin IC in it. Pin 1 and 9 represents empower pins. The said pins are linked with a positive 5V. Pin numbers 2 and 7 are called control contributions from microcontroller to 1st motor and associated with pin numbers 6 and 7 of Arduino separately.

Essentially, pin number ten and fifteen are control contributions from microcontroller to 2nd motor. They are linked with pin number five and four of Arduino. Pin numbers four, five, twelve and thirteen of L293D are GND pin and are linked with Gnd.

1st engine is linked to pin number three and six of L293D. The subsequent engine, that goes about the correct wheel engine, is linked with pin number eleven and fourteen of L293D.

The 16th number pin of L293D is named Vcc1. This is associated with +5Volts. The eighth pin number is named Vcc2. This is the engine flexibly voltage. It can be associated anyplace somewhere in the range ofi4.7Volts. In this feature, pin number is 8 if L293D is associated with +5V flexibly.
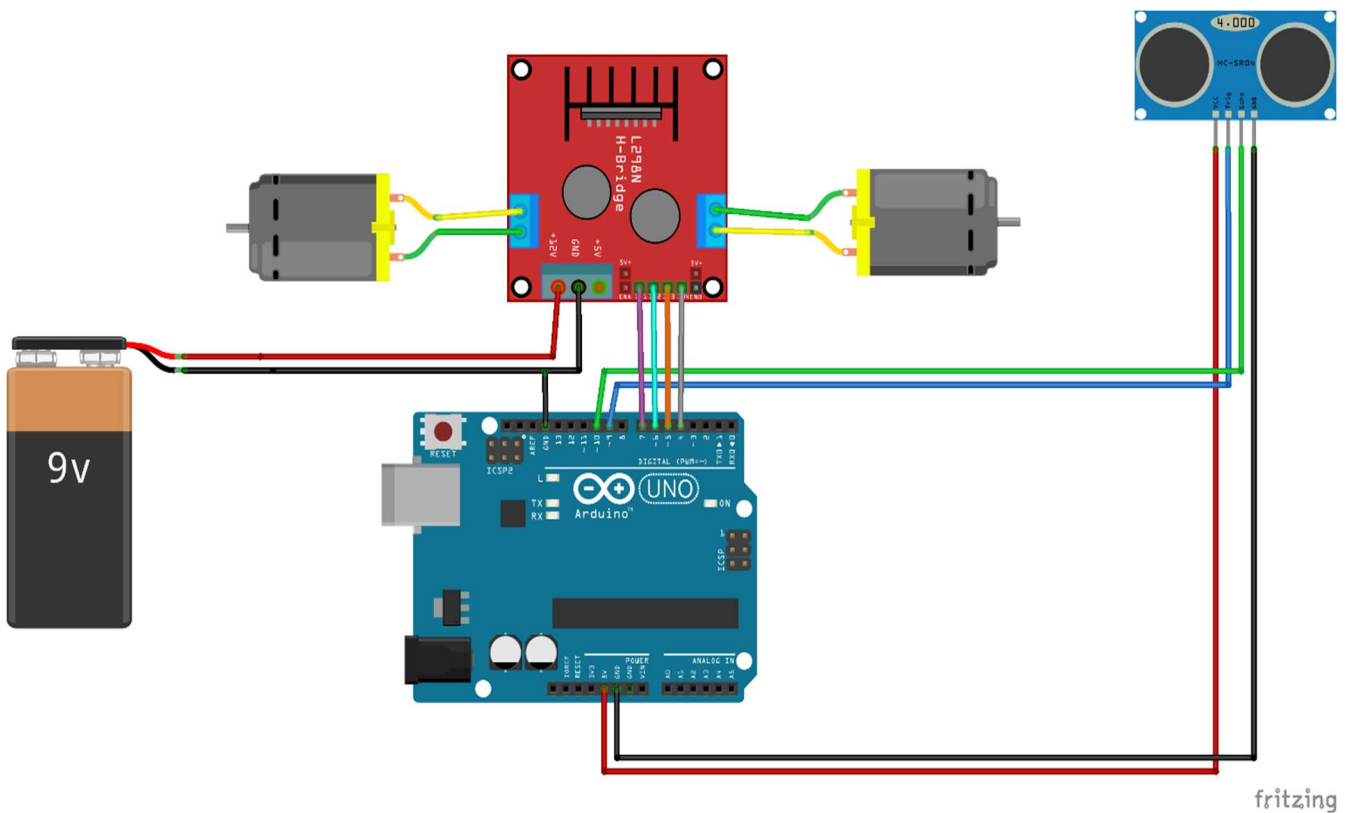
Figure 4.3: Connection Diagram of ASDA

CHAPTER 5

OPERATIONAL OVERVIEW

The model of ASDA driver function for the ASDA proposed model is essentially the same as a routine voyage control proposed model. The ASDA driver has to work the proposed model by the way of a lot of on-offs on the guiding wheel. The switches are equivalent to for a habitual voyage control proposed model with the exception of the growth variations to switch the time between the ASDA car and the front target car. Likewise, there exists arrangement of prompt posts that can be exposed on the tool to tutor the ASDA person regarding complaint of ASDA proposed model and to provide essential admonitions.

The ASDA person connects with the ASDA proposed model by clicking the ON button that makes the proposed model into the 'ASDA reserve' state. The ASDA pilot at that point pushes the Set change to enter the 'ASDA dynamic' mode so that all things considered the ASDA proposed model endeavours to switch the ASDA car to the pre set speed upon the traffic ridden conditions.

5.1 INITIALIZATION OF ASDA

At the point of time the start key practically off, no force needs to be applied to any of the proposed models. When the main objective comes to the on position, the ASDA proposed model in states to the 'ASDA off' state.

5.2 ENGAGING ASDA CONTROL

Enter 'ASDA standby' – Just dynamic voyage control can be locked in the ASDA driver should first enter 'ASDA backup'. This is performed by the ASDA driver by clicking the ASDA 'On' button. Assume no proposed model issues are available, the ASDA proposed model will change to the 'ASDA backup' state.

Entering 'ASDA active' – The ASDA driver when enter the 'ASDA dynamic' state by squeezing the Set and Resume button. On the off chance that an earlier set button for speed is available in library, the proposed model utilizes the earlier incentive as the objective speed when start again is

clicked, the present velocity the Set catch was clicked will turn into the objective speed. The accompanying conditions must be valid for the proposed model to enter 'ASDA dynamic' in light of the journey:

Switch Brake 1 =when brake not applied

Switch Brake 2 =when brake not applied

Actual Speed of the vehicle >= 25 mph

If enter dynamic ASDA control, the speed of the vehicle denotes to keep up a preset speed or on the other hand to keep up a period hole to a front moving vehicle, whichever has low speed.

5.3 OPERATION DURING ASDA CONTROL MODE (ASDA SPEED CONTROL)

Activity mode is proportional to customary velocity control. In the event that no front moving vehicle is available inside the Time difference or leeway of the proposed model, the speed of vehicle is kept up at the target speed. The motor monitor proposed model controls the motor yield by means of choke control to keep up the speed of the vehicle at the objective speed.

5.4 OPERATION DURING ASDA TIME GAP CONTROL

The ASDA proposed model gets into follow mode or 'ASDA time control' if the radar recognizes a vehicle in the front at or inside the leeway separation. This method of activity, the ASDA proposed model sends an objective speed to the Engine Model Module and deceleration orders to apply the brakes to keep up the set time between the vehicles.

- The ASDA proposed model does deaccelerate the vehicle by bringing down the objective velocity of motor Module and applying brakes for deceleration order to the Brake mode. The most extreme permitted slowing down exertion of the proposed model. During the time of brake deceleration occasions, the Brake Mode initiates the brake

- The ASDA proposed model quickens the car by speeding up applied to motor mode. The motor mode attempts to keep up the objective velocity and can quicken the vehicle at a pace of increasing speed.

- The ASDA pilot can change the time 'Time Gap +' switches. Clicking the 'Time Gap +' switch makes the time hole an incentive to increment and along these lines the freedom to increment. Clicking the time an incentive to diminish and along these lines the leeway between vehicles.

- Circumstances happen with the end goal that the ASDA proposed model can't keep up the time hole inside the proposed model, 0.2 [g]. Then again the base speed of the vehicle might be reached. Under these circumstances the ASDA proposed model enters 'ASDA backup' decline. furthermore, alarms the ASDA driver by showing a "ASDA driver Objection Required" instant message group and by perceptible toll. On the off chance that the brakes pushed by the ASDA proposed model, may be gradually discharged. Now the ASDA driver should look after the vehicle.

5.5 TRANSITIONING BETWEEN SPEED AND FOLLOW MODES

The ASDA proposed model naturally changes among speed and Time Gap. The method of activity is dictated by the small of the preset speed for Speed Mode and the objective velocity to keep up the hole between the ASDA vehicle and a forward moving vehicle. Essentially, if non vehicle is available inside the freedom separation, the proposed model will work in Speed mode, else, it will work in Time mode.

5.6 CANCELING ASDA CONTROL OPERATION

Journey Controls the activity that might be dropped by the administrator or naturally by the ASDA proposed model. Both of the accompanying circumstances will deactivate ASDA: Brake pedal is clicked Off button is clicked Speed of the vehicle < 25 mph.

CHAPTER-6

ASDA TO IMPROVE FUEL EFFICIENCY

6.1 INTRODUCTION

As all-inclusive expanding enthusiasm for ecological and vitality issues, investigate in many field is being accomplished a goals of vitality sparing and natural issues at the same time improving eco-friendliness of car. Going before contemplates have demonstrated that high discharge rates associated with the utilizing non-renewable energy sources and street traffic emphatically influence the air class in town regions [1], [2].

Specifically, managing issues, it is inquired about in its arena to improve efficiency of current gas and diesel fuel vehicles. There are significant shares to build up another solid for instruction skeleton and structure shape of the vehicles or lower air obstruction. [3], [4] Also enterprises attempt to discover different proposed models for effectiveness, for example, CVT (Continuously Variable Transmission) to have the option of motor speed on the ideal activity

Moreover, ecofriendly hydrogen and electric vehicles are created and turn out to be wide blowout as option regular one by outflows of CO_2 which causes ozone depleting substance. [6], [7]. Despite these endeavors, in any case, these examinations are difficult to apply in many vehicles as a result of significant expense to grow new material or cutoff of auxiliary issues. Itis successful strategy improving eco-friendliness of vehicle not to just grow new proposed model, yet additionally controlling vehicle speed, increasing speed and slowing down to against squander vitality out and about.

The examination, new speed of the vehicle control methodology recommends dependent on the versatile voyage control proposed model. This proposed model is consequently modifying the subject speed of the vehicle to keep up safe good ways from going before vehicle. A versatile journey control proposed model is an augmentation of a voyage control proposed model in traditional vehicles. [8] This proposed model, by and large, center around following execution and the separation among our

and front vehicle while vehicle ahead. The control calculation proposes to change the reactivity relying upon present condition of our and the other vehicle with adaptable separation to keep up of wellbeing.

6.2 CONTROL ALGORITHM:

The calculation depends on ideal calculation, straight quadratic available regulation(LQR), so the two blunders and information can be thought of. One of blunders is distinctive of wanted and real separation and is relative speed among the aimed vehicles. The involvement is a quickening of vehicle. This calculation decides the ideal eco-friendliness speeding up as control information and ensures wellbeing. A vehicle quickens quickly, causes more fuel utilization [9], [10]. It implies that the car ought to easily quicken to improve eco-friendliness. On the off chance that own vehicle observed to follows the car gradually, be that as it may, it can give a space to impact the objective vehicle has stop. To tackle the issue, this calculation is speeding up with two thought about impacts, separation and indication of focus on vehicle with increasing speed.

6.3 SIMULATION AND RESULT:

The recreation condition was preset with genuine vehicle structure and administrative driving cycle. The recreation is centered around eco-friendliness and following execution as wellbeing side both.

A common SUV is displayed for measured vehicle and FTP-75 Federal Test Procedure, normally is uses to confirm adequacy of the calculation. This cycle isn't just administrative, yet in addition visit increasing speed and with the deceleration are reasonable for the proposed model. Thought about controllers are basic Proportion-Integration controller, fundamental LQR technique with variable and LQR with factor. The controllers following execution and the other factor is chosen for eco-friendliness in light of the fact that the two control objectives are exchange.

- Eco-friendliness of straightforward PI controller is most reduced as 10km/L since it helps vehicle to help time separation. Indeed, The PI controller has just objective. In this way, eco-friendliness is lower and following execution isn't superior to other people. At long last, the Active LQR controller has higher eco-friendliness than different controllers.

Simultaneously, separation mistakes are a lot of lower than LQR for eco-friendliness and like the others.

This investigation proposes the control calculation for improving eco-friendliness on versatile voyage control proposed model. The calculation is broadened utilizing variable factor from going before study is direct guideline. In this way, it monitors our own vehicle to improve eco-friendliness and to good ways from going before vehicle simultaneously. This calculation is working the vehicle like human ASDA driver. Notwithstanding, we showed up at the outcome by a restricted reproduction of conclusion, likewise the cycle isn't for versatile journey proposed model. The future examination will create and check with increasingly elite driving cycle for the proposed model. Moreover, this present reality test is requested for the more exactness.

CHAPTER-7
SAFETY ISSUES IN VEHICLES WITH ASDA SYSTEM

Many field is being accomplished a goals of vitality sparing and natural issues at the same time improving eco-friendliness of car. Going before contemplates have demonstrated that high discharge rates associated with the utilizing non-renewable energy sources and street traffic.

Specifically, managing issues, it is inquired about in its arena to improve efficiency of current gas and diesel fuel vehicles. There are significant shares to build up another solid for instruction skeleton and structure shape of the vehicles or lower air obstruction. [5]

Moreover, ecofriendly hydrogen and electric vehicles are created and turn out to be wide blowout as option regular one by outflows of CO_2 which causes ozone depleting substance. [6], [7]. Despite these endeavors, in any case, these examinations are difficult to apply in many vehicles as a result of significant expense to grow new material or cutoff of auxiliary issues. Itis successful strategy improving eco-friendliness of vehicle not to just grow new proposed model, yet additionally controlling vehicle speed, increasing speed and slowing down to against squander vitality out and about.

ASDA proposed model is grouped into two kinds: RADAR ASDA and LIDAR ASDA. Radar proposed model comprises of a Radar sensor placed before the sample vehicle to identify the nearness of vehicle in front. This proposed model has three covering radar light emissions recurrence 77-78 [kHz]. This sort of proposed model can distinguish car up to a separation of 125m. \The principle bit of leeway of this proposed model can perform in unusual climate.

LIDAR kind of ASDA proposed model are laser-dependent proposed model. It has a light emission that is smaller than a water drop. The principle bit of leeway of this proposed model is more affordable and simple to introduce. Utilizing ASDA proposed model are barely any normal and helpful terms.

Response time for the driver: Time taken by ASDA driver in an undesirable circumstance to react. For the most part, react time is 3-4 seconds.

Safe separation from other vehicles: The base separation among the main vehicle and the front vehicle furnished by ASDA proposed model, in the separation of the ASDA needs to make essential move in crisis circumstance from pressing brake. In vehicle a button is given to set the separation. Estimation of the sheltered separation is accompanying condition: (Vss x t, where: Vss = speed of ASDA vehicle, t = reaction time).

The ASDA model function is spoken to roar referenced parameters: preset the estimation of speed of vehicle and keep up that;

- Pre-set the estimation of speed of the car and keep up.

- Reading of separation and speed of the car ahead.

- Observing and acting on the speed of ASDA prototype.

- Modify the speed of vehicle by handling choke valve and application of brakes.

- Apply legitimate capacity in bad climate state.

- Perform great at the middle of speed of 20 – 150 km/h.

7.1 ASDA SYSTEM OPERATIONAL VIEW:

As referenced over fundamental capacity of ASDA proposed model assumes control over the monitor velocity of a vehicle, keeping up a consistent speed preset by the driver. To keep the speed and to keep an appropriate separation between the two included objects, ASDA proposed model performs predominantly has 4 control tasks in succession:

Constant Velocity Control Task: If there is none of the vehicle in the region of ASDA prepared vehicle or an extremely enormous separation between two vehicles than this activate courage the proposed model to keep up a consistent speed.

Deceleration Control Task: At the point vehicle running before ASDA prepared vehicle reduce its speed or distinguished a more slow speed, then the proposed model monitors the choke to decelerate our vehicle in least time length. In the event that for some situation choke presentation not adequate the lull the main vehicle the proposed model consequently utilizes the brakes to stop the car.

Acceleration Control Task: In certain options like change of lane, It may overtake other vehicle, when our vehicle distinguished that there exists no vehicle ahead then the proposed model consequently quickens the vehicle to the previous set speed.

Following Control Task: At the point when ASDA prepared following a car going before it the proposed model controls the choke and applies break so it can keep up appropriate separation and prepare a similar speed of going before vehicle. Each proposed model is utilized for security of car ought to a decent interface among human and machine. ASDA proposed model is an expansion of regular journey control proposed model. In this proposed model there are a some buttons on the guiding wheel, ASDA driver needs to work the changes and make fundamental move. As prior referenced this proposed model is expansion of customary voyage proposed model, practically all buttons that are as of now at Old System. Be that as it may, ASDA proposed model has additional two buttons on controlling the time hole between the ASDA vehicle and other. To give a decent idea and ebb and flow territory of ASDA proposed model to the ASDA driver, there are a few notices that can be shown on group, which causes the ASDA driver to make appropriate move the notice circumstance.

The principle target of Modes of working of ASDA proposed model is to give solace and wellbeing to the ASDA driver by assuming control on vehicle. Wellbeing of the car is characterized into two : dynamic security as well as uninvolved security. ASDA proposed model is combination of both dynamic as well as inactive wellbeing. As indicated by an overview below:

ASDA proposed model can forestall 40% of mishaps relying upon the sort and situation of mishap. ASDA driver of vehicle additionally anticipate that an ASDA proposed model should meet the necessities regarding execution, unwavering quality (as far as low pace of bogus alerts) and wellbeing (as far as low pace of missed identifications). As of now ASDA proposed model works in barely.

Velocity Control Mode of ASDA: The proposed model works in this system when the separation among the vehicle is more noteworthy than the ideal separation. Next motivation is the mode with the objective speed of the vehicle gets more than preset velocity from the person monitoring it.

Space Control Mode of ASDA: The proposed model works in the mode when objective car that is more slow before the ASDA prepared vehicle. Than the proposed model keeps up a separation between them.

 Stop and Go Mode of ASDA: It gets initiated especially in rush hour gridlock circumstance when car needs to halt and go every now and again. At the point the objective car stops down to a calm situation in rush hour gridlock than ASDA prepared car additionally needs to stop.

Collision Avoidance Mode of ASDA: Crash preservance proposed model in a vehicle is intended to keep away to lessen the pace of mishaps. It utilizes a few sensors like ultrasonic or camera. At the point when undesirable circumstance happens it gives cautioning to the ASDA driver to make a move quickly to stay away from mishap.

Let us see how ASDA System is useful in wellbeing of driver? As referenced before ultrasonic sensor is utilized to recognize the car going in front of the ASDA prepared vehicle. At that point when the street is straight, the ASDA driver can without much of a stretch recognize the previous vehicles going on a similar way.

However, in certain circumstances, it is extremely difficult for ASDA driver to see and recognize the car pushing forward uncommonly the bends in street. Assume for a situation 3 vehicles to go on a

bend street in front of own vehicle. This situation is important to discover the car on a similar way as the person driving the car.

This causes ASDA proposed model to choose the vehicle that needs to follow. Soon the ASDA proposed model decides whether the recognized item by ultrasonic sensor is a moving item by looking at the velocity of the car and the vehicle. In this event the own car was moving, for the most part it is viewed as a static item.

Simultaneously, the way evaluated by deciding the concerning span of ASDA driver vehicle depends on the identified rate, directing edge, and speed of the vehicle. Aa it is constantly moving, when every sensor exams happens, the proposed model needs to decide that the presently identified vehicle is one as the past recognized vehicle. To pass judgment on this circumstance, proposed model needs to contrast the situation of identified car and the examined point.

7.2 CONTROL MODULES:

Engine Control: Fundamental capacity of this feature is to control the velocity of a monitored car by monitoring the motor's choke. At the point when a motor control gets data from the ASDA module, then it begins monitoring the velocity of vehicle.

Break Control: Fundamental capacity of this feature is to hit the brakes at whatever point it is required by ASDA module. The stopping mechanism is water driven proposed model with electronic part upgrade.

Instrument Cluster: It is utilized basically to procedure the elements of journey changes and move the data of those specific changes to the ASDA and motor control parts. Bunch likewise show instant messages to illuminate the driver, with respect to the procedure happening in ASDA proposed model.

Controller Area Network: In this feature a Sensor is put before the vehicle with the goal can stretch data of beyond vehicle. The data can be separation, velocity and parallel increasing speed. A controller part gets the sign and orders the actuators of choke and apply break to make a move. This proposed model utilizes CAN for correspondence among parts of car.

Sensors: It contains the Brake machine Sensor, Throttle Sensor, Ultrasonic Sensor, Four Wheel Sensor.

Actuators: The essential capacity of this feature is to decide the velocity of the car and use deceleration of the vehicle by controlling by offering sign to choke the actuator of car. The fundamental capacity of choke valve as per need of ASDA proposed model.

Communication: Common Area Network is a normal system in ASDA proposed model uses 2 wires to get and transmit the information. Every hub can convey 0 to 8 bytes of back rub which comprise the notice display. The primary job of notice to choose the need of notice. The notice with the most elevated needs to be conveyed first. This trailing notice may send its notice when it found the transport allowed to diffuse.

CHAPTER-8

CONCLUSION & FINAL REMARKS

7.1 BENEFITS OF AUTOMATIC SAFE DRIVE ASSISTANCE

1. ASDA drivers gets a break from continuously pressing the accelerator and vice versa and hitting the brakes in heavy traffics.
2. A very intelligent traffic system may be that which self-adjusts itself to avoid accidents.
3. The fuel efficiency will be increased.
4. Exact location of car can be send when accidents occurs.
5. The ASDA systems will help to cooperate with other vehicles.
6. It can avoid the violation of speed limits.
7. Reduction in the rates of accident.
8. Reduction in tiredness of driver.
9. Increase the efficiency of fuel.

7.2 DISADVANTAGES

- This feature is very expensive and not available in cheap cars.
- A market saturation is needed in order to make smart vehicle a part of our lives.
- It may make the ASDA become lazy which might lead to accidents.
- The ASDA model needs to communicate with other vehicles on the roads and co-operate to respond directly to traffic signals.

7.3 CONCLUSION

The expanding pace of mishaps brought about by ASDA driver botches is making a huge number of individuals pass on consistently. There is an extraordinary development in the security of car by executing numerous innovations such as ASDA, Airbags are a part of it. Obstacle observing sensors and some more. These innovations limit the pace of casualty yet not maintaining a strategic distance from mishaps. ASDA proposed model gives help to the ASDA user to drive peacefully.

We may notice that ASDA is a mode to help drive great and getting the car far from mishaps. At the time of foggy circumstance or in poor climate, ASDA driver can't pass judgment on the separation between the former vehicles. In any case, ASDA proposed model gives a simpler method to drive in foggy and poor climate ailment too.

The Automatic Safe Drive Assistance was created to drive sheltered and agreeable. It lessens the quantity of applying brakes and clicking activity that was expected of the driver. This proposed model decreases the weight on ASDA driver with the goal that ASDA driver be comfortable. ASDA proposed model gives eco-friendly driving. Programmed speeding up and deceleration of the vehicle make it drive more secure too dependable.

The expanding pace of mishaps brought about by ASDA driver botches is making a huge number of individuals kick the bucket each year. There is uncommon development in the security of car by executing numerous advances like ABS system, Airbags feature, Object detection shirking and some more. These advances limit the pace of casualty yet not keeping away from mishaps. ASDA proposed model gives help to the ASDA driver to drive in their vehicle. I state that ASDA is a will make driving enjoyable and safe.

For less visible circumstance and bad climate, ASDA driver can't pass judgment on the separation between the former vehicles. Be that as it may, ASDA proposed model gives a simpler method to drive in bad climate condition too. ASDA System can possibly lessen the quantity of mishaps.

The Automatic Safe Drive Assistance created was created to make drive protected and agreeable. It diminishes the quantity of brake to be applied and other activities that are expected by the driver. Therefore, this proposed model lessens pressure on ASDA driver so that their vehicle, the ASDA driver feel the comfort. ASDA proposed model gives eco-friendly driving. Programmed speeding up and auto deceleration makes the vehicles safe and dependable.

It will presumably take decades, however auto collisions may in the long run become as uncommon as plane mishaps are presently, despite the fact that the street laws should be changed, up to a degree. The execution of highlights, for example, Automatic Safe Drive Assistance (ASDA) will without a doubt help to lessen the quantity of mishaps and will assist the ASDA driver with taking less worry during traffic hours.

REFERENCES

[1] Rizaldi A., Immler F., Althoff M., *"A formally verified checker of the safe distance traffic rules for autonomous vehicles,"* NASA Formal Methods: 8th International Symposium, pp. 175-190, 2016.

[2] C. Marino., A. Nucara., M. Pietrafesa., A. Pudano., *"The Assessment of Road Traffic Air Pollution by Means of an Average Emission Parameter,"* Environmental Modeling & Assessment, vol. 21, no. 1, pp. 53-69, 2016.

[3] Dang R., *"Coordinated cruise control system with lane-change assistance,"* IEEE Transaction on Intelligent Transportation System, vol.16, no 5, pp. 2373-2383, 2015.

[4] Nilsson P., Hussien O., Chen Y., Balkan A., Rungger M., Ames A., Grizzle J., Ozay N., Peng H., Tabuada., *"Preliminary results on correct-by-construction control software synthesis for adaptive cruise control,"* IEEE Conference on Decision and Control, pp. 816-823, 2014.

[5] Bernhard K., *"Slipstream Cooperative Adaptive Cruise Control, a conceptual ITS application for electric vehicle,"* Proceedings of the IEEE Vehicle Conference, Greenville, USA, pp. 1-5, 2012.

[6] Asadi B., Vadihi A., *"Predictive cruise control: Utilizing upcoming traffic signal information for improving fuel economy and reducing trip time,"* IEEE Transactions on Control Systems Technology, pp. 707-714, 2011.

[7] Marzbanrad J., Karimian N., *"Space control law design in adaptive cruise control vehicles using model predictive control,"* Journal of Automobile Engineering, pp. 870-884, 2011.

[8] Axel Fritz., Werner Schiehlen., *"Automatic Cruise Control of a Mechatronically Steered Vehicle Convoy,"* International Journal of Vehicle Mechanics and Mobility, vol. 32, pp. 331-344, August. 2010.

APPENDIX A

Required Code:

The required code is mentioned below that is used in our project entitled Automatic Safe Drive Assistance.

Code to interfacing Ultrasonic sensor with Arduino for measuring distance between two vehicles

```
const int trigPin = 7; //Trigger pin of Ultrasonic Sensor 1

const int echoPin = 8; //Echo Pin of Ultrasonic Sensor 1

const int trigPin1 = 9; // Echo Pin of Ultrasonic Sensor 1

const int echoPin1= 10; // Echo Pin of Ultrasonic Sensor 1

long duration;

int distance1, distance2;

void setup() {

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

pinMode(trigPin1, OUTPUT);

pinMode(echoPin1, INPUT);

Serial begin(9600);

}

Void loop ()

{

digitalWrite(trigPin, LOW);

delay(300);  // Wait for 0.3 Sec

digitalWrite (trigPin, HIGH);
```

```
delay(1000); // Wait for 1 Sec

digitalWrite (trigPin, LOW);

duration = pulseIn (echoPin,  HIGH);

// Calculating the distance

distance1= duration*0.034/2;

Serial.print ("Distance1: ");

Serial.println (distance1);

digitalWrite (trigPin1, LOW);

delay(300); //// Wait for 0.3 Sec

digitalWrite (trigPin1, HIGH);

delay(1000); //// Wait for 0.1 Sec

digitalWrite (trigPin1, LOW);

duration = pulseIn (echoPin1, HIGH);

// Calculating the distance

distance2= duration*0.034/2;

Serial.print("Distance2: ");

Serial.println(distance2);

}
```

APPENDIX B

Code to interfacing Ultrasonic sensor with Arduino for measuring distance and displaying distance between two   vehicles on LCD Screen.

```
#include <LiquidCrystal.h>;

//const int rs = 12, en = 11, d4 = 5, d5 = 4,  d6 = 3, d7 = 2;

//LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

LiquidCrystal lcd(12,11,5,4,3,2);

Const int trigPin=7;

Const int echoPin=8;

Const int trigPin1 = 9;

Const int echoPin1= 10;

Long duration;

Int distance1, distance2;

Void setup() {

 lcd.begin (16,2);

 pinMode (trigPin,  OUTPUT);

 pinMode (echoPin,  INPUT);

 pinMode(trigPin1,  OUTPUT);

 pinMode(echoPin1, INPUT);

 Serial.begin (9600);

}

void loop()

{
```

```
digitalWrite (trigPin,  LOW);

delay(300);

digitalWrite  (trigPin, HIGH);

delay(1000); // Wait for 1 Sec

digitalWrite (trigPin, LOW);

duration = pulseIn (echoPin, HIGH);

distance1 = duration*0.034/2 ;

Serial.print ("Distance1: ");

Serial.print (distance1);

Serial.println (" cm");

delay (120); // Wait for 0.120 Sec

digitalWrite(trigPin1,  LOW);

delay(300);n  // Wait for 0.3 Sec

digitalWrite(trigPin1, HIGH);

delay(1000);  //Wait for 0.1 Sec

digitalWrite(trigPin1, LOW);

duration = pulseIn(echoPin1, HIGH);

distance2= duration*0.034/2; // Calculating the distance

Serial.print("Distance2: ");

Serial.println(distance2);

lcd.setCursor(0,0); // Sets the location at which subsequent text written to the LCD will be
displayed

lcd.print("Distance1: "); // Prints string "Distance" on the LCD Screen

lcd.print(distance1); // Prints the distance value from the sensor

lcd.print("  cm");
```

```
lcd.setCursor(0,1); // Sets the location at which subsequent text written to the LCD will be displayed

  lcd.print("Distance2: "); // Prints string "Distance" on the LCD Screen

  lcd.print(distance2); // Prints the distance value from the sensor

  lcd.print("cm");

}
```