# AUTOMATIC HAND BRAKING SYSTEM

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Abstract—The increasing cases of accidents on road due to incompetency of drivers have led to inclusion of collision avoidance systems, automatic hand braking being one of them. This system assists the driver to calculate the distance between itself and the obstacle and apply brake when needed. An ultrasonic emitter is kept on the front part of the car which produces and emits ultrasonic waves. Ultrasonic receiver which is also fixed on the front portion of the car receives an ultrasonic signal from obstacles positioned within the predetermined distance in front of the car. The reflected wave gives the information about the distance between the vehicle and the obstacle. Then 8051 is used to control servo motor based on information obtained from reflected wave and gradually slows down the speed which would ultimately result in termination of speed using the handbrake, if the driver himself doesnt take necessary action required at that time.

Our System is a collision avoidance system but in worst case if collision takes place then we have installed a GSM based system which will notify the relatives on the front end about the incident.

Index Terms—hand braking, ultrasonic sensor, obstacle detec-tion, collision avoidance

## I. Introduction

Roads have become quite unsafe nowadays owing to the humongous traffic .Due to this enlarged problem of innumer-able vehicles on road there is a need of technology to assist mankind to manage the perfect functioning of traffic and road. Many new technological ideas from the contemporaries of science technology and research are coming up to provide apt solution for the problem. Automatic handbrake system is one such idea which can help to solve this major problem. The main objective of this system is to reduce the speed of the car whenever certain obstacle comes in front of it. By doing this we can avoid accidents which happen due to the delay caused by the reaction time of the driver. In extreme cases it can help reduce the damage caused due to collision. 8051 micro controller is used to govern the speed of the vehicle. It controls the ultrasonic senor which sends the signal to receive the reflected wave in order to calculate the distance between him and the obstacle. After receiving the signal carrying information about the distance the micro controller decides the necessary action to be taken, if the distance measured is out of the specified range decided by the manufacturer then no action would be taken but if it is in the range then the 8051 micro controller would give commands to the brake and the rack and pinion arrangement of the system would effectively work towards decreasing the speed of the vehicle gradually. When the distance drops below the critical value and the driver doesnt take action in the crucial time then the micro controller gives command to stop the vehicle by pulling the handbrake completely thus dropping the speed to zero. Thus accident can be avoided and safety can be ensured. In worst situation of some technological failure where the accident could not be avoided then the system is also equipped with a GSM module which will help to send a message informing about the accident to the numbers feed-ed in it by the driver. High manufacturing cost is not preferred by manufacturers of home-use and commercial automobiles. This type of system is affordable according to a common mans pocket.

## II. Concept

The main objective is to find a way to implement a minimum spacing for cars in traffic in an affordable way, alongside to achieve safety for passengers of a moving car. The anti-collision device, when wired into the circuitry of a vehicle would help in the reduction of road mishaps. Though not every kind of collision can be helped by this, and it must be stated here that no allusion is being made that technology is the best line of action to take. It should be further noted that some already existing laws made use of technologies like the street lights and traffic lights. This would be a supplementation and not a replacement.

A. Conventional Handbrake

In cars, the parking brake, also called hand brake, emergency brake, or e-brake, is a latching brake usually used to keep the vehicle stationary.

It is sometimes also used to prevent a vehicle from rolling when the operator needs both feet to operate the clutch and throttle pedals.

Automobile hand brakes usually consist of a cable directly connected to the brake mechanism on one end and to a lever or foot pedal at the driver's position.

The mechanism is often a hand-operated lever (hence the hand brake name), on the floor on either side of the driver, or a pull handle located below and near the steering wheel column, or a (foot-operated) pedal located far apart from the other pedals.Although sometimes known as an emergency brake, using it in any emergency where the foot brake is still operational is likely to badly upset the brake balance of the car and vastly increase the likelihood of loss of control of the vehicle, for example by initiating a rear-wheel skid.

Additionally, the stopping force provided by using the handbrake is small and would not significantly aid in stopping the vehicle.parking brake operates generally only on the rear wheels, which have reduced traction while braking but in some cases, parking brake operates on the front wheels, as done in most.

The hand brake is instead intended for use in case of mechanical failure where the regular foot brake is inoperable or compromised.

Modern brake systems are typically very reliable and equipped with dual-circuit hydraulics and low-brake-fluid sensor systems, meaning the handbrake are rarely used to stop a moving vehicle.On vehicles with drum brakes on the rear axle, the parking brake cable pulls on a lever mounted within the rear brake drum.

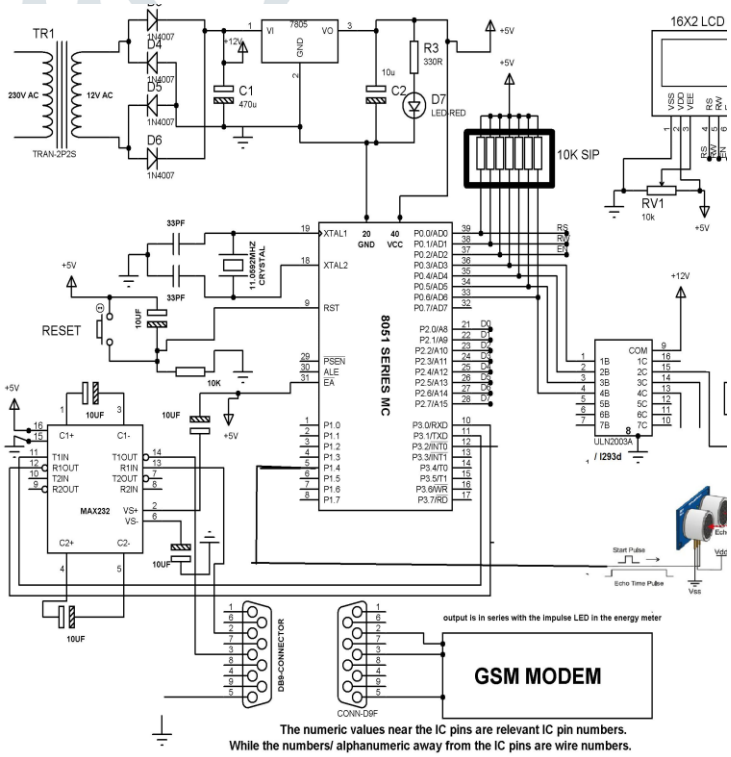
The cable is connected directly to the brake shoes, and upon application, it physically pulls the shoes into the spinning drum to create stopping friction.

B. Design Analysis

The normal hand braking system consists of a rack and pinion arrangement which is placed near the left side of the seat of the car. At any point of time if any obstacle which could be a car or a human being comes in front of a car which is running at a very high speed then the driver gets panicked and loses control on the car. In such situations even our normal brakes fail. Hence there is a need for a more efficient and safe braking system. Our objective is to reduce the speed of the car whenever an obstacle comes in front of the car immediately and there by engaging the handbrake. The first task in hand was to decide which sensor we will use for determining the distance between the obstacle and the car. The analysis of the sensor data against various types of obstacles is shown in this table.The standard deviation parameter is used to check the consistency of the sensor measurement for a specific type of obstacle.

| Material | Ultrasonic Sensor | Infrared Sensor |
|---|---|---|
| cardboard | 9.3 | 10.6 |
| Paper sheet | 37 | 20.2 |
| Wood | 10 | 36.5 |
| Plastic | 4.3 | 25.1 |
| Rubber | 4.6 | 58.3 |

III. CIRCUIT DIAGRAM



## IV. Literature Survey

Active Pedestrian Safety by Automatic Braking and Evasive Steering.

Keller et al. in [1] wrote a novel active pedestrian safety system which includes sensing, situation analysis, decision making, and vehicle control.The sensing component is based on stereo vision, and it combines the following two complementary approaches for robustness:motion-based object detection and pedestrian recognition.

Christoph G et al. in [2] this paper proposed that the system should have the ability to decide,in a very less time,what task it should perform. It should monitor and take decision as to apply automatic brake or evasive steering at relatively high speed. (up to 50 km/h).

Automatic Handbrake System

Thivagar [1] This project uses an ultrasonic sensor for detection, which senses an obstacle and in turn engages the handbrake in case the obstacle is extremely close, to avoid collision.

C.Nantha Kumar[2]As this project only does engagement and disengagement of the handbrake any sudden jerk can actually harm the driver.
some of the advantages are-Low cost, Improves parking experience in hills, Very compact, Emergency start and stop is possible, Predefined data sets.

Collision warning with full auto brake and pedestrian detection-a practical example of automatic emergency braking

Coelingh et al.in [1] this paper was written to detect dangerous traffic situations and help road users in avoiding accidents.Applications have been developed because of the technological advances in area of sensors such as radars , lidar further reducing costs

Erik et al.this paper described and compared the theoretical and practical performance of the automatic emergency braking provided by CWAB-PD in commonly used test scenarios.

Collision Avoidance and Braking System

Yamasaki et al. [1] In this paper an action range presumption unit presumes an action range in which the obstacle can exist in a predetermined time if the obstacle accelerates, decelerates, or turns on the basis of the moving performance of the obstacle detected by the obstacle detection means. An action probability presumption unit presumes a probability of the obstacle existing in the action range on the basis of the conditions of the road on which a host vehicle and the obstacle exist and the action history of the obstacle.

Nasu et al. [2] In this a driving operation support unit determines a target locus which prevents the host automobile from moving into the presumed action range or to a position where the action probability is high and generates vehicle control information necessary for making the host vehicle run along the target locus. The driving operation support unit gives the driver instructions and warnings and assists the driver with driving operation support operations. Thus, the possibility of collision of the host vehicle with the obstacle can be reduced even if the obstacle makes an action beyond the scope of the driver's assumption.

Adaptive emergency braking control with underestimation of friction coefficient

Jingong et al. in [1] this paper proposed a scheme for on-line estimation of the tireroad friction coefficient of a vehicle is presented, which is guaranteed to underestimate its true value at all times, but converges to the true value under persistence of excitation conditions. Based on these two estimation schemes, an emergency braking controller is designed.

Alvarus et al. in [2] this paper proposed a control scheme for emergency braking maneuvers in automated highway systems and a new online identification scheme to determine the tire-road friction characteristics of the vehicle are presented. The proposed controller determines the required pressure in the master cylinder of the braking system to achieve maximum deceleration during braking, based on the estimation of the tire-road friction characteristics and the overall braking system gain, for the given set of parameter estimates. Vehicle collision avoidance system.

Collision avoidance system

Kiefer et al. In this system provides to each properly equipped vehicle an indication of the locational direction, heading, and relative velocity of other similarly equipped vehicles or stationary objects. Each vehicle in the system is equipped with a transponder module which transmits information data relating to that vehicle, and receives information data relating to the other similarly equipped vehicles.

Raymond J et al. In this a central reference time signal transmitter is provided for transmitting a reference timing signal which effectively synchronizes each of the transponder modules. Upon receiving the reference timing signal, the transponder module subsequently transmits information data relating to that particular vehicle. Each of the transponder modules is allocated a unique time period for transmission of its information data. Thus, the system can accommodate a great number of transponder modules within the system, each transmitting their respective information data during unique time slots during a relatively small time frame.

Vehicle collision avoidance system.

Shaw et al. [1] In this paper an automobile collision avoidance system based on laser and radars is disclosed for aiding in avoidance of automobile collisions. The very small beam width, very small angular resolution and the highly directional character of laser radars A provide a plurality of advantages as compared with micro Related U.S. Application Data wave radars. With two sets of laser radars this system can detect the location,s the direction of movement, the size of all obstacles specifically and precisely.

Comparison

Active Pedestrian Safety by Automatic Braking and Evasive Steering (2010) This system uses a combination of long-range radar and a forward-sensing Wide-angle camera to continuously monitor the area in front of the vehicle. It has a very good performance in common test scenario .It promises reduction of speed before impact to reduce fatal injuries by 30 percent but it uses camera for distance inputs, which has slower response time, and hence it cant be a full proof accident avoidance mechanism. Automatic hand brake system This project uses an ultrasonic sensor which senses an obstacle and in turn engages the handbrake in case the obstacle is extremely close to avoiding collision. Low cost system, improves parking experience in hills, very compact, emergency stop and start is possible, predefined data sets but sudden jerk is harmful.

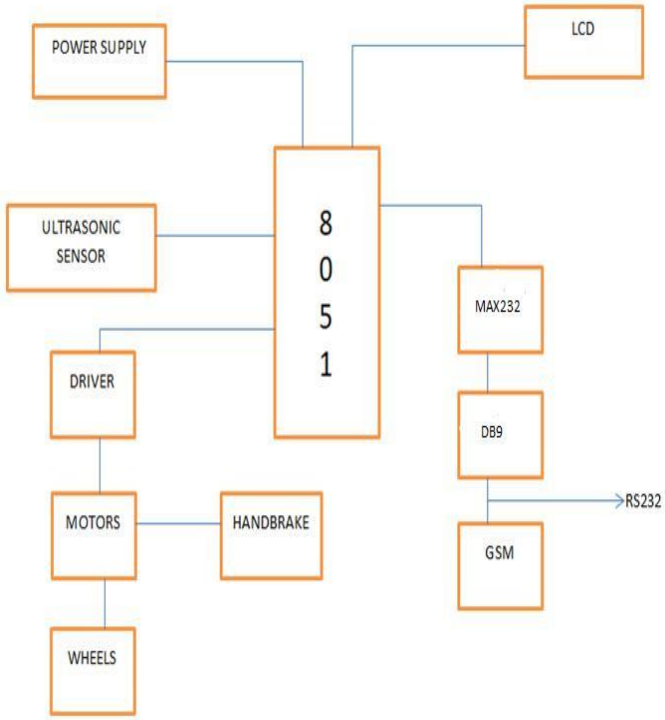
Collision Avoidance and Braking System

Here an action range presumption unit presumes an action range in which the obstacle can exist in a predetermined time if the obstacle accelerates, decelerates, or turns on the basis of the moving performance of the obstacle detected by the obstacle detection means a driving operation support unit determines a target locus which prevents the host automo-bile from moving into the presumed action range Adaptive emergency braking control with underestimation of friction coefficient It presents a scheme for on-line estimation of the tireroad friction coefficient of a vehicle . The proposed con-troller determines the required pressure in the master cylinder of the braking system to achieve maximum deceleration during braking. Collision avoidance system This system provides to each properly equipped vehicle an indication of the locational direction, heading, and relative velocity of other similarly equipped vehicles or stationary objects. An automobile col-lision avoidance system based on laser and radars is also used for aiding in avoidance of automobile collisions.

Gaps

Active Pedestrian Safety by Automatic Braking and Evasive Steering (2010) No predefined data sets This project depends on the response time of the camera hence response time is slower The vision of the camera gets affected during night time and is not able to properly detect the obstacles. Active Pedestrian Safety by Automatic Braking and Evasive Steering (2011) This system largely works on avoiding collisions at low speed (upto 50km/hr). At high speed the system fails to sense the object as well as cant be used in real traffic. Automatic hand brake system This project only does engagement and disengagement of the handbrake, the sudden jerk can actually harm the driver. It does not follow any regulated method to keep the track of the distance.

V. BLOCK DIAGRAM




8051 Micro controller: In our venture 8051 miniaturized scale controller is utilized on the grounds that on this small scale controller we can run 84 applications simultaneously.Its speed is relatively higher than other smaller scale controllers like pic, arm and so on. Likewise it is shabby in contrast with the highlights it gives. 8051 has most extreme accessibility of documents.

Ultrasonic sensor : The ultrasonic handset is utilized to detect the separation between the hindrance and the vehicle. Trans beneficiary SR05 is used.

MAX232 : It is a dimension shifter IC which is utilized for interfacing between 8051 small scale controller and GSM module. Association between them is finished utilizing DB9 connector.

GSM : GSM (Global System for Mobile interchanges) is a standard created by the European Telecommunications Standards Institute (ETSI) to depict the conventions for second-age computerized cell systems utilized by cell phones, for example, tablets. GSM is a cell arrange, which implies that mobile phones interface with it via scanning for cells in

the quick vicinity.In our undertaking we have utilized GSM to give an extra element of telling the relative about the mishap.

Engines : Motor is characterized as an electric or specialist gadget that can make a movement. While interfacing with the controller a portion of the engines like DC engine, stepper engine and brush less dc engine may require a driver IC or driver circuit.

Driver : It is essentially an ebb and flow speaker which acknowledges the low ebb and flow motion from the controller and changes over it into a high momentum flag which drives the motor.

Hand brake : In street vehicles, the leaving brake, additionally called hand brake, crisis brake, or e-brake, is utilized to keep the vehicle stationary and as a rule likewise play out a crisis stop.

Rack and Pinion : A rack and pinion is a kind of straight actuator that contains a couple of riggings which convert rotational movement into direct motion.A roundabout apparatus called ”the pinion” connects with teeth on a direct ”gear” bar called ”the rack”; rotational movement connected to the pinion makes the rack move, in this way deciphering the rotational movement of the pinion into the direct movement of the rack. In this manner the direct movement is utilized to impel the hand brake with the assistance of little link.

## VI. Working principle

The first task of our device is to determine the distance between the obstacle and the car. The ultrasonic system is based on the principle of bionics. The ultrasonic waves travel at a speed of 340m/s in the medium (air). By using the formula speed=distance/time, we have to calculate the distance. If the distance comes under danger zone then speed of the vehicle will gradually reduce and finally engaging the handbrake at once .A traditional handbrake consists of a rack and pinion arrangement. A circular gear called ”the pinion” engages teeth on a linear ”gear” bar called ”the rack” rotational motion applied to the pinion causes the rack to move, thereby translating the rotational motion of the pinion into the linear motion of the rack. Thus the linear motion is used to actuate the hand brake with the help of small link

.In case of emergencies this handbrake is used to stop the car. The sudden changes in speed could actually harm the driver. So our system along with the help of servo motor and 8051 micro controller first decreases the speed of the car and then eventually stops the car .The servo motor works on the principle of position feedback to control its motion and final position. However in case even after decreasing the speed and stopping the car the accident still occurs then in that case a GSM based system is also installed in our project. The GSM modem like wave com allows you to support SMS text mode using AT commands without the need of encoding the binary PDU field of the SMS first.

## VII. Implementation

Vehicle innovation has been expanding quickly as of late, especially in connection to slowing mechanisms and detecting frameworks. To avoid mishaps and target alleviation ASS which means ”dynamic security frameworks” are being explored and created .Among numerous helpful dynamic well being frameworks, it has been accounted for that AEBS (Advanced Emergency Braking Systems) viably averts mishaps and diminishes setbacks at the same time. The task expects to recognize frameworks as of now underway like footing control (TC), electronic brake constrain dispersion (EBD), brake help (BA) and electronic dependability control (ESC) capacities and future frameworks that are right now being developed. The task plans to build up a model framework that will offer an impact usefulness underway vehicle, a framework which can work consequently with the assistance of prominent sensors and some change in conventional slowing mechanism that can caution the driver in front crash and apply the brake naturally in crisis or basic circumstances.

## VIII. Advantages

Substantial hardware is vital for some ventures, yet it can likewise be dangerous for clients, people on foot, and property. Be that as it may, crash evasion frameworks can make activity of these frameworks more secure and progressively productive by boosting perceivability and well being while at the same time diminishing risk. Here is a more intensive take a gander at a portion of the benefits of impact shirking frameworks.

Improved Visibility There is a reason that the DMV knows regardless of whether you wear glasses: You need satisfactory vision so as to securely work an engine vehicle. In any case, even those with immaculate visual perception can keep running into inconvenience when they are placed in circumstances in which their perceivability is undermined. Crash evasion frameworks look to improve perceivability so driver can be certain, agreeable, and in charge while out and about.

Safety The most essential favorable position that an impact shirking framework will convey to the table is an

upgraded feeling of well being. This isn't only vital for your driver; it's significant for people on foot, bicyclists, and different drivers out and about also. Impact shirking frameworks will utilize radar and video innovations to limit the probability of mishaps, along these lines making a more secure street for any individual who navigates it.

Reduced Expenses A mishap can be a startling knowledge for all who are included, and it can result in harm to the two vehicles and individuals. Furthermore, it can considerably diminish the effectiveness of your activity. When you utilize a crash shirking framework, you can depend on your innovation to keep mishaps from happening. This protects everyone, averts harm to organization vehicles, and guarantees that the driver remains on track.

## IX. Applications

This framework is intended to give an additional eye to the driver. It will help in help of the vehicle by connecting with the handbrake when the driver has misconceived and miscounted his moves. It will take into notice the separation from the obstruction and begin backing off the vehicle as per the separation from the snag. This framework likewise has a GSM framework which will help find and achieve the relatives and restorative help required around then.

The current form of model does not bolster GSM based framework but rather this model worked with GSM will help in finding the area and giving help.

Coming up next are the benefits of programmed handbrake framework :

This is in all respects financially possible gadget.
It improves stopping knowledge in inclines.
It is an extremely reduced framework.
Crisis stop and begin is conceivable.
It helps in decreasing human connection.

## X. Future Scope

With future examination and research we will mount ultrasonic tests all around the vehicle, reveal to us the speed between the moving vehicle and autos around it. A similar venture can be extemporized with Radar innovation as a boondocks. We trust that the separation control framework can be planned into an update able framework. For example, we may enter the tire type, climate and street condition to change the preset scope of safe driving separation, making the framework more secure and more brilliant. This will likewise give such framework greater market space and increasingly aggressive edges in the market. Understanding this absolutely requires huge amounts of work and learning, similar to the programming activity of small scale controllers and vehicle structure.

## XI. Conclusion

The circuit is unmistakably organized and can be associated effectively, accordingly encouraging troubleshooting and distinguishing proof. Its quality likewise incorporates moderate affect ability , ease and availability of material. The ultrasonic sensor can detect remove up to 10m, all things considered, applications.But when the vehicle is at a fast then the vehicle should utilize radars for estimating the separation.

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