

# Brake Failure Detection and Emergency Braking System

Dhanamjayulu C, Chalamalasetti Guna Sai, Bharath Srinivas G, Hussain Basha D, Arunkumar G, Venugopal P



**Abstract:** Now a days accidents might occur because of varied reasons, the foremost reason is equipment failure and is happened due to improper maintenance of the products. To prevent these abnormal situations and to protect one's life from these accidents, there's a necessity for watching of braking system in cars. vehicle safety is a special term means safeguarding the automobiles or reducing the hazardous effects caused by them, specially associated with human life and health. Special safety options are engineered into vehicles occupants solely, and a few for the security of others. the method used in this work is timer operation to check the condition of brake wire periodically. This paper deals with making a circuit model, which checks the condition of brake wire in any automobile. alerts the driver by sending a audio or visual signal. Then activates the braking system which acts as a emergency breaking as to avoid accidents.

**Keywords :** Emergency Braking System(EBS), alarm system, Buzzer, Advanced Driver Assistance(ADA), NE 555 Timer.

## I. INTRODUCTION

Now a day's increasing road accidents is that the worry area of each human- being, road and safety department of central government and state government are attempting terribly laborious to manage the road accidents by completely different ways. consistent with the recent report of central government, geographic area state is at the ordinal Position in road accident throughout the India [1].

A Emergency Braking system(EBS) consisting of mechanical device actuators and communication networks, rather than typical hydraulic or electrohydraulic devices, has emerged as a replacement and promising transport braking management theme. It offers increased safety and luxury, cuts off price related to producing and maintenance, and eliminates environmental considerations caused by hydraulic systems [2].

**Revised Manuscript Received on December 30, 2019.**

\* Correspondence Author

**Dhanamjayulu C\***, Department in School of Electrical Engineering, Vellore Institute of Technology, Vellore, India. E-mail: [ghanush403@gmail.com](mailto:ghanush403@gmail.com); [dhanamjayulu.c@vit.ac.in](mailto:dhanamjayulu.c@vit.ac.in)

**Chalamalasetti Guna Sai**, Department in School of Electrical Engineering, Vellore Institute of Technology, Vellore, India.

**Bharath Srinivas G**, Department in School of Electrical Engineering, Vellore Institute of Technology, Vellore, India.

**Hussain Basha D**, Department in School of Electrical Engineering, Vellore Institute of Technology, Vellore, India.

**Arunkumar G**, Department in School of Electrical Engineering, Vellore Institute of Technology, Tamil Nadu, India.

**Venugopal P**, Department in School of Electrical Engineering, Vellore Institute of Technology, Vellore, India.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

The situation is today's world has become more advanced. many automobiles are getting automated. Due to this the need of innovation for the stopping systems also increased. braking by wire system is introduced here [3].

The system to operate it need a lot of spare parts. the sensory systems, movers, mini android systems.

They have brought a tremendous change in the system. the latest electrical vehicles have become a trend in the automobile

industry[4]. Project is totally equipped and designed for safety of the car vehicles. Automatic equipment failure indicator and braking system is that the handiest answer to the current drawback. it's the foremost effective and therefore the simplest methodology used to reduce the speed of accident thanks to equipment failure [5]. Another analysis work focuses in distinguishing the modes of failure in varied automobile elements and tends to spot appropriate strategies to avert such replacements. The strategies can't be devised to avert fully the replacement there are strategies that once enforced may prolong the amount of use of the element within the system [6]. This article discussed various modes of failure in different components of the car. There will be mistakes, and they are inevitable. But proper maintenance can improve the performance [7]. This paper deals with the introducing a reproducing a brake system in the secondary braking system, in the place of the scientific process, which allows for the effective use of brakes [8]. The proposed arrangement used for intelligent braking system has many potential applications, especially in developed countries where extensive attention is given to research on smart vehicles and smart highways. In the four wheeler vehicle, we can use this method and can reduce the number of road accidents [9]. An indication of deterioration is an early warning system. The brake condition is constantly monitored and audio visual warnings are issued. This system reduces injuries and avoids life loss. Auxiliary braking gives the driver the ability to prevent life and property damage [10].

The proposed model was tested with real subjects in this study. the people of varying kind are tested. few cases like with or without wearing glasses, driving at different time of the day and night. different drivers like paid and household, the condition of the roads was also taken into consideration. in that way the controller has been tested [11]. This paper addressed a critical study of on-road vehicle detection systems focused on vision— one of a driver assistance system's most important components. Based on the research activities 5 underway worldwide, it is certain that in the future this field will continue to be one of the hottest research areas [12].



## Brake Failure Detection and Emergency Braking System

It was provided in this article a detailed survey of various types of ADAS models and an overview of the sensors used in these variants. They defined a category of ADASs based on the various types of sensors used and addressed with vision-based ADASs outdoor and indoor monitoring. The value and import of sensor fusion techniques and advanced communication systems like V2X [13]. Vehicle light weight can provide more power and this can reduce overall weight by using active disk brakes and by using alternative materials to reduce the weight of brake components. In the disk brake system, heat dissipation is fastest. The development should be such that the point of view of venue, cost point of view and storage are the most common problem [14].the braking mechanism using rope has been introduced here.the major issues in implementing the model in underground mines.the features of this model are expected to be improvised by increasing the brake lining direction.

This can also help with the issue related to friction and temperature generated in the whole area of the application of the brake. The model of the rope brake may also refer to draglines [15]. If we are really convinced to do more and more, maybe in our future better way. An indication of failure is an early warning system. This tracks the brake condition continuously and gives audio visual warning [16].

The braking technique which can be regenerated is expected to achieve two objectives.one is improving the dynamic efficiency of the force distributed across the brake and it is expected to minimize the energy recovering in the motor of axle and two of the axles used [17].

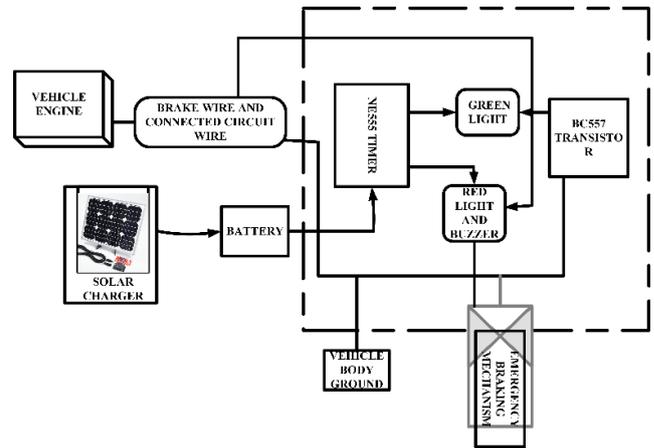
This paper deals with the main issue that leading to accidents and come up with solutions section I deals with the introduction of the project in details about how braking system in vehicles work Section II talks about the proposed block diagram made from visio software and explanation of how the mechanism works.section III talks about the simulation of prototype model which was designed for detection of brake failure.section IV talks about experimental results and tabulation obtained from our project.

section V gives the instructions required to be followed to implement this model.section VI gives the conclusions are drawn from the prototype model,experimentation and how it can affectively solve the real life problems.section VII talks about refernces from which source the knowledge has been acquired to complete this project.

### II. PROPOSED EBS MODEL BLOCK DIAGRAM

The main purpose of the model is to efficiently recognize the fault in the system and activate alarm system followed by emergency braking system.

The brake wire system is connected to the wire of the detection circuit which is powered by a DC voltage source.it can be powered by solar charger.whenever there is a fault or break in the brake wire of the system this creates the condition of circuit to work.



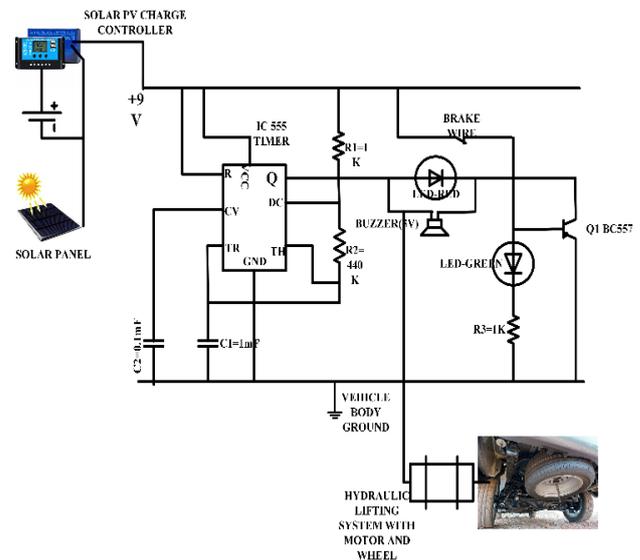
**Fig. 1. Proposed Emergency Braking architecture.**

The main components of EBS are the NE555 timer and the BC557 transistor followed by braking mechanism to wheel.

The pnp junction transistor which is bs,557 model is used to control the light emitting diodes and the 5V buzzer.whenever the wire which is managed to connect in concurrence with the automobile braking wire.the transistor will get a supply voltage of maximum voltage.this helps the circuit to work such that the green diode itself glows,leaving the red led and the buzzer in turn off condition.

When there is a circuit damage like abnormality in the brake wire condition the transistor will be in off condition,then the green led will be turned off.which in turn activates the red led and the buzzer will be connected to the ground.the timer used will be in astable condition.this gives the blinking of led or the beep sound.

### III. EMERGENCY BRAKING SYSTEM WORKING



**Fig2.shows the circuit diagram of the proposed model.**

The detailed diagram of circuit and EBS are depicted above. can observe that the failure in brake system alerts the timer which periodically checks for voltage provided across the terminals and gives the audio and visual output to the driver as red light and buzzer sound.

this activates the emergency braking system.the motor rotates the wheel at an angle of 90° .then the hydraulic system lowers the emergency wheels to reach the ground to make in synchronization with the vehicle velocity.now at this movement driver can activate the emergency brakes attached to these wheels in addition to pressing the clutch so that engine won't be powering the vehicle.the whole process will take less time if it use efficient spares and standard mechanisms.this will slow down the vehicle and stops at certain point.to avoid the major accidents which are caused by brake failures can be reduced using this mechanism.

**IV. EXPERIMENTAL RESULTS**

The proposed circuit can be easily engineered on any board like in this case bread board is used,pcb board makes the circuit even more simpler to make it rigid.whenever the copper wire which is termed as brake wire is cut.the timer operates in astable mode.it makes the transistor off so it turns off the green led.the red led and the buzzer will be in ON condition.this was shown in the figures 3 and 4.

**A. 555 Timers in Astable Mode**

This mode helps in timer to be precisely used for the control of turning on and off of the led's.this mechanism happens in a periodic fashion for certain time it will be considered as on time,and off time.the internal structure of timer has resistors and a capacitor to calculate the specific on and off times.the formulas for calculation for the astable mode working of the timer is given below.

**B.Calculations**

Time1  
=0.693\*(R1+R2)\*C1=0.693(1K+440K)\*(1mF)=0.305ms

Time2 = 0.693\*R2\*C1=0.693\*440K\*1mF=0.304ms

T = (T1+T2)=0.609ms

Frequency (F) = 1/T=1.6379

D duty cycle = Time1/(Time1+Time2)=0.5005675

**Table1.shows the operation of Timer(555) in astable mode**

R1 Ω	R2 Ω	C1 (F)	T1	T2	T	F
1000	44000	0.000001	0.305613	0.30492	0.610533	1.6379

R1,R2 - Resistors,C1,C2 – Capacitors,T1&T2 are ON and OFF times for timer,T - Time Period,F - Frequency.

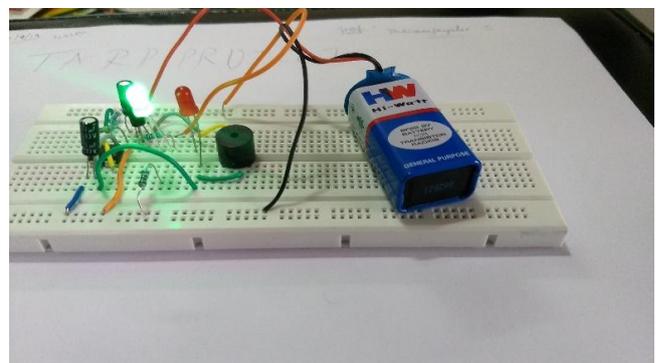
**C. Hardware Required**

**Table 2.shows the hardware required for the project**

S.NO	Components	Quantity

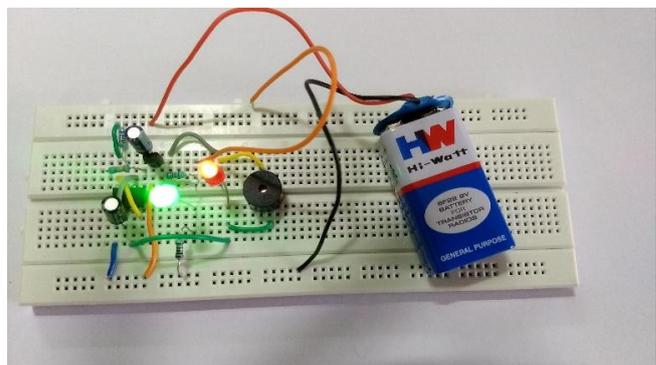
1	Breadboard	1
2	IC 555 Timer	1
3	BC557 PNP Transistor	1
4	Red and Green LED's	1
5	Capacitors (1uf and 0.1uf)	2
6	Resistors(1KΩ,440KΩ)	4
7	Buzzer(5V)	1
8	DC voltage source(10V)	1

First designed and made a prototype of the project by using the parts described above.



**Fig3.Before any failure in the proposed system**

This in turn activates the emergency braking system connected to it at vehicle bottom.



**Fig4.If there is any fault or disturbance in the system red light and buzzer sound.**

This in turn activates the EBS(Emergency Braking System).

**Table3. shows the correct mechanism of how EBS works**

Condition of wire attached to brake wire	Circuit output	Emergency Braking system
Good	Green LED ON	OFF State

## Brake Failure Detection and Emergency Braking System

Slightly damaged	Green LED with slight Red LED output	OFF State
Wire disconnection or cut	Red LED with Buzzer Sound	ON State(Fully Activated)

### V. INSTRUCTIONS TO USE

- Always operate vehicles with correct negative grounding.
- Keep the amount of audio visual indicator high so that it will be simply hear by vehicle operator.
- It is necessary and necessary to connect the sensing element with brake switch.

#### A.Working

**i.** It is a device used for avoiding accidents. This circuit is continuously monitor the conditions of brake and gives audio visual indication.

**ii.** If the brake system is intact then green LED blinks and for around one second and when the brake fails the buzzer beeps and also only red will LED glows.

**iii.** Then emergency breaking mechanism is also powered the motor rotates the wheel to angle of 90° angle so that it aligns under the vehicle.

**iv.** The hydraulic system works (or a hydraulic drive system) is a transmission system that uses pressurized hydraulic fluid to power hydraulic machinery.

**v.** This will lower the wheel slowly to certain height and makes the wheels to lift 1cm above ground balances the system and runs with its own speed

**vi.** Now they can apply the hand brake to stop it completely and vehicle stops eventually

**vii.** Instead of applying hand brake suddenly (which leads to accident) one can stop the vehicle through this method safely.

### VI. CONCLUSIONS

The main purpose of this project is to supply such a tool to vehicles operator in order that any harmful harm and damages

accidents caused by failure of brake may be simply prevented by the correct indication of operating condition of brake. This

system endlessly monitors the condition of the brake wire and alerts the rider before it gets cut. The indication to the rider is given within the type of audio sign. All the elements area unit placed rigorously, therefore contributory to the most effective

working of the unit. therefore the project has been with success designed and tested.the emergency braking system will be a new era of vehicle protection system if implemented in any motor vehicles to protect them from accidents.there

have been many devices to stop the vehicle at abnormal conditions.but the proposed model deals with application of brake before any accident could happen and also ensures the safety of human as well as vehicle.

### REFERENCES

1. "Accidents in India --Report on the road Government of India Accident Press data Road Transport and Highways eleven - Dec 2010
2. "Road Accidents in India 2010": Report on Road Accidents Press data of India Ministry of Road Transport & Highways 11- Dec-2010.
3. Xiang, Weidong, et al. "Automobile Brake-by-Wire Control System Design and Analysis." IEEE Transactions on Vehicular Technology, vol. 57, no. 1, 2008, pp. 138–145., doi:10.1109/tvt.2007.901895.
4. Lombardi, G., et al. "Aerodynamic Design of High Performance Cars: Discussion and Examples on the Use of Optimization Procedures." SAE Technical Paper Series, 2002, doi:10.4271/2002-01-2043.
5. Leu, Kuen-Long, et al. "An Intelligent Brake-by-Wire System Design and Analysis in Accordance with ISO-26262 Functional Safety Standard." 2015 International Conference on Connected Vehicles and Expo (ICCVE), 2015, doi:10.1109/iccve.2015.20.
6. Radhakishan Maske, Satesh Surwase, Balbhim Moharir, Vrushabh Mahajan, Vijay Kedar, Prof.Amol Adkine "Automatic breakdown indicator and braking system" in International Journal of Advance analysis and Innovative ideas in Education Vol-3 Issue-3 2017 [http://ijarjie.com/AdminUploadPdf/AUTOMATIC\\_BRAKE\\_FAILURE\\_INDICATOR\\_AND\\_BRAKING\\_SYSTEM\\_ijarjie5483.pdf](http://ijarjie.com/AdminUploadPdf/AUTOMATIC_BRAKE_FAILURE_INDICATOR_AND_BRAKING_SYSTEM_ijarjie5483.pdf)
7. Paul Gregory et.all " AN investigation on Failure of Automotive elements in cars" International analysis Journal of Engg & technical school (IRJET) Vol-04, ISSUE-06-June-2017, PP-1784-1790.
8. Lombardi, G., et al. "Aerodynamic Design of High Performance Cars: Discussion and Examples on the Use of Optimization Procedures." SAE Technical PaperSeries,2002, doi:10.4271/2002-01-2043.
9. Vishal Pagar, Pravin Shewale, Harshad Savkar, Bhushan Surale, Vikram Londhe "Automatic Brake Fluid outflow interference with Safety Bypass Braking System" in International Journal for analysis & Development], Vol. 5, Issue 12, 2018.
10. U.S.Patent no-5176429 Dateof patent-jan 5,1993 FAILURE DETECTION CIRCUIT FOR ANTI-SKID BRAKING SYSTEM, Inventors: Kaneko Junichi; Toshihiro Hamada, every of Shizuoka, Japan Assignee: Nissinbo Industries, Inc., Tokyo,Japan,App.No.: 621,459 Filed: November. 29, 1990
11. Zutao Zhang, Jiashu Zhang, "A Novel Vehicle Safety Model: Vehicle speed Controller below Driver Fatigue", "IJCSNS International Journal of computing and Network Security", VOL.9 No.1, New Style calendar month 2009
12. "M. Bertozzi, A. Broggi, M. Cellario, A. Fascioli", Artificial vision in vehicles, from iee journal.
13. " S. Tsugawa and Sadayuki",vehichles based on human vision: Machine vision systems and driving management systems, IEEE Trans.
14. Omkar vaishampayan, Akshay joshi, Savio pereira-(2014). "A Review on type of Hydraulic Disc Brakes and Calculations". ISSN No 2277 - 8179.
15. T.D. Barkand, "Investigation of the Accident and Installation and Testing of Dynamic Braking on the foremost Elevator at Duquesne light-weight, solon Mine, #3 North Portal," MSHA, Mine Electrical Systems Division investigatory Report C-052287-12, May 1987.
16. "J.A. Nederbragt",brake using rope: As Precaution Against speed.
17. W.A.Shanaka,P.Abeysiriwardhana,A.M.Harsha,S.Abeykoon, "Simulation of Brake by wire system with dynamic force control", knowledge and Automation for property (ICIAfS) 2014 seventh International Conference on, pp. 1-6, 2014.

### AUTHORS PROFILE



Institute of Technology,

**Dhanamjayulu C** is a faculty and a member of control and automation department in School of electrical engineering, Vellore Institute of Technology, Vellore, India. He has received the PhD degree in electronics engineering from Vellore Institute of Technology, Vellore, India, the M.Tech in control and instrumentation systems from Indian



Published By:  
Blue Eyes Intelligence Engineering  
& Sciences Publication

Madras, India and the B.Tech degree in electronics and communication engineering from JNTU University, Hyderabad, India. He is also an Assistant Professor Senior with the School of Electrical Engineering, Vellore Institute of Technology, Vellore, India. Since 2010, he has been a Assistant professor senior at Vellore Institute of Technology, Vellore, India. His research activities are in the area of multilevel inverters, power converters, and active power filters and power quality.



**Chalamalasetti Guna Sai** is a student of B.tech EEE department in School of electrical engineering, Vellore Institute of Technology, Vellore, India.



**Bharath Srinivas G** is a student of B.tech EEE department in School of electrical engineering, Vellore Institute of Technology, Vellore, India.



**Hussain Basha D** is a student of B.tech EEE department in School of electrical engineering, Vellore Institute of Technology, Vellore, India.



Vellore.

**Arunkumar G** has received the Bachelor Degree in Electrical and Electronics Engineering in 2002 and Master Degree (Power Electronics) in 2005. He completed his Ph.D. Degree at Anna university, Tamil nadu, India on 2015. Since 2015, he is working as an Associate Professor in the School of Electrical Engineering, VIT University,



**Venugopal. P** received his B.Tech degree in EEE from JNTU University in the year 2003. He received the M.Tech from IIT Madras 2006., He completed his Ph.D. Degree at VIT university, Tamil nadu, India on 2010. Since 2010, he is working as an Assistant Professor (sr) in the School of Electronics Engineering, VIT University, Vellore.