FABRICATION OF INTELLIGENT BRAKING SYSTEM

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Abstract: In present days, to reduce the risk of accidents, Vehicles are often equipped with active safety systems. Accidents are most commonly occurring in the urban environments. Antilock Braking Systems (ABS), Traction Control and Stability Control are the most popular systems, which consist of different types of sensors. These sensors help to constantly monitor the condition of the vehicle. In this paper, for controlling the speed of a vehicle the use of ultrasonic sensors in safety systems is proposed. An intelligent mechatronic system consists of an ultrasonic wave emitter which is fixed on the front section of a car emitting ultrasonic provided on the front portion of a bike and car producing and emitting ultrasonic waves towards front direction, a predetermined distance. For receiving ultrasonic wave signal an ultrasonic receiver is also fixed on the front section of car and bike. The reflected wave (detected pulse) help to identify the distance between the obstacle and the vehicle. Based on the detected pulse information a microcontroller controls the speed of the vehicle and push the brake pedal and apply brake to the car or bike for further safety.

I. Introduction

Driving is a compulsory activity for most people. People use cars to move from one place to another. The number of vehicles is increasing day by day. Nowadays, the numbers of accident are so high and uncertainly. Accidents occur frequently and cause worst damage, serious injury and death. These accidents are mostly caused by delay of the driver to hit the brake. This project is designed to develop a new system that can solve this problem where drivers may not brake manually but the vehicles can stop automatically due to obstacles. The main target for this project is, cars can run automatic braking due to obstacles when the sensor senses the obstacles. The braking circuit function is to brake the car automatically after received signal from the sensor. The primary objective of this is to develop a safety car braking system using ultrasonic sensor and to design a vehicle with less human attention to the driving.

1.1 Need for this system

Accidents are resulting in loss of invaluable lives, materials and money. So far the accident preventing systems are not very efficient and the loss of lives is continuing. There are many systems like air bags, GPS, robot driven cars, tracked cars etc. which can avert accidents to some extent. There are many causes of accidents. Some of them are ignoring traffic rules, drunken driving, dream driving, mechanical failures in the vehicle, and mistakes of the drivers. In all these cases the basic reason cited is failure to apply the brakes at the right time. In all the above cases, if the brakes are applied at the right time the accidents can be averted. If a system is developed, which applies the brakes at the time of accidents automatically will avert accidents, which are caused by all the above reasons. This project aims to overcome the mistake made by the drivers and at the time of accidents the system takes control of the vehicle and brings the vehicle to stop before colliding.

Erik ceolingh [1] studied more vehicles are provided with automatic emergency braking systems. These system are used to avoid the accidents and to help the drivers by Automatic Emergency Braking system. This paper describes one of the latest AEB systems called Collision Warning with full Auto Brake and Pedestrian Detection (CWAB-PD). CWAB-PD is

the third generation of the Volvo system that helps drivers to avoid collisions and range of automatic emergency braking (up to 10 m/s^2). These system uses a combination of a long-range radar and a forward-sensing wide angle camera to continuously monitor the area in front of the vehicle. CWAB-PD system is an effective method to avoid the accidents. Keller [2] presented a novel active pedestrian safety system that combines sensing, decision making, situation analysis, and vehicle control. Detection performance is related to the number of matches between the ground truth and system-detected object locations. There are the following two important aspects: 1) sensitivity and 2) precision. Sensitivity relates to the percentage of true solutions that were found by the system (i.e., detection percentage), whereas precision relates to the percentage of system solutions that were correct. A sensitivity and precision of 100% is ideal: the system finds all real solutions. Lokey [3] investigated an automatic safety brake for rotary blade equipment in which a capacitance proximity sensor utilizes. the sensitivity of the sensor may be adjusted to suit the capacitance effect of the individual user of the equipment. The primary object of the invention is to provide an automatic brake for the rotary blade of rotary blade equipment actuated by approach of the human body to the blade. Leiber [4] invested a hydraulic brake booster for a vehicular brake system, which is actuated by means of a brake pedal. An improved hydraulic brake booster including a booster cylinder and a dual-circuit main cylinder are connected together. Romero [5] invested an aircraft automatic braking system which takes into account aircraft landing characteristics including touchdown rebound performance and nose high touch down attitude. This invention relates to aircraft automatic braking systems and more particularly to signal processing of nose wheel and nose gear information signal processing of nose wheel and nose gear information signals in an aircraft automatic braking system to improve system performance with respect to aircraft rebound conditions and nose high attitude conditions during landing of the aircraft. Hauser [6] invention relates to aircraft automatic braking systems and more particularly to signal processing of nose wheel and nose gear information signal processing of nose wheel and nose gear information signals in an aircraft automatic braking system to improve system performance with respect to aircraft rebound conditions and nose high attitude conditions during landing of the aircraft. Steiner [7] developed electronic control unit with generates an output signal when the speed or the rate of change of the force with which the driver actuates the brake pedal exceeds a threshold value. An antilock brake system (ABS) is coupled to and acts on the individual brake circuits by feedback. The brake systems have inlet and outlet valves associated individually with the wheel brakes and are electrically controllable. Feedback pumps are individually associated with the brake circuits, these pumps being drivable electrically and having a high output pressure level. the brake system provided in certain embodiments is especially advantageous for driving-dynamic braking pressure regulation, and also for automatic control of full brake application operation of the brake system, since, in addition to monitoring the brake pedal position by means of a pedal position sensor, it permits additional determination of the brake-actuating behavior of the driver. Miyazawa [8] developed a braking circuit breaking control unit receives an impact detection Signal that is outputted from outside when an impact Such as a crash of a motor vehicle has been detected, and generates and applies a circuit breaking control Signal based on the impact detection Signal. A circuit breaking unit forcibly interrupts a power Supply path and Stops the Supply of power to a load. A hydraulic automotive vehicle brake system with brake slip control and automatic brake management for traction control and/or driving dynamics control includes a braking pressure generator which is hydraulically connectable to at least one-wheel brake. At least one pump which is connected

with its Suction Side to a pressure fluid accumulator and with its pressure Side to a pressure fluid conduit. The present invention by Hinz [9] relates to a hydraulic automotive vehicle brake system with brake slip control and automatic brake management for active brake operations such as traction control and driving dynamics control. Mai [10] developed a method and arrangement for emergency braking of a vehicle includes a detection system on the vehicle which detects obstacles located in or near the direction of motion of the vehicle and generates corresponding data, sensors on parameters of the condition of the vehicle, and an evaluating unit which determines. A first Step in this direction was the adoption of antilock braking Systems (ABS) and ant slip regulation (ASR) to enhance longitudinal vehicle Stability in dynamically critical Situations, i.e. in braking and accelerating processes.

2. Manufacture of Intelligent Braking System

2.1 Instruments used

The devices used are Hall sensor, ultrasonic distance sensor, microcontroller kit, braking motor and bike wheel. Ultrasonic sensor is a transducer that varies its output voltage in response to changes in magnetic field density. Sensors are used for proximity switching, positioning, speed detection, and current sensing applications. In its simplest form, the sensor operates as an analog transducer, directly returning a voltage. With a known magnetic field, its distance from the sensor plate can be determined. Using groups of sensors, the relative position of the magnet can be deduced. Two Magnets were fastened on the spokes of the vehicle. Sensors will sense any objective and obstacles. Sensor is attached to the inner side of the mud guard. When the wheel completes one rotation, a pulse will be coming out from the sensor. This pulse is given as input to the microcontroller.

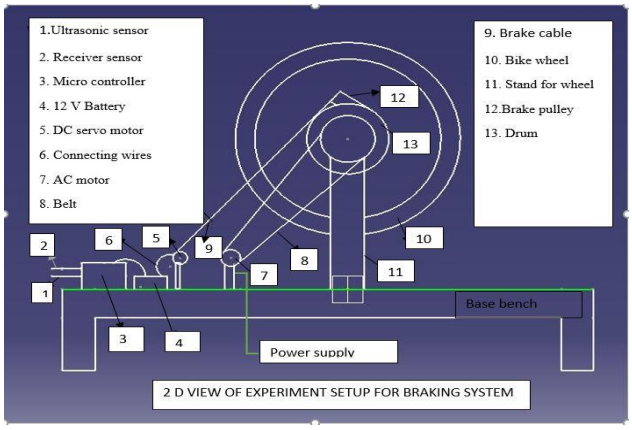

Fig 1. 2D view of intelligent braking system

Working principle: Ultrasonic waves of 40 KHz frequency will be sent from the transmitter of the sensor. The ultrasonic waves have the property that they are not affected by environmental changes. This ultrasonic wave will be reflected back from the obstacle. An ultrasonic receiver present in the same sensor receives these waves after reflection. The time difference between transmission and receiving is calculated and the distance is estimated by program present in the ASIC (Application Specified Integrated Chip) present in the sensor. This distance is displayed in a LCD display and simultaneously an equivalent analog output is given out from the device. Location this sensor is fitted in front of the vehicle. This sensor gets switched on once the vehicle is started and the sensor gives out the analog output continuously depending on the position of the obstacle. Used are sensors of range 32 m, Resolution12 inches, Signal

Output 0-5 V dc, Excitation Voltage12-24Vdc, servo motor connected to microcontroller kit connected to servo motor is shown in fig 1.2. The whole control of the system was in the hands of ATMEGA8-16PI microcontroller. A microcontroller is a computer-on-a-chip. It is a type of microprocessor emphasizing self-sufficiency and cost-effectiveness, in contrast to a general-purpose microprocessor (the kind used in a PC). The on chip flash allows the program memory to be reprogrammed in system or by a conventional nonvolatile memory programmer. Interfacings of the ports of the microcontroller two were used as input ports one for ultrasonic sensor and other for proximity sensor. The other port was used as output port to give signal to the braking system. The braking motor in our project just applies the brakes. As the project was done in two-wheeler (TVS 50), has cable brakes the rotation of the motor just pulls out the cables by which the vehicle comes to a halt. The intensity of braking is high as the motor used has very high torque. Why motor the easy way to apply the brake is to pull the cables. The Hobson's choice is an electric serve motor. The rotation causes the braking. The motor selected had very high initial torque so the application of the brakes will be very sudden and the vehicle comes to a halt immediately.12V DC and 100 Ampere, two motors are used in this experiments. 2D view of intelligent braking system show in Fig 1.

2.2 Assembly of intelligent braking system.

The microcontroller kit and servo motor need a 12V power supply, which was provided using wires from the vehicle battery. Sensors will be connected to the microcontroller. Due to economic and time constraints a proximity switch was used temporarily. When the proximity switch was pressed, it was taken into consideration that the vehicle has entered the critical limit, that is, the braking distance becomes less than that of the braking distance required for that speed. There by, the microcontroller accesses these two signals and gives the output signal which drives the motor to pull the braking cable. The braking motor in our project just applies the brakes. As the project was done in two-wheeler (TVS 50), has cable brakes; the rotation of the motor just pulls out the cables by which the vehicle comes to a halt. The intensity of braking is high as the motor used has very high torque. With motor the easy way to apply the brake is to pull the cables. The Hobson's choice is an electric servo motor.

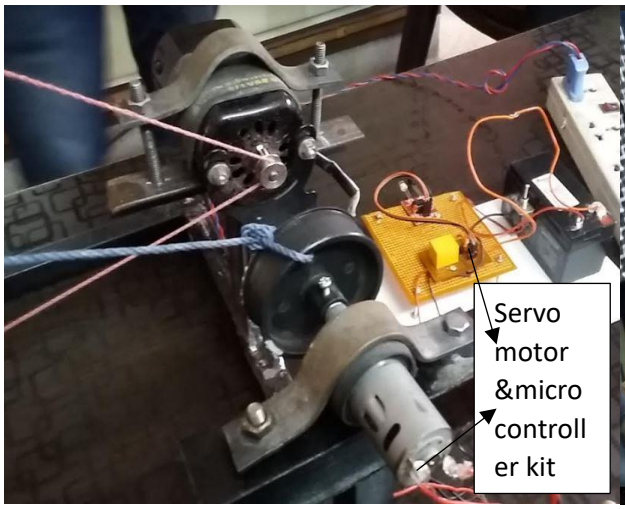

Fig 1.2 Servo motor connected to Microcontroller kit

Fig 1.3 Assembly view Intelligent Braking System

In present intelligent braking system, sensors taken the sense any obstacle the input signals are given to the micro controller attached in turn gives signals to servo motor. Microcontroller is a main part in the braking system. This control all devices as shown in Fig 2. The brake cable is connected with one end attached to servo motor and another end attached to brake pulley and pulley is connected to inside the drum. If the servo motor runs in anti-clockwise direction to the bike wheel. If sensor detects any obstacles, motor automatically runs, and gradually decreases the vehicle speed and brings it to rest. Assembly of intelligent braking system is shown in Fig 3.

4. CONCLUSION

The Intelligent Braking system, if implemented can avert lots of accidents and can save invaluable human lives and property. Implementation of such an advanced system can be made compulsory similar to wearing of seat belts so that accidents can be averted to some extent. Our Intelligent braking system provides a glimpse into the future of automotive safety, and how much more advanced these individual systems can be for avoiding accidents and protecting vehicle occupants when they are integrated into one system. The future of automotive safety is more than just developing new technology; it is shifting the approach to safety. fabrication of intelligent braking system approach represents a significant shift from the traditional approach to safety, but it is fundamental to achieving the substantial benefits.

5. REFERENCES

1. E. Coelingh, A. Eidehall, and M. Bengtsson. Collision warning with full auto brake and pedestrian detection-a practical example of automatic emergency braking, Intelligent Transportation Systems (ITSC), 13th International IEEE Conference on 2010 Sep 19 (pp. 155-160).

2. C.G. Keller, T. Dang, H. Fritz, A. Joos, C. Rabe, and D.M. Gavrila. Active pedestrian safety by automatic braking and evasive steering. IEEE Transactions on Intelligent Transportation Systems.12(4), 1292-304 (2011).

3. R. Lokey. Automatic safety brake for rotary blade equipment. United States patent US 3,785,230. 1974 Jan 15.

4. H. Leiber. Hydraulic brake booster for a vehicular brake system. United States patent US 4,126,996. 1978 Nov 28.

5. E.G. Romero. Aircraft automatic braking system. United States patent US 4,007,970. 1977 Feb 15.

6. B. Hauser, H. F. Ohm, and G. Roll. Motorcycle ABS using horizontal and vertical acceleration sensors. United States patent US 5,445,443. 1995 Aug 29.

7. M. Steiner. Braking pressure control device with maximum vehicle deceleration during automatic braking. United States patent US 5,586,814. 1996 Dec 24.

8. Y. Miyazawa, I. Takiguchi, D. Takanohashi, H. Miyamoto, and C. Yazaki. Power supply circuit breaking apparatus for motor vehicle and power supply circuit breaking system for motor vehicle. United States patent US 5,818,122. 1998 Oct 6.

9. A. Hinz, and E. Czarnetzki. Hydraulic motor-vehicle brake system with anti-locking control and automatic actuation of the brakes for the control of the drive and/or travel dynamics. United States patent US 6,007,162. 1999 Dec 28.

10. R. Mai, Bergholz, E. Lissel, F. Van Meel, and A.G. Volkswagen. Automatic emergency braking method and arrangement. United States patent US 6,084,508. 2000 Jul 4.