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Design and Fabrication of Automatic Brake Failure Indication

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Abstract: ***The braking system of the bike is undoubtedly one of its more important features. Brake failure occurs only because of the worn-out brake shoe and cuts in the liner. This work aims to create a better braking system with the indicator which indicates a display of the percentage of brake working condition. If the condition of the brake pad is low in the LCD we can change the brake pad to avoid brake failure.***
Keywords: Disc brake, brake failure indication, brake monitoring.

I. INTRODUCTION

The Better braking system of a car is undoubtedly one of its more important features. This work aims to create a better braking system with indicator indicates which indicator displays the percentage of brake working condition. Brake failure occurs only because of a worm out of the brake shoe and cuts in the liner. It consists of two sensors is given to a microcontroller. If the brake liner is cut, the sensor sends to the microcontroller. The microcontroller analyses the input signal and operates the corresponding indicator. If nothing wrong, the vehicle will move, and if anyone critical, the vehicle will move, and if anyone critical the vehicle will stop and the screen shows the indication of the brake failure. Since this indicates the status of the brake, the user can identify the condition of the brake and thus limiting the chances of malfunction.

II. LITERATURE REVIEW

This paper describes an ultrasonic sensor that is able to measure the distance from the ground of selected points of a motor vehicle. The sensor is based on the measurement of the time of flight of an ultrasonic pulse, which is reflected by the ground. A constrained optimization technique is employed to obtain reflected pulses that are easily detectable by means of a threshold comparator. Such a technique, which takes the frequency response of the ultrasonic transducers into account, allows a sub-wavelength detection to be obtained. Experimental tests, performed with a 40 kHz piezoelectric-transducer based sensor, showed a standard uncertainty of 1 mm at rest or at low speeds; the sensor still works at speeds of up to 30 m/s, although at higher uncertainty. The sensor is composed of only low cost components, thus being apt for first car equipment in many cases, and is able to self-adapt to different conditions in order to give the best results [1]. A certain number of motorbike disc brakes, made of stainless steel, shown the presence of small cracks only after a few thousand miles. These cracks were mainly located nearby the holes placed on flange to ventilate and refresh pads.

According to results, the deterioration can be led back to thermal cyclic strain (related with the heating–cooling cycles developed during the brake action) superimposed to the mechanical strain caused by braking torque. This work analyses the aforesaid disc brakes investigating both the main causes and the evolution of its deterioration in order to find out possible solutions. The short lifespan of such discs has to be ascribed to the rapid decay of the mechanical properties of the manufacturing material. Material decay is liable for starting cracks. Several actions could be chosen to face this problem. The choice of a particular chemical composition, which will be demonstrated to be unfit for the purpose, produced an extreme tempering of the steel as a direct result of its protracted exposure to high temperatures (a situation which can be considered usual referring to disc brakes). In this work, we present the effect of choosing a different kind of steel, characterized by a greater resistance to the tempering processes [2]. In contrast, one embodiment of this invention is an apparatus comprising a wear pin, the wear pin moving in a first direction as the brake wears, and a Switch for measuring movement of the wear pin in the first direction, wherein when the wear pin moves in the first direction to a predetermined position, the Switch signals that the brake has worn a predetermined amount. Another embodiment of the present invention is a method comprising steps of moving a wear pin in a first direction as the brake wears, and measuring the movement of the wear pin in the first direction by a switch, wherein when the wear pin moves in the first direction to a predetermined position, the Switch signals that the brake disc stack has worn a predetermined amount [3].

A vehicle brake having a brake monitoring and Sensor System attached to a brake shoe of a brake assembly for monitoring of temperature and wear of a brake Shoe lining of a vehicle. The vehicle brake monitoring and Sensor System includes a brake assembly for frictional braking of a vehicle. The brake assembly includes a brake Shoe lining having a brake Shoe and a brake pad for frictional engagement with the brake assembly; and the brake Shoe lining has first rivet openings with rivets therein, and has Second rivet openings with no rivets therein. The vehicle brake monitoring System also includes a Sensor System having a first Sensing element and a Second Sensing element each connected to the brake Shoe; the first Sensing element is embedded in one or more of the first rivet openings with the rivets therein; and the Second Sensing element is embedded in one or more of the Second rivet openings having no rivets therein. The first Sensing element is for generating a first electrical Signal in response to Sensing changes in the temperature of the brake Shoe generated by heat in the brake shoe and transmitted to one or more rivets in the first rivet openings. The Second Sensing element is for generating a Second electrical Signal in response to Sensing a predetermined depth of wear of the brake pad. The vehicle brake monitoring and Sensor System further includes a monitoring unit for processing the first and Second electrical Signals generated by the first and Second Sensing elements [4]. Number of break-ins either in cars or houses are rising at an alarming rate. This cause problems to society in terms of loss of belongings or precious items and damages of the properties. This system is designed to help car users to protect their cars from such incidents with the use of alarm and GSM module. It focused on detection of movement inside the vehicle with sensor. An SMS is send to the owner with no sound of alarm to notify on the intrusion. After receiving the notification, only the owner can unlock the car as the system as it used a remote controlled switch key [5].

A method for providing an estimate of brake pad thickness. The method employs fusion of sensors, if used, and driver brake modeling to predict the vehicle brake pad life. An algorithm is employed that uses various inputs, such as brake pad friction material properties, brake pad cooling rate, brake temperature, vehicle mass, road grade, weight distribution, brake pressure, brake energy, braking power, etc. to provide the estimation. The method calculates brake work using total work minus losses, such as aerodynamic drag resistance, engine braking and/or braking power as braking torque times velocity divided by rolling resistance to determine the brake rotor and lining temperature. The method then uses the brake Int. C. temperature to determine the brake pad wear, where the wear is accumulated for each braking event. A brake pad sensor can be included to provide one or more indications of brake pad Field of Classification thickness from which the estimation can be revised [6]. The brake indicator is a cylindrical device, measuring approximately one quarter of an inch in length and three eighths of an inch in width. This component is a high insulator pressed part with a round rod, as well as a wire configuration with terminal rubber booth protection. The wiring serves as the communication conduit between the brakes and the dashboard panel control inside the vehicle. The Publication Classification brake indicator assembly’s sensor rod is positioned flush with each brake pad. Thus, the sensor rod will have contact with (51) Int. Cl. the rotor every time the brakes are depressed. As such, the indicator sensor rod will touch the rotor behind the brake pad before the pad wears down enough for a metal-on-metal contact. When the sensor rod touches the rotor, the wiring activates the warning light on the vehicle's dashboard, thereby informing the driver of the potential problem [7]. The present invention provides a method and device for determining clearance between a friction element and a rotating member utilizing passive Sensors that communicate through a wireless link. The brake actuator assembly of this invention includes a push rod movable within an air chamber. A Sensor mounted to the push rod communicates through a transceiver antenna. Signals from the Sensor are detected by the antenna and used to determine displacement of the push rod. Displacement of the push rod corresponds to known displacement of elements within the brake actuator, and to the clearance between the friction element and the rotating member. Accordingly, the present invention provides an accurate and adaptable method and device for determining clearance between a friction element and a rotating member of a brake assembly [8]. Failure of brakes especially in two-wheelers have been one of the major causes for many accidents. The forced stresses acting on the disc rotor due to forced braking damages the disc and eventually it breaks. This shows that no proper material has been chosen while analysing the disc at different conditions. Thus, the main aim of this project is to mitigate the failure by using a material which will overcome the negatives of all the current materials used in a disc brake. Static analysis is done on the disc rotor to validate the ductility and a thermal analysis is done to determine the temperature coefficient acting on the disc. Three existing materials that is Stainless Steel, Cast Iron and Carbon-Carbon Composite is being compared with Vanadium Steel to check for the maximum deformation, stress and temperature. The disc brake is modelled using Creo Parametric 3.0 and the analysis is done in ANSYS Workbench 15.0. By finishing the analysis, it is proved that Vanadium Steel has better strength and temperature distribution factors than the other three materials [9].

An IPC (Industrial Process Control) has the mostly used automation tool as PLC Programmable Logic Controller). Our project highlights an automatic user-friendly platform for a car washing. Various components such as conveyor belt, Proximity Sensors, dc motor, brushes and dryer are used in this concept and are controlled using PLC.

We have tried in our project work to use less water, more efficient washing. Usually 150 gallons of water is used by us but using this process approximately 35 gallons of water can be utilized saving large amount of it. Also washing vehicles manually sometimes causes tiny scratches which are avoiding using this method. Hand washing does not clean up the car completely but using this process we can clean up the car up to 95 percent efficiency [10].

III. COMPONENTS OF BRAKE FAILURE INDICATION SYSTEM

A. Brake

Nowadays most of the bikes are coming in drum brakes as well as disc brakes. Inexpensive bikes, where the front and rear tires are fitted with disc brakes, the same low-budget bikes only have disc brakes in the front tires. Now the disc brake is applied to give better and effective braking. Let us know how the disc brake works and also know which bikes are available on a low budget that come with disc brakes. It is a new braking technology that includes a disc in the wheel. With the help of this disc, the braking of the bike is tremendous. The system stops the bike completely. The disc brake in the next tire is about 70 percent more effective in controlling the speed of the bike, while the rear tire only brakes 30 percent. Because drum brakes are not very effective in case of sudden braking.

B. Battery

Chemical energy is converted into electrical energy under the chemical process in the battery. Wherever we can take power, it is called a cell. Depending on how much power we need, a cell is connected in series or parallel. We call it battery. Where we get D.C supply. The most important thing about the battery is that we can store power. And we can use it according to our requirements.

C. Microcontroller at Mega

The AVR microcontroller was manufactured by "Atmel Corporation". The microcontroller includes a Harvard architecture that works rapidly with the RISC. Features of this microcontroller include different features than others such as sleep mode-6, inbuilt ADC (Analog to digital converter), internal oscillator and serial data communication, executes instructions in a single execution cycle. AVR microcontrollers are available in three different categories such as Tiny AVR, Mega AVR, and Xmega AVR

1) The tiny AVR is used in simple applications and it is small in size and easy for lower spaces.
2) Mega AVR microcontroller has good components memory and is used in modern multiple applications and it is very famous due to a large number of integrated components.
3) The x mega AVR microcontroller requires high speed and use program memory and it is applied for difficult applications.

D. Sharp Sensor

To measure the distance of an object, trikonasana are optical sensors using the measuring method. The company produces the most common infra-red (IR) wavelengths using a "sharp" distance sensor that has an Analog voltage output. Sensors made by "Sharp" are equipped with IR LED lenses, which emit narrow light rays. After reflecting from the object, the beam will be directed through a second lens to a position-sensible photodetector (PSD). The conductivity of this PSD depends on the position where the ray falls. The conductivity is converted to voltage and if the voltage is digitalized using an Analog-digital converter, the distance can be calculated.

The path of the reflected beam from different distances is presented on the drawing next to the text. The path of the light beam from the IR beam sensor is inversely proportional to the output of the distance sensor by "sharp", which means that the output is decreasing (gradually decreasing) when the distance is increasing. The exact graph of the relation between distance and output is usually on the data-sheet of the sensor. All sensors have their specific measurement range where the measured results are reliable and this limit depends on the type of sensor.

The maximum distance measured is restricted by two aspects: the amount of reflected light is decreasing and the inability of the PSD to record small changes in the location of the reflected ray. When measuring very distant objects, the output remains almost the same as when measuring objects at maximum distance. The minimum distance is limited due to the characteristic of sharp sensors, which means that the output decrease (again) starts faster because the distance is at some point (depending on the model 4-20 cm). This means that one value of the output corresponds to two values of the distance. This problem can be avoided by noting that the object is not too close to the sensor.

E. LCD Display

An LCD is a flat panel display that optically shows the properties of liquid crystals. It doesn't emit the light directly to the display. It needs a reflector or backlight to show the value in monochrome or color or low information content. With certain images are available to display, which can be displayed or hidden like a digital clock, such as pre-set words, digits, and 7-section displays. They use the same basic technique, except that arbitrary images are composed of a large number of small pixels, while other displays contain larger elements. LCDs are used in many applications, including computer monitors, televisions, instrument panels, aircraft cockpit displays, and indoor and outdoor stages. Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smartphones. LCD screens are also used on consumer electronics products such as DVD players, video game devices, and watches. LCD screens have replaced heavy, heavy cathode ray tube (CRT) displays in almost all applications. LCD screens are available in a wider range of screen sizes than CRT and plasma displays, with LCD screens ranging from small digital clocks to giant, large-screen television sets. Since LCD screens do not use phosphors, they do not suffer the image to burn - when a static image is displayed on the screen for a long period of time (e.g., table frame for an aircraft schedule on an indoor signal). However, LCDs are susceptible to image persistence. LCD screens are more energy-efficient and can be dealt with more safely than CRTs. Its low power consumption enables it to be used more efficiently in battery-powered electronic devices than CRTs. By 2008, annual sales of TVs with LCD screens exceeded sales of CRT units worldwide, and CRT became obsolete for more purposes.

IV. EXPERIMENTAL SETUP AND WORKING

The performance of a brake system is assessed by the rate at which this system absorbs the kinetic energy of a vehicle moving under the effects of its inertia and any mechanical energy provided by its prime mover. As pointed out, the parameters which govern the brake performance can be divided into enabling parameters and resisting parameters. The enabling parameters are those parameters that control the value of brake torque needed to dissipate the vehicle's kinetic energy. These are mainly the effectiveness of the pads, and the efficiency of the hydraulic system used to push the pads against the brake discs. While the effectiveness of a pad generally deteriorates with time. The parameters which resist the action of the brake torque are those parameters that constitute the kinetic energy of the vehicle, namely the vehicle mass and speed at the start of (and during) the braking process. The novel system to monitor brake performance, presented in this paper, collects real-time data on the brake pads. The distance between the disk pad and the rotor is measured. Moreover, the proposed system features highly sophisticated electronics and software designs which render the system suitable for remote monitoring applications if needed. The threshold value is fixed to measure the distance between the pads and the rotor using the sharp sensor. This signal is sent to the microcontroller amtega8. The microcontroller will display the value on the liquid crystal display. The next section offers an insight into the hardware design of the novel brake-monitoring system proposed in this paper.

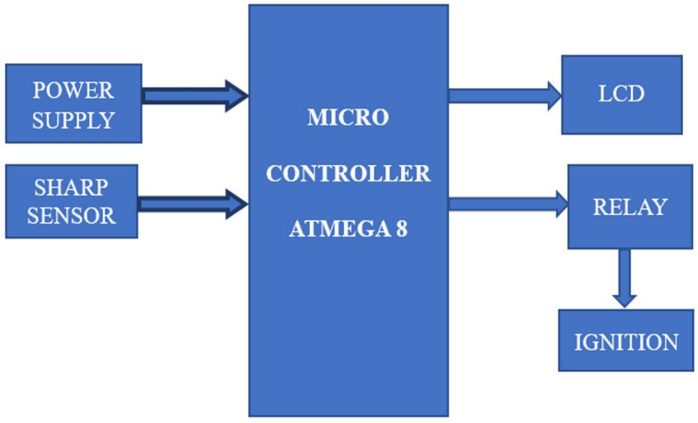

Figure 1. Block Diagram of automatic brake failure indication system

V. RESULTS AND DISCUSSIONS

In this project, we have developing an automatic brake failure indication and monitoring system by studying the various journals and the review papers and documents based on brake failure indication. This project work implements the continuous monitoring of brake pad distance by using a sharp sensor and microcontroller using LCD to indicate the percentage of brake pad availability.

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VI. CONCLUSION

The automatic brake indication system indicates the condition of the brake pad availability in the display unit. It displays the value in percentage form. The ultrasonic waves are transferred in the senor and reach the other side and it senses by the rotation of the disc by placing the metal proximity sensor in the disc plate. The ultrasonic sensor judge and sends a signal to the pre-coded microcontroller and send the value. The brake pad availability is defined automatically.

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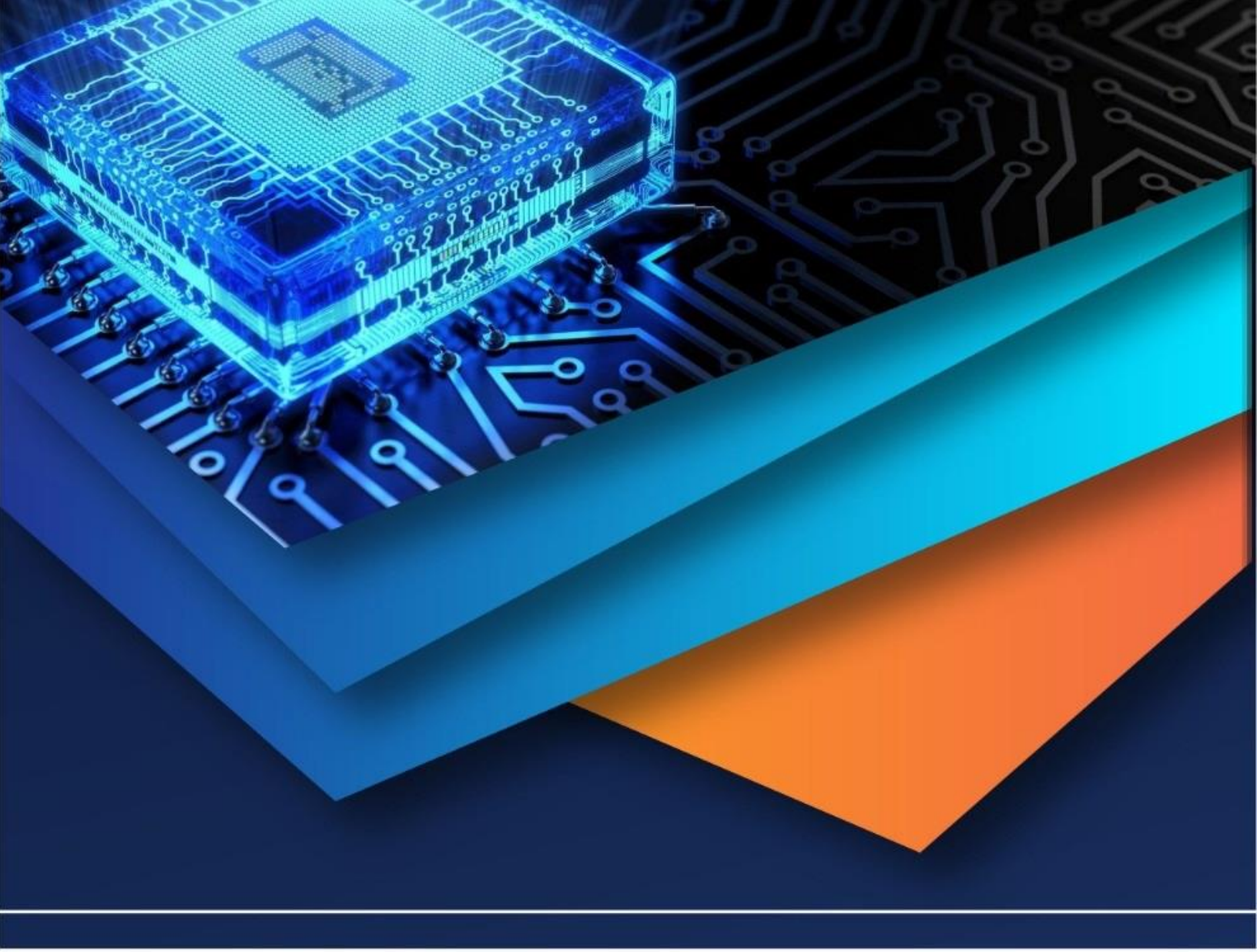

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