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Solar Energy Based Object Detection & Automatic Speed Reducing Intelligence Robot Using Sensors

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ABSTRACT: The average human life span has decreased since ancient times. Because the number of automobiles on the road is growing every day, the death rate from accidents has dramatically grown. Because brake failure causes so many accidents, we can lessen their impact when the brake is controlled automatically. A receiver and an emitter make up an ultrasonic setup that is put up in front of the vehicle. When an obstacle is recognized, the ultrasonic waves are always emitted by the ultrasonic emitter and are reflected back to the receiver, which then picks up the signal. The Arduino controller receives the signal from the reflected wave, and depending on the object's distance, it activates the buzzer and stops the car with LED indicators. motor used to move the vehicle.

KEYWORDS: Accidents, Ultrasonic sensor, Arduino, Object Detection.

I.INTRODUCTION

Every day, more and more people utilize automobiles. At the same time, traffic congestion has emerged as a global issue. This issue is primarily brought on by human driving, which involves slow reaction times and bad decisions that can disrupt traffic and result in accidents. The most unwelcome event for a road user is a road collision. Vehicles in India are typically fitted with ABS (Anti-Lock Braking System), traction control, brake assistance, and other safety features. To monitor the state of the vehicle and react in an emergency, all of these systems use various types of sensors. In order to boost vehicle stability during emergency braking, this intelligent braking system needs to work with the car's ABS (Anti-Lock Braking system). In order to construct a system that requires less human attention while driving, this study will develop a safety braking system employing ultrasonic sensors.Vehicle technology has advanced quickly in recent years, especially in regard to braking and sensing. To stop accidents from happening and to mitigate their effects, ASS (active safety systems) are being investigated and developed. When a vehicle is taken into consideration, the braking system is one such element that is unavoidably needed. In situations where a vehicle must slow down or be sippol, it lowers the kinetic energy of the vehicle. They are ensuring the safety of the passengers and the vehicle. In order to ensure the safety of the drivers' and passengers' precious lives, braking systems are always deployed.

In this age of multitasking, people often drive while using their cell phones, among other distractions.One of the most frequent causes of traffic accidents, which result in thousands of fatalities each year, is this driver error. So, the goal of our research is to create a system that can automatically apply the brakes as soon as it detects any obstacle within a set distance. We suggest using relay switches, Atmegs controllers, shraninas, and other components in this system to control the vehicle's speed and automatically apply the brakes.One of the most frequent causes of traffic accidents, which result in thousands of fatalities each year, is this driver error. So, the goal of our research is to create a system that can automatically apply the brakes as soon as it detects any obstacle within a set distance. We suggest using relay switches, Atmegs controllers, shraninas, and other components in this system to control the vehicle's speed and automatically apply the brakes giving the distance of the obstacle in front of the vehicle and returning to the receiver. The microcontroller receives these two information signals, calculates the safe braking distance, and then automatically engages the brakes based on that calculation. In order to power the system, solar energy is used. As people have been employing a variety of constantly developing devices to collect solar energy from the dawn of time. When exposed to sunshine, the solar panels used in this project will continuously charge the battery, which powers all of the electronic gadgets utilized in the project

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II. PROPOSED WORK AND DESCRIPTION

This system consists of an Ultrasonic sensors which is used to detect the object at a particular distance with an indication of LED &buzzer, this system also uses the Atmega controller for the controlling purpose, the components such as ultrasonic sensor and microcontroller are used to design a vehicle with full safety of its occupants.

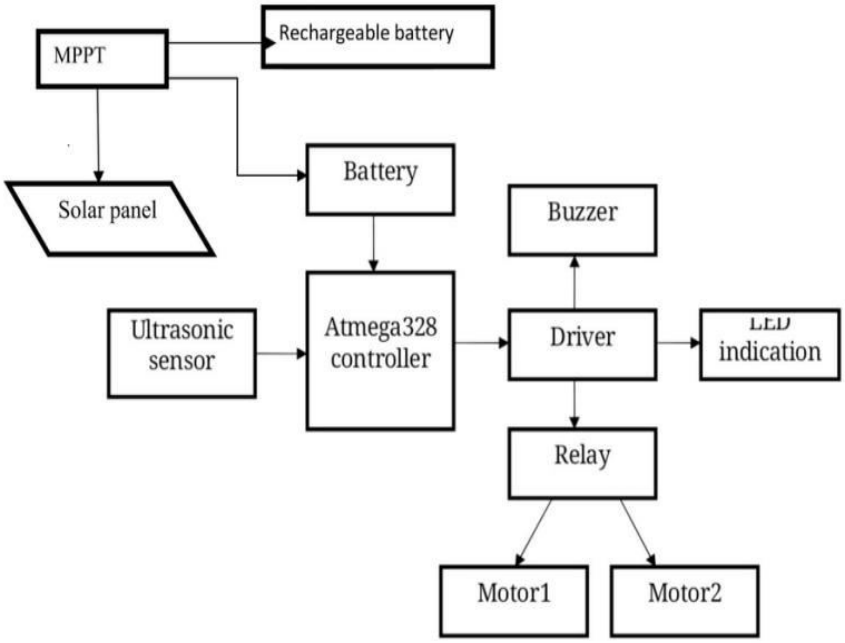

Fig.1 – Block Diagram of Proposed System

This project uses ultrasonic sensors to lessen auto accidents. A controller, an ultrasonic sensor, a driver, a relay, a motor, a battery, and LED indicators make up this system. The controller used in this project is an Atmega328. To identify the obstruction in front of the vehicle, an ultrasonic sensor is used. The ultrasonic rays are transmitted using the ultrasonic sensor. The rays are reflected back if any obstructions are found along the way. The "ULTRASONIC RECEIVER" receiver circuit picks up the reflected rays. The rays are transmitted via a circuit known as a ULTRASONIC TRANSMITTER.The obstacle's reflected ultrasonic waves are picked up by the ultrasonic receiver circuit, which then sends the control signal to the control circuit. The solenoid valve is turned on by the control circuit. When the driver does not manually use the brakes, this mechanism operates. Signals are delivered to the microcontroller to trigger the braking mechanism whenever an obstruction is identified by the ultrasonic sensor. The brakes are therefore deployed. This technology can protect the occupants of the car while also preventing harm to the exterior of the car. If a sensor picks up an object, the controller receives the sensor signal. To stop the car, use the controller.

III.CIRCUIT DIAGRAM AND DISCRIPTION

In this case, the vehicle is powered by a battery. We use an Atmega328 controller in this project. 28 pins are on it. ADC is built into it. Ultrasonic sensors are used to find obstacles in the way. The controller pin A0 is where it is linked. It is employed to find the thing. The controller uses the driving unit to operate the vehicle motor after receiving sensor data. We employ the ULN2003 driver. The controller port D10 to D13 are where it is linked. Through a relay, it is utilised to drive the motors. Relays function as switches. It is connected to output pins 15 and 16 of the driver. The motors are wired to the relay's N/O port. To display project information, an LCD is used.A solar panel, diode, battery, relay circuit, IR sensors, motors, and an Arduino board make up the idea. Solar cells use the photovoltaic effect to turn light energy into electrical energy when sunlight strikes their grids. Solar panels use the same process to turn solar energy into electricity, which is then sent to rechargeable batteries via a diode circuit. To prevent the reverse flow of electricity into the solar panel, a diode circuit is inserted here. The battery provides the motors and Arduino Board with the necessary electricity. For the purpose of triggering the relay circuit when an obstruction is detected, an Arduino

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board is connected to a relay circuit board.

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IV.ATMEGA 328

AnArduino board's ATMEGA 328 microcontroller serves as its processor. There are almost 28 pins in it. By sending and receiving inputs to the external device from these 28 pins, the inputs can be controlled. Furthermore, pulse width modulation is included (PWM). These PWM are used to pulse-modulately convey the whole signal. It uses input power supplies like V oc and Gnd. These integrated circuits mostly have analogue and digital inputs. Many applications employ these analogue and digital inputs to carry out their processes.

V. ANALOG INPUT

The Six analogue input pins are present on the PCB of the Arduino atmega-328 microcontroller. The names of these analogue inputs range from AD to A5. We can do the operation utilizing analogue inputs from these 6 analogue input ports. The operational range of an analogue income is 0 to 5V. Analog signals are thought of as continuous time signals that can be employed in a variety of applications. Also known as non-discrete temporal signals, these The only way to determine if an input is an analogue signal or a digital signal is by looking at the time signal attributes, which include voltage, current, and other inputs. A variety of Arduino microcontroller applications can only use analogue inputs rather than digital inputs.

VI. DIGITAL INPUT

The non-continuous time signal with discrete input pulses is what is meant by digital inputs. It can be shown as a series of 0s and Is. These digital inputs have two possible states: on and off. The 12 digital input pins of the Arduino atmega328 microcontroller are also included. You can write it out as D0 to D11. Applications requiring digital input/output can use over 12 inputs. The discrete input pulses can be triggered and provided to the digital input ports during the course of their operation. Since these ports accept input, they can be utilized for both input and output processes. Only the digital inputs can be accessed by these digital pins.

VII. ATMEGA-328

The integrated ATMEGA-328 chip has 28 pins. It has six analogue inputs, which are denoted as PCO through PC5, according to the pin diagram. The continuous time signal is present on these analogue input pins, serving as the system's analogue input. Moreover, it has 12 digital inputs. It can be represented by the digital input ports PDI to PD11, which operate on the basis of pulse width modulation (PWM). These PWM send the signal in a way that is widely disregarded.

VIII.ULTRASONIC TRANSMITTER/RECEIVER

The UTR is a hybrid circuit that enables the realization of an ultrasonic detector by using only a small number of external components. The amplitude variation of the received ultrasonic signal (40 KHz), caused by the movement of an object, provides the basis for detection. Thanks to "Thick films hybrid technology," it displays stable electric characteristics.

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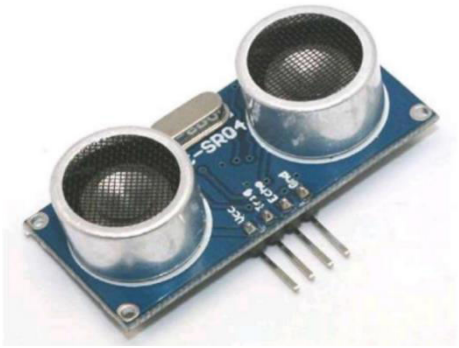

Fig.2 – Ultrasonic Sensor

IX.THEORY OF OPERATION

By first producing a brief burst of ultrasonic sound and then "listening" for the echo, the PING sensor locates objects. The sensor sends off a brief 40 kHz (ultrasonic) burst under the direction of a host microcontroller (trigger pulse). This burst moves through the air at a speed of around 1130 feet per second before hitting something and returning to the sensor. The PING))) sensor sends an output pulse to the host, and since this pulse will end when an echo is detected, its breadth reflects the target's distance.

The four pins on the HC-SR04 Ultrasonic (US) sensor are labelledVec, Trigger, Echo, and Ground, respectively. This sensor is fairly common and is utilised in many applications where sensing objects or measuring distance is necessary. The ultrasonic transmitter and receiver are formed by two projects that resemble eyeballs on the front of the module. The sensor operates using the elementary formula Distance-Speed > Time from high school.

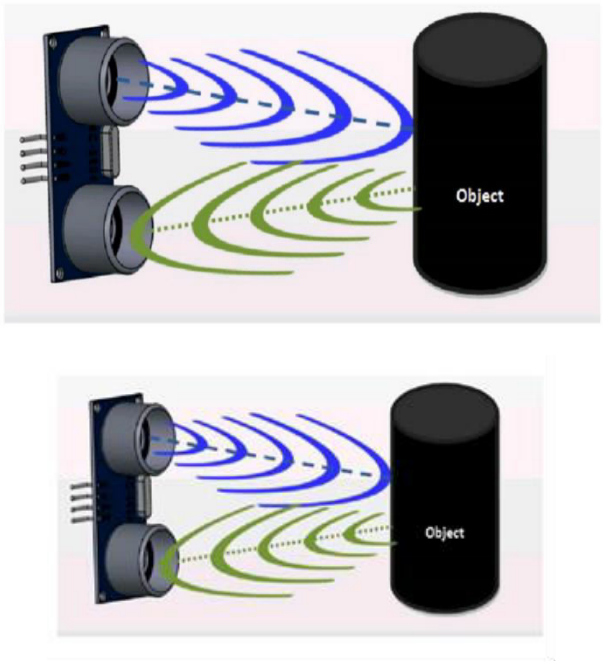

Fig.3 –Ultrasonic Sensor Operation

Now, we need to know the speed and the duration in order to compute the distance using the formulas above. As we are employing an ultrasonic wave, we are aware of its 330ms universal speed under normal room conditions. The circuitry

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integrated into the module will determine how long it will take for the US wave to return and will turn the echo pin high for that same period of time so that we can also determine how long it will take.

X.WORKING OF ULN2003IC

Eight NPN Darlington pairs make up the ULN2003 IC, which provides the correct current amplification needed by the loads. We are all aware that transistors can be used to increase current, but in this case, Darlington transistor pairs are used inside the integrated circuit to achieve the necessary amplification.A Darlington pair consists of two transistors that work together as one to produce high current gain. In this pair, the second transistor further amplifies the current from the first, supplying a strong current to the output terminal. There won't be any base current and the transistor will remain in the off state when no base voltage or signal is delivered to the IC's input ports.

XI.FEATURES

- Output Voltage: 50 V
- Input Voltage (for ULN2002A/D-2003A/D-2004A/D): 30 V
- Continuous Collector Current: 500 mA
- Continuous Base Current 25 mA
- Operating Ambient Temperature Range -20 to 85°C
- Storage Temperature Range: -55 to 150 °C
- Junction Temperature: 150 °C

XII.RELAYS

Devices that switch are relays. The brains of industrial electronic systems are switching devices. Contacts are created or broken when a relay is powered or triggered. They are utilised for ac or de power control. They are employed to regulate the flow of events during the operation of many systems, including telephony, welding circuits, electronic heaters, counters, and X-ray machines. Magnetic effects are produced by the coil current in electromagnetic relays, a type of electromagnet. It pushes or pulls relay contact-carrying flat, soft iron armatures or strips. To obtain a variety of different ON/OFF combinations, numerous relay contacts can be activated.

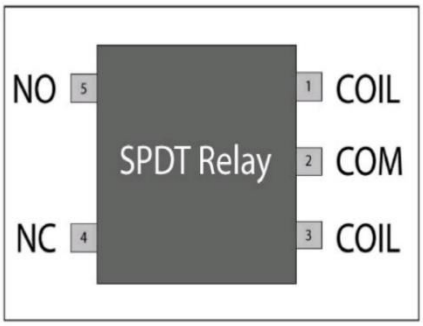

Fig.4 - SPDT Relay

XIII.LIQUID CRYSTAL DISPLAYS

Materials used in liquid crystal displays (LCDs) combine the characteristics of crystals and liquids. Instead of a melting point, they have a range of temperatures where the molecules are practically as mobile as they would be in a

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liquid yet are arranged in a manner like a crystal. Two glass panels make up an LCD, and the liquid crystal.The LCDs are thin and light, measuring only a few millimetres. While LCDs use power, they may be powered for extended periods of time and are compatible with low power electrical circuitry. As the LCD doesn't produce light, light is required to read the panel. Reading in the dark is made feasible by the use of backlighting. The LCDs have a long lifespan and a broad temperature range of operation. The LCDs are more user-friendly because it is reasonably easy to change the layout and display sizes. Simple seven-segment LCDs with a little quantity of numeric data are the only LCDs used in watches, calculators, and measuring devices. Recent technological developments have improved legibility, increased information display capacity, and expanded the temperature range.

XIV.SOLAR PANEL

A solar panel really consists of a number of solar (or photovoltaic) cells that can produce power thanks to the photovoltaic effect. On the surface of solar panels, these cells are organised in a grid-like configuration.As a result, it might alternatively be described as a collection of photovoltaic modules put on a supporting framework. A 610 solar cell assembly that has been packaged and connected is known as a photovoltaic (PV) module.These panels are exceptionally resilient to wear and tear. Solar panel deterioration is very gradual. Their effectiveness only declines by one to two percent (and occasionally even less) over the course of a year.

Fig.5 – Solar Panel

XV.RECHARGABLE BATTERY

A form of electrical battery known as a rechargeable battery, storage battery, secondary cell, or accumulator can be charged, discharged into a load, and recharged numerous times, as opposed to a main or disposable battery, which is delivered fully charged and thrown away after use. One or more electrochemical cells make up its structure. It stores and accumulates energy by a reversible electrochemical reaction, hence the term "accumulator". From button cells to megawan systems connected to stabilise an electrical distribution network, rechargeable batteries are created in a wide variety of sizes and configurations. Lead-acid, zinc-air, nickel-cadmium (NiCd), nickel-metal hydride (NiMH), lithium-ion (Li-ion), and Lithium 34 are just a few examples of the various electrode materials and electrolytes that are used.

XVI.WORKING

A solar panel, diode, battery, relay circuit, US sensors, motors, and an Arduino board make up the hardware prototype, as illustrated in Figure 4. By using the photovoltaic effect, each solar cell turns light energy into electrical energy of 0.18 volts when sunlight strikes its grids. A solar panel then transforms this solar energy into electrical energy of 6 volts (6V), which is then sent to a rechargeable battery via a diode circuit. To prevent the reverse flow of electricity into the solar panel, a diode circuit is inserted here. The Arduino Board and motors are powered by the 6 volts from the battery. The Arduino board contains a voltage regulator that reduces the output voltage to 5 volts.
For the purpose of triggering the relay circuit when an obstruction is detected, an Arduino board is connected to a relay circuit board. The vehicle's front is equipped with a US sensor that is coupled to an Arduino board. The project's US

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sensor has a 25 cm field of view. An error signal or a triggered voltage pulse of 3 to 5 volts is sent to the Arduino board when an obstruction is detected in front of the sensor by the US sensor. After receiving the error or voltage signal, the Arduino board starts the buzzer and turns off the voltage or triggering input to the relays. The relay's coil shuts when the triggering signal or voltage is applied to the circuit.

XVII.RESULT

Fully automated, dependable, and practical, the system. This uses a sensor to help prevent accidents in vehicles. Here, we're using ABS technology, which is activated via a controller. Rechargeable batteries were introduced as a supply, and the MPPT Controller is now connected to them. When an object emerged in front of the car at a distance of 25 cm, the brakes were automatically engaged. As the object leaves its line of motion, it also automatically resumes moving along its path. Solar panels were utilised to generate the input energy, which was then delivered to the system's components: The audio and LED indication were turned on to alert once the vehicle detected obstructions and applied the brakes.

XVIII.CONCLUSION

If the automatic braking system is used, accidents can be prevented and priceless property and lives can be saved. The system as a whole is quite flexible and can use a variety of sensors and actastor solutions. Since they were created, more uses have been discovered for them. Currently, this system was created as a small-scale project, but it can be applied at the industry level to help us prevent numerous accidents and loss of life. The future of car safety goes beyond simply creating new technology to avoid collisions.

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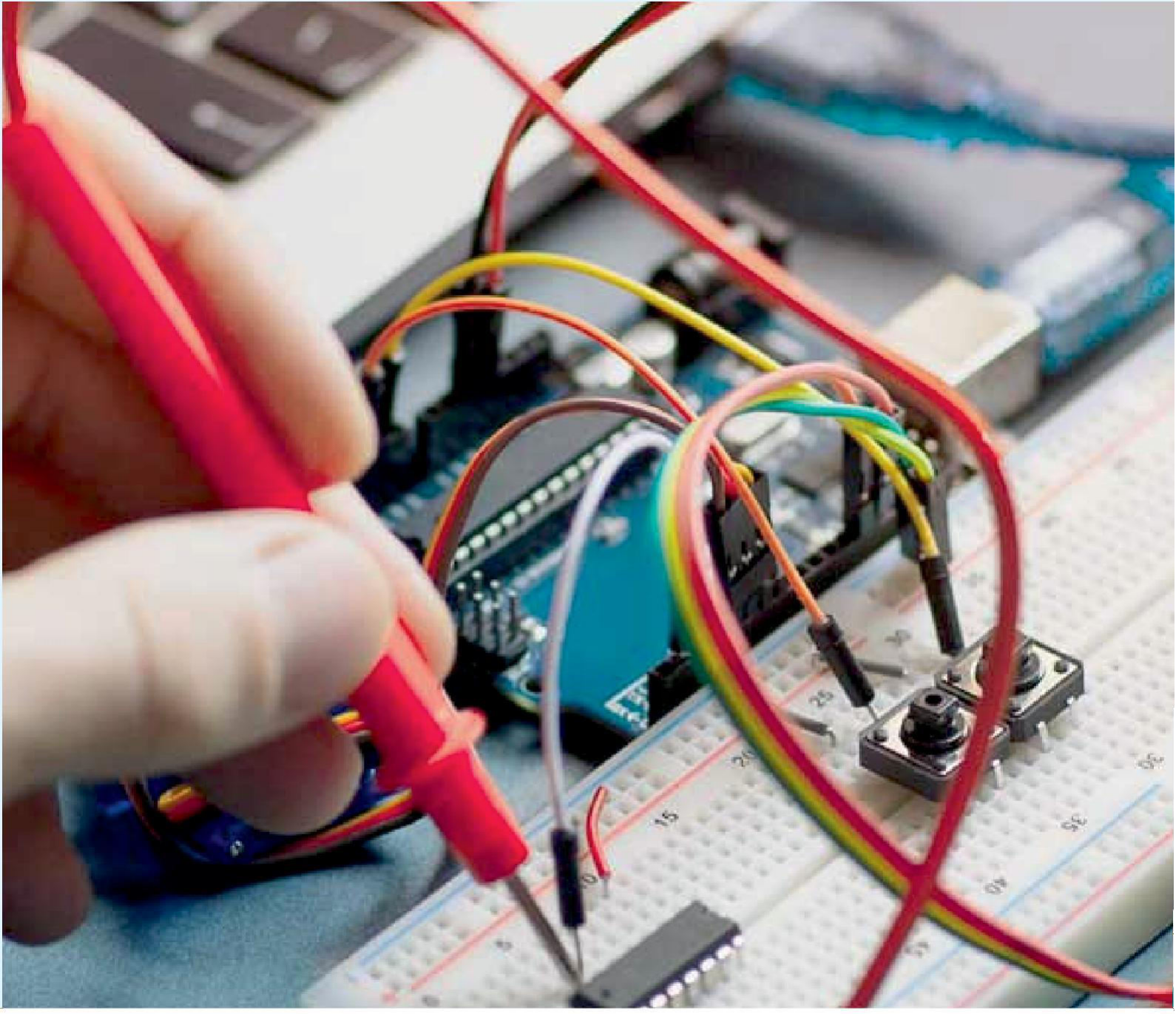

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