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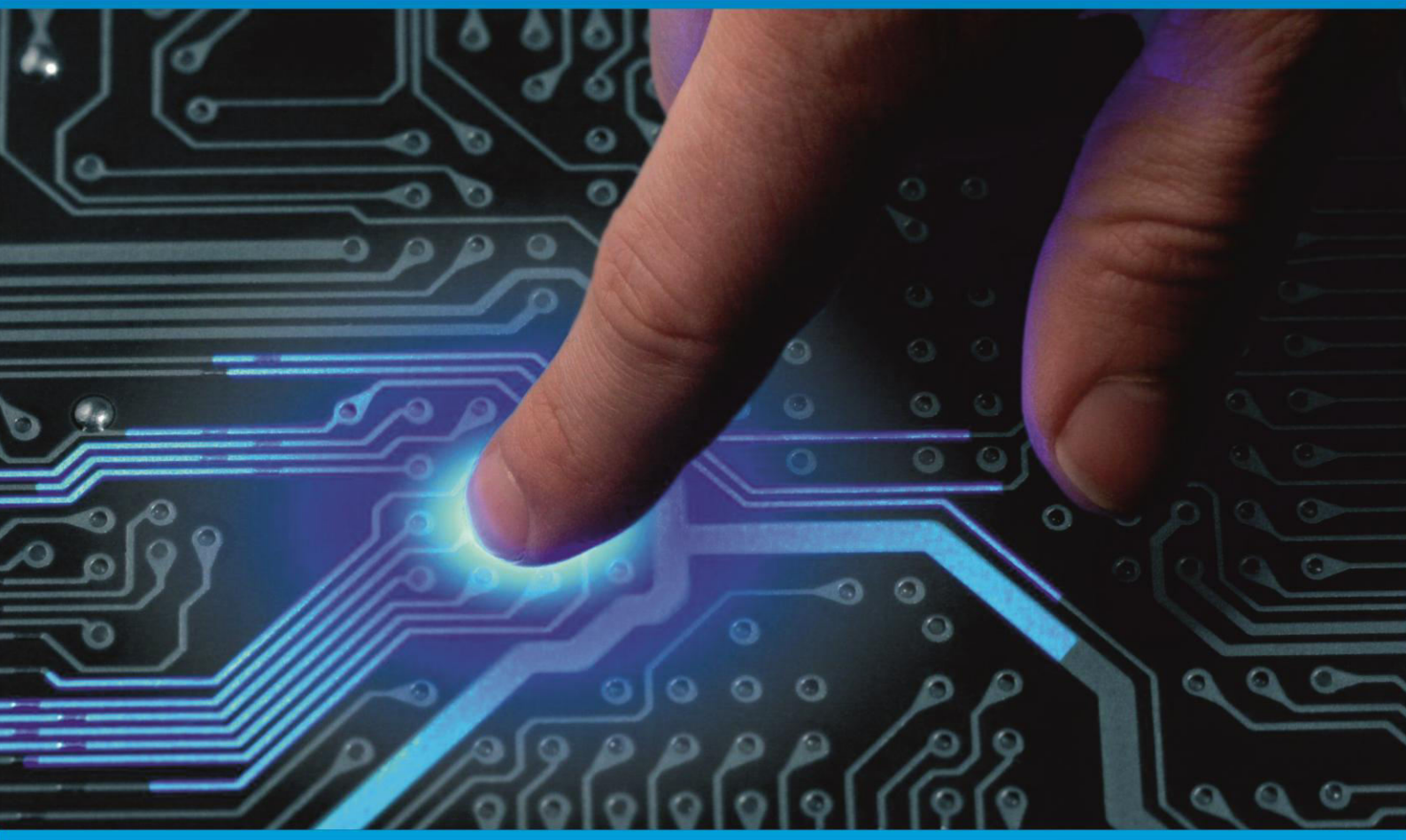

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Advanced Alert System for Safe Distance Excavation in Excavator

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ABSTRACT: Advanced alert system is one of the real time applications effectively used in embedded system. Heavy equipment is widely used for construction jobs of almost any size, in commercial and civil sites. They usually cover a broad range. Earth movers and other heavy equipment not only help to speed up the earth work but also for materials handling, demolition, and construction. There are many types of heavy construction equipment, one such we use here is "EXCAVATOR". Construction sites often create dangerous situation for workers as they work in close proximity with the equipment. In this Project, we present a Distance warning system developed to address this issue and enhance safety at construction sites. This proposed technology helps to alert workers and equipment operators from hazardous situations.

KEYWORDS: Boot Loader, Rectifier circuit, Selecting board arduino , Serial Monitor, Serial Plotter.

I. INTRODUCTION

Several accidents occur frequently in various construction sites. Occupational accidents at construction sites are a serious public health issue in Korea. Construction sites often create dangerous situations for workers as they work in close proximity with the equipment. In 2015, approximately 11% (46) of the 437 occupational fatalities in the construction site in Korea resulted in workers colliding with equipment. In this paper, we present a proximity warning system developed to address this issue and enhance safety at construction sites. The proposed technology helps to alert workers and equipment operators from hazardous proximity situations. When the radio frequency identification (RFID) sensor detects an approaching worker, the main board instantly shuts down the excavator to prevent accident. Our system contains an RFID tag, RFID reader, alarm device, camera, a display device (the Around View) and excavator control technology.

Occupational injuries from the construction field are a global public health issue, whereas the construction sector is a hazardous industry in which occupational accidents occur most frequently around the world. Generally, a construction site requires working personnel, equipment, and materials for performing various tasks. The equipment and workers perform continuous dynamic activities in dynamic space. At times, the construction equipment operates in close proximity to workers, which can cause damage or injury to the workers in the construction site. Such conditions can lead to collisions between workers and construction equipment, incurring the risk of personal injuries. In addition, construction equipment can also be damaged in accidents. [18] Proposed Approximate Multiplier for Fault Identification in Machine Vision .Fosbroke [9] identified various factors leading to contact collisions at construction sites. Zhuetal. [10] proposed a technique that could improve construction site safety by predicting the movements of onsite workers and mobile equipment. [11] developed a radio frequency identification (RFID)-based real-time locating system (RTLS) for construction safety management. Teizer [12] tested construction site applications of magnetism-based proximity detection and alarm technology for safe heavy equipment operation. Seo et al. [13] proposed adaptive nonlinear diffusion filtering for speckle noise.[4] proposed Low Power Binary Counter-based Approximate Multiplier Architecture. [19] Proposed Design and Implementation of Energy efficient Approximate [16] Proposed Risk Detection in IoT Based Healthcare System. [20] Proposed Low power High Speed Hybrid logic 8T Full Adder Circuit.

The purpose of the current research is to develop proximity detection and control system for prevention of collision accidents caused by excavators. The proposed system utilizes RFID technology and the Around View Monitor (AVM) to detect the approach of workers and alert them to dangerous situations using an alarm device. Also, this technology shuts down the excavator automatically whenever it is needed. [8] Energy Efficient Domino Logic Architectures with Single Electron Transistors in Pull down Network. [17] Proposed Inter-Vehicle Communication

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Exploring Wide Range Traffic Collision Prevention with Cognitive Radio Technology. [21] Proposed Improved Fuzzy C Means Algorithm using robust Information Clustering.

II. LITERATURE REVIEW

1. Sensor Based Accident Prevention System Aravinda B1 , Chaithralakshmi C1 , Deeksha1, Ashutha K 2:

In the developing countries accident is the major cause of death. If we gaze at the top 10 dangerous roads in the world we can see that all of them are mountain roads and curve roads. In the mountain roads there will be tight curves and the roads will be narrow. In these kinds of situations the driver of a vehicle cannot see vehicles coming from opposite side. Thousands of people lose their lives each year because of this problem. Since we are talking about mountain roads here other side might be lead to a cliff. The solution for this problem is alerting the driver about the vehicle coming from opposite side. This is done by keeping an ultrasonic sensor in one side of the road before the curve and keeping a LED light after the curve, so that if vehicle comes from one end of the curve sensor senses and LED light glows at the opposite side. By looking at the LED light on/off criteria driver can become alert and can slow down the speed of the vehicle.

2. Accident Alert and Tracking Using Arduino Aarya D.S1 , Athulya C.K2 , Anas.P3 , Basil Kuriakose 4 , Jerin Susan Joy5 , Leena Thomas:

The high demand of vehicles has also increased the traffic hazards and the road accidents. Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country. An automatic alert system for vehicle accidents is introduced in this paper. The proposed system which can detect accidents in significantly less time and sends the basic information to first aid centre within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the central emergency dispatch server in a short time so that the emergency dispatch server will inform to the ambulances which are near to that location, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the ambulance. When the accident occurs the alert message is sent automatically to the central emergency dispatch server. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of vibration sensor. This application provides the optimum solution to poor emergency facilities.

3. IoT Based Coal Mining Safety for Workers using Arduino D. Prabhu1 , V. Naga Nikhil2, J. Shiva Kumar:

Mines are the world's most dangerous place to work because in the mines, explosion often happens and thousand people are dying. And a recent report states that in such mine accidents an average of around 12,000 people have died. This plan will be useful to them in remote locations during the crisis. In this paper given an overview of IoT based coal mining safety for workers using IoT and Arduino. Apart from this, it consists of LDR, Gas sensor, Temperature and Humidity sensor which are used to monitor the underground hazards. In this paper, we mainly focused on the hazards monitoring, all the sensor values compared with the received data from the sensor with safety limits and if any hazards detected, the ground section will be given the necessary alert.

III. EXISTING WORK

Rectifier Circuit

It is known that, the rectifier circuits convert a sinusoidal ac voltage into its corresponding pulsating dc. Apart from the dc component, this pulsating dc voltage will have unwanted ac components.). These ripples will be the highest for a single-phase half wave rectifier and will reduce for a single-phase full wave rectifier. The ripples will be minimum for 3-phase rectifier circuits. For supply purposes constant dc voltage is required than the pulsating output of the rectifier.

The output of the rectifier has to be passed though a filter circuit to filter components. The filter is a device that allows passing the dc component of the load and blocks the ac component of the rectifier output. Thus the output of the filter circuit will be a steady dc voltage. The filter circuit can be constructed by the combination of components like capacitors, resistors, and inductors. Inductor is used as it allows only dc components to pass and blocks ac signals. Capacitor is used to block the dc and allows ac to pass.

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Selecting Board Arduino

In order to upload the sketch, we need to select the relevant board we are using and the ports for that operating system. The steps are as follows:

First, go to the "Board" section and select the board you would like to work on.
Next, look for the USB serial device in the port section of the Windows Device Manager.

- After the correct selection of both Board and Serial Port, click verify and then upload button appearing in the upper left corner or you can go to the Sketch section and press verify/compile and then upload.
- The sketch is written in the text editor and is then saved with the file extension.ino.
- As we upload the code, TX and RX LEDs will blink on the board, indicating the desired program is running successfully.

Figure 1: Transformer Circuit

Boot Loader

As we go to the Tools section, we will find a boot loader at the end. It is very helpful to burn the code directly into the controller. When we buy the new Arduino Module, the boot loader is already installed inside the controller. However, if we intend to buy a controller and put in the Arduino module, we need to burn the boot loader again inside the controller by going to the Tools section and selecting the burn boot loader.

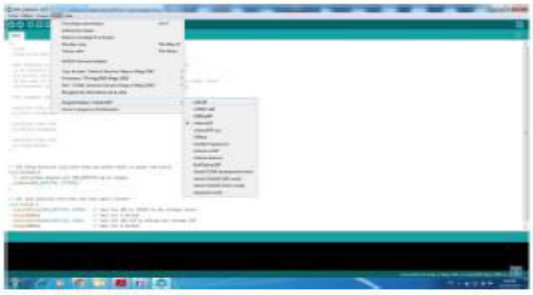

Figure 2: Boot Loader Window

Serial Ploter

Arduino serial plotter is another component of the Arduino IDE, which allows you to generate a real-time graph of your serial data. The serial plotter makes it much easier for you to analyze your data through a visual display. You're able to create graphs, negative value graphs, and conduct waveform analysis.

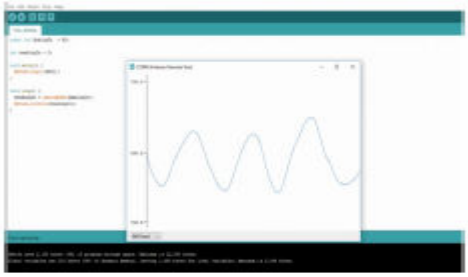

Figure 3: Serial Plotter Waveform

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SERIAL MONITOR

A separate pop-up window that acts as an independent terminal and plays a vital role for sending and receiving the serial data. You can also go to the Tools panel and select Serial Monitor pressing Ctrl+Shift+M all at once will open the Serial Monitor. The Serial Monitor will actually help to debug the written Sketches where you can get a hold of how your program is operating. Your Arduino Module should be connected to your computer by USB cable in order to activate the Serial Monitor.

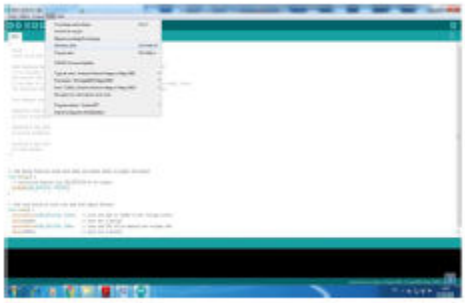

Figure 4: Serial Monitor Window

IV. PROPOSED WORK

Construction sites often create dangerous situation for workers as they work in close proximity with the equipment. In this Project, we present a Distance warning system developed to address this issue and enhance safety at construction sites. . This proposed technology helps to alert workers and equipment operators from hazardous situations. When the radio frequency identification (RFID) sensor detects an approaching worker, the main board instantly shuts down the excavator to prevent accident. Our system contains an RFID tag, RFID reader, alarm device, camera, a display device (the Around View Monitor), and excavator control technology.

Methodology

A warning system is used to detect the presence of worker/workers and to warn heavy equipment operators and is highly needed to prevent collision accidents at construction sites. In this Project we had developed a construction safety system, which can activate warning devices and automatically halt heavy equipment, to prevent possible collision accidents. The ultrasonic sensor will calculate the distance. The buzzer is used to indicate the presence. The switch is provided to turn off the alert system.

V. PROPOSED WORK

The Project is based on alert system for excavators. The process includes the measurement of distance between the obstacle and the hand of the JCB machine. This system alerts the driver in case of very close and accurate excavation process.

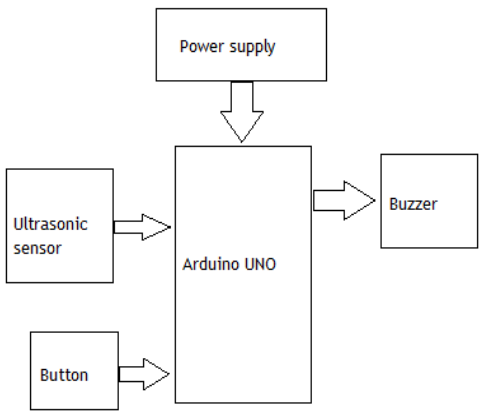

Figure 5: Block Diagram of the Proposed Work

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- We present a distance warning system developed to address this issue and enhance safety at construction sites. The proposed technology functions in real time to alert workers and equipment operators of hazardous proximity situations.
- It is widely applicable in small construction fields alongside excavators and other equipment because this system does not require additional communication infrastructure, such as servers.

VI. IMPLEMENTATION AND RESULT

Figure 6: Image of the proposed work

VII. CONCLUSION AND FUTUREWORK

Heavy equipment is widely used for construction jobs of almost any size, in commercial and civil sites. They usually cover a broad range. Earth movers and other heavy equipment not only help to speed up the earth work but also for materials handling, demolition, and construction. There are many types of heavy construction equipment on job sites.

There are few scientific evaluation data for construction safety technologies such as proximity detection and alert systems including limited testing methods for evaluating these systems. Minimal information and data currently exist to evaluate how existing construction safety technologies can be implemented to warn construction personnel of the presence of hazardous proximity situations. In future this can be implemented with the help of Artificial Intelligence research.

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