INDUSTRIAL SAFETY DEVICE FOR EMPLOYEES IN OVERHEAD BRIDGE CRANE USING RF MODULE

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ABSTRACT: *Industrial automations are mostly dependent on machines and tools. Crane plays the major role in lifting, loading and unloading cargos. On an average 70% of the industrial accidents occurs due to cranes which leads to death of the workers working there. Cranes are mostly used in building construction, industries and so on. OSHA's analysis of crane accidents in general industry and construction identified an average of 71 fatalities each year.The proposed system controls the crane uses wireless technology and microcontroller with ATMEGA328 processor with switches and relay. In this system the wireless remote consists of two sections namely transmitting section and receiving section namely RF transmitter and RF receiver. The various switches in the remote controls the movements of crane like forward, reverse, and emergency stop button. The control pendant technology which was used earlier resulted in short circuit and decreased the safety of the plant. In order to maintain safeness of workers and environment and to overcome the above-mentioned problem wireless remote control is proposed.*

KEYWORDS: Cranes, RF transmitter, RF receiver, ATMEGA328 processor Wireless remote.

INTRODUCTION:

Cranes are widely used in industries, railways, harbor, loading and unloading cargos, and in lifting heavy loads. This paper proposes an intelligence device namely wireless remote to control cranes. The data transmission between transmitter and receiver is done by using ATMEGA328 microcontroller. Wireless technology is a prime concern in our day- to-day life. It also benefits all the fields' namely industrial automations, military, building construction. It requires low costs for its installation, reconfigurations and maintenance. It suits mostly for distance communication which is the key beneficial of this technology. Apart from Bluetooth, Radio Frequency (RF) is a new technology in wireless communications. RF controller is an emerging short range and low-cost new technology. The frequency of RF is 2.4GHz. It is best suitable for switching operations of electric appliances from a distance. RF wireless remote (RF transmitter, RF receiver) is used to control the loads from a remote place.

AVR MICRO CONTROLLER:

The combination of software and hardware, in addition to mechanical and other parts designed to perform required functions is known as embedded systems. These systems are collaborated with other components of an enclosed system to execute specific activities and desired applications. They collect data from sensors and other computers continuously and process the data within real time constraints. The micro-controller used in this project is AVR (Advance virtual RISC micro-controller) which has high performance and low power 8-bit flash program memory. At cycle frequency of 1MHz it can execute 1million instruction per second. It has wide applications in embedded systems. It is a modified Harvard Architecture machine in which program and data can be stored in separate physical memory systems that appears in different address spaces. With the help of special instructions these physical memory systems can read data items from program memory. Program instructions are stored in non-volatile flash memory. It has three types namely, Tiny AVR micro-controller, Mega AVR micro-controller, Xmega AVR micro-controller. The Xmega AVR micro-controller is used in this project due to its extensive peripheral set with 28-100 pin package and 4-256 KB program memory.

AVR Micro-controller.

TRANSMITTER:

The transmitter has three main parts namely keypad, encoder and RF transmitter.

KEYPAD:

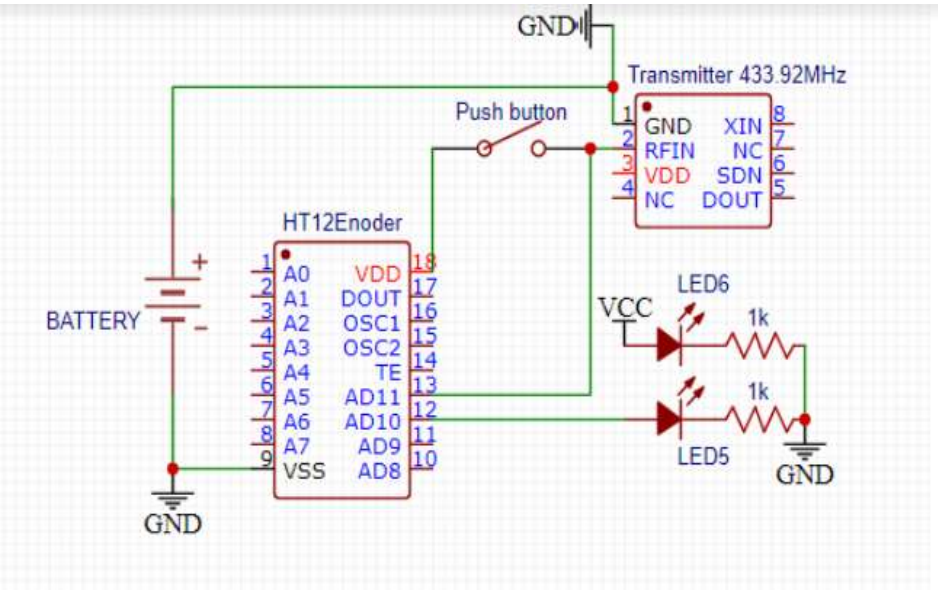
The keys in the keypad are used as the inputs for the desired motions of crane.

ENCODER:

The inputs from the keypads are encodes command in binary form. The commands are sent through radio waves to the receiver in order to avoid any other signal interferences in industries.

RF TRANSMITTER:

The working range of RF Transmitter in 434MHz which extends up to 100ft. It can travel thorough walls and furniture. The RF modules are generally fabricated using CMOS technology. IR remote requires direct line of sight to send signal, but RF does not require direct line of sight to transmit signal that corresponds to binary command of the button you opted.



Transmitter circuit diagram.

RECEIVER:

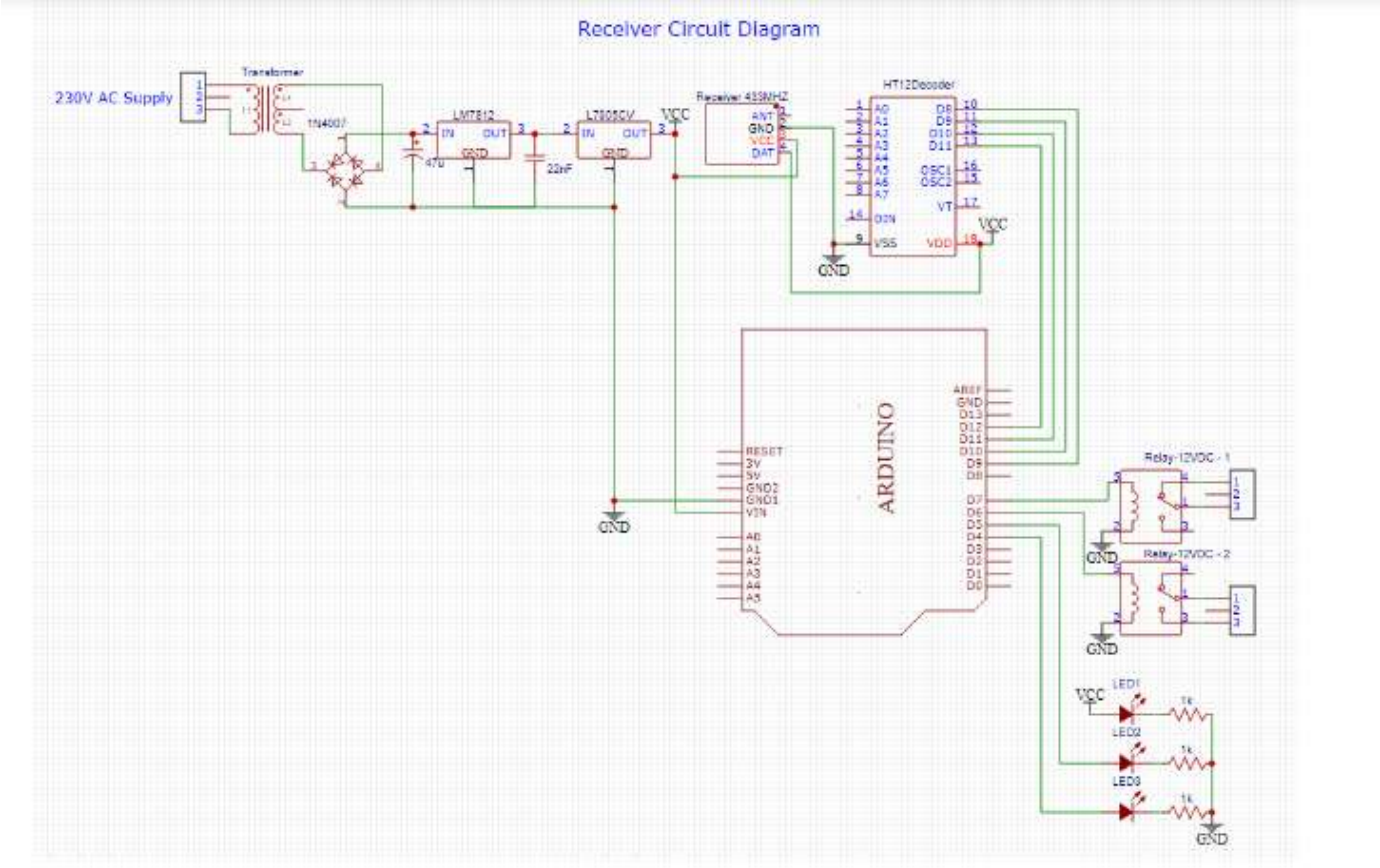
The receiver has 2 parts namely Decoder and RF receiver.

RF RECEIVER:

The working frequency range of RF receiver is 434MHz. It receives the signal transmitted from transmitter.

DECODER:

The decoder decodes the signal and passes to AVR micro-controller. It consists of driver motor circuits, AVR micro-controller, and mechanisms set-ups for the required movements and DC power supply. It has 28 pins with three main ports namely Port B, Port C, Port D. The digital 8-pins directional ports are port B and port D. Port C has 8 pins where pin 1 is reset bin and remaining seven pins are bidirectional analog ports. The micro-controller operates at +5v DC power supply. The micro-controller is interfaced with 3 driver circuits which consists of single pole double throw switch that rotates 3 motors. To rotate the crane in two distinct directions such as in clockwise and in anti-clockwise direction the single pole double throw switch. The motor is also interfaced with trolley mechanical set-ups for the front-back, left-right, up-down movements of the crane. Apart from main 6 movements it has emergency stop button when there is need to stop the crane in case of emergency, overload of crane i.e. more than the crane's capacity. The emergency button brings the entire operations of crane into halt and enhances the safety conditions of workplace and workers nearby.



Receiver circuit diagram

CONCLUSION:

In order to avoid the accidents occurs due to cranes in workplace due to unsafe conditions, this project is proposed to meet the required safe condition. The wireless remote control enhances the precision control of cranes movements, multitask and safe conditions. It reduces the risks at workplaces and can be used widely.

FUTURE SCOPE:

As many industries depends on cranes this system is highly beneficial for small scale and large-scale industries.

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