Wireless Remote Control for Electric Overhead Travelling Crane

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Abstract – Design of Wireless Remote Control for Electric Overhead Travelling Crane is proposed. This system is an intelligent for control Electric Overhead Travelling Crane using Wireless Remote. Proposed system designed based on Microcotroller 89S52 Processor with Zigbee, Control Switch and Relays. An 89S52 Processor system can be used for diverse industrial applications involved with a real-time wireless control. The crane can be controlled by using wireless remote consisting two different sections namely Transmitting section and Receiving section, the transmitting section consisting PIC microcontroller (Peripheral Interface Controller) it is remote circuit and the receiving section consisting AT89S52 microcontroller comes under crane side. The Zigbee is used as Wireless Link between transmitter and receiver circuit. Wireless Remote consist of various switches used for various movement of crane like forward-reverse movement, left-right movement, up-down movement and magnetizing and demagnetizing the electromagnet coil. When any switch is pressed from the remote side, the signals can be transmitted and received using Zigbee using 89S52 the command are process and accordingly the receiver side relay operate and gives the movement to the crane accordingly. In this fashion, direction of motion of the crane can be remotely controlled by wireless communication.

Index Terms – µC89S52 , Zigbee, PIC, EOT

1. INTRODUCTION

Electric Overhead Travelling Crane is widely used in various aspects of production activity, for instance, gantry crane issued in loading and unloading cargos in harbor and railway station, tower crane is used in hoisting building materials in construction site, etc. This equipment has special requirement to safety and control accuracy, while traditional wireless remote control system on sale possesses too simple structure, and its signal sending is unstable, also it has no judgment or emergency handling ability when encountering emergent situations, so various crane systems mostly need field operation of specialized workers at present. In this paper, an intelligent control system of Six-way wireless crane with simple emergent situation handling ability is designed based on Zigbee technology, and it uses 89S52 Microcontroller and PIC Controller with Zigbee. Moreover, installation of this system is simple, and field real-time control of crane can be achieved by simply mounting receiving control unit on original equipment, thus workload of operator is reduced, hoisting precision and speed of equipment are enhanced, and working efficiency is improved enormously. [1]

2. METHODOLOGY

A. Proposed Architecture

The system is composed of two parts, namely Transmitter and Receiver. First part consist of Transmitter is wireless remote control transmitting terminal, while second part consist of receiver is wireless remote control receiving terminal which is used in controlling crane action directly using 89S52 microcontroller.
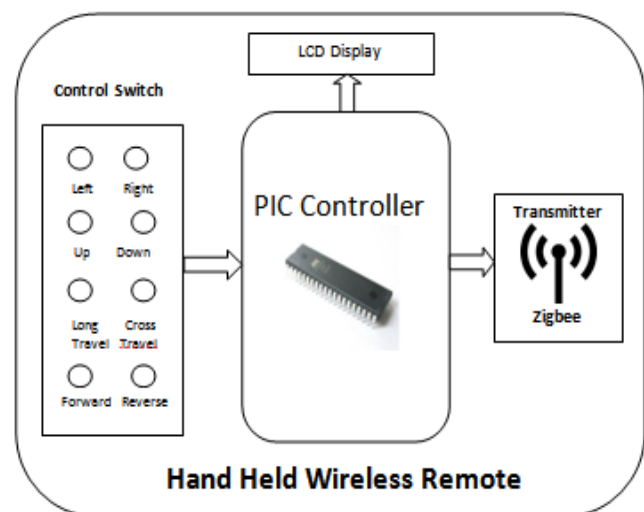

Figure 1: Block diagram of Hand Held Wireless Remote (Transmitter)

The transmitter section consists of keypad, Zigbee, PIC16F628A, power supply with 9v battery. Transmitter connects with independent Six bit keys to perceive instructions of operator and it is interfaced with PIC16F628A.The Six buttons on the keypad are used for the movement of the crane in left-right or up-down direction. Every key has a unique control like up key is used to move the crane in upward direction and down key is used to move the crane in downward direction and left and right keys are used to move the crane left and right direction respectively. The zigbee in the block diagram is the communication protocol the purpose of the wireless communication protocol is to provide communication between control application and keypad. Zigbee is interface with IC. Whatever input will be given to the transmitter through keypad will pass through the zigbee to the receiver. The power supply is used to provide power to zigbee and IC. The 9v of power supply is battery given by the battery. And thus the data is transmitted by the zigbee module of transmitter to the receiver section.

Figure 3: Block diagram of Crane Side Controller (Receiver)
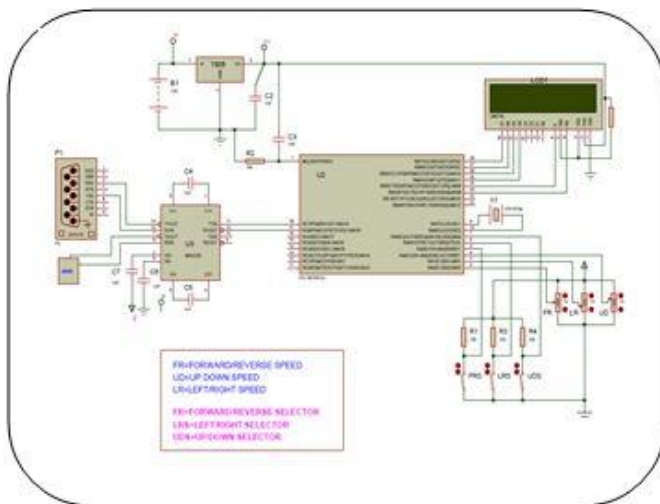

Figure 2: Circuit Diagram of Hand Held Wireless Remote (Transmitter)

The Receiver Section consist Zigbee, PIC16F628A, PIC 89S52 Controller and Six-bit relay group to control crane action. The Zigbee possesses multipoint communication ability, so one remote control can control hoisting of several cranes without interfering with each other. During operation of the system, the PIC Controller receives the signal from zigbee. Action of pressing any key at transmitter shall illustrate that action instruction should have been sent out by remote control operator at this time PIC Controller shall code instruction rapidly and accordingly the relay energized and movement of crane can be controlled in real time. [1]
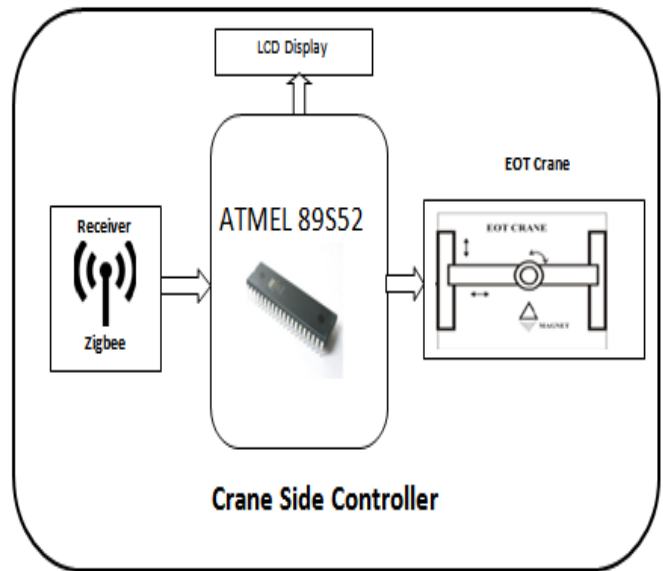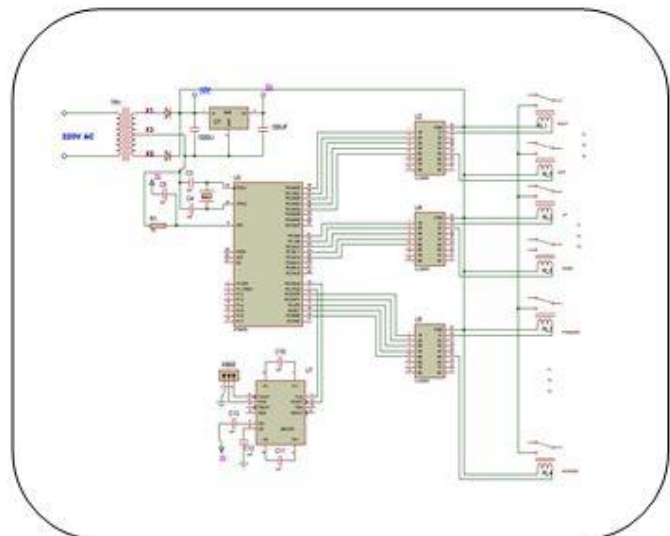

Figure 4: Circuit Diagram of Crane Side Controller (Receiver)

B. Zigbee

There are various wireless control and monitoring applications in home environments and industries which needs lower data rates, longer battery life and lower complexity than the existing standards. For these type of wireless applications, a new standard has been developed by IEEE which is called IEEE 802.15.4 This new standard is also named as ZigBee. Moreover, to fulfil the demand of consuming low power and low speed in wireless communication devices, a new wireless technology ZigBee comes as per the requirement of time.

ZigBee is named for erratic zigzagging patterns of bees between flowers which symbolizes communication between nodes in a mesh network. Network components of ZigBee are analogous to queen bee, drones and worker bees. [11]

Figure 5 : Physical Layer of Zigbee Module [12]

3.   SOFTWARE

Keil IDE is a windows operating system software program that runs on a PC to develop applications for 89S52 microcontroller and digital signal controller. IDE provides a single integrated environment to develop code for embedded microcontroller.

Figure 6: Interfacing flow of Keil compiler [13]

Keil µVision4 IDE (Integrated Development Environment) is a Windows based front end for the C Compiler and assembler. KeilµVision4 is used for writing embedded C programs.

Embedded C is a high level language. Standard libraries are modified or enhanced to address the peculiarities of an embedded target processor.
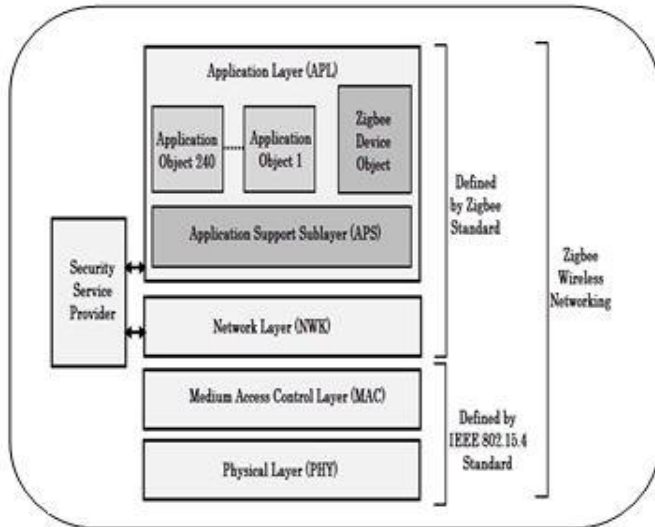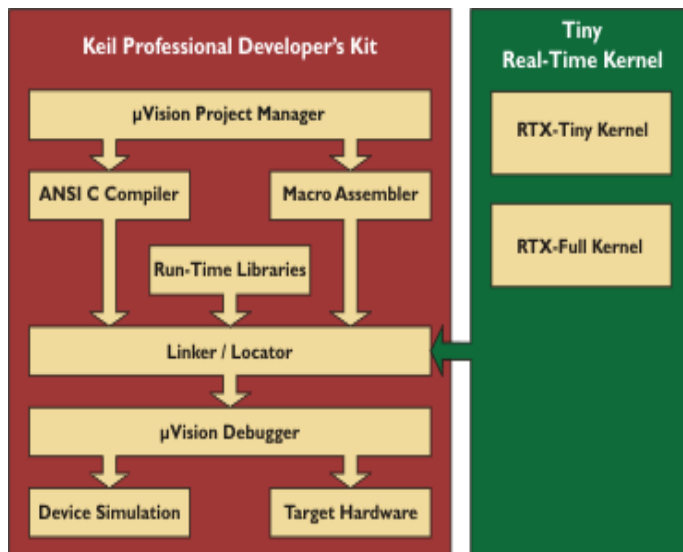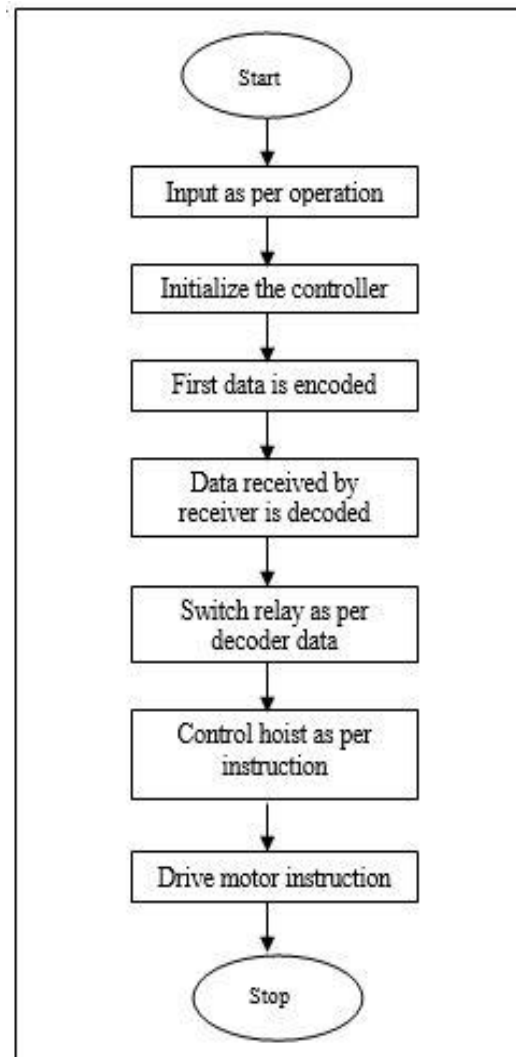
4.   IMPLEMENTATION

Figure 7: Process Flow

5. CONCLUSION

Design of Wireless Remote Control for Electric Overhead Travelling Crane is proposed necessary mighty functions to developing fast and efficient application. System performs real-time controls of Electric Overhead Travelling. High precision Control can be achieved by the microcontroller system. The Microcontroller System provides a platform for diverse control and acquisition applications and factory automations. The system is able to deal with Multi-Tasks this enhances the reliability of the control system and reduces the risks. In addition system uses technology wireless remote

control using Zigbee. Thus, the system is compact system and reduces the cost that is useful for industrial applications. As system is generic solution it becomes easy to provide machine to machine communication. This design can be used widely in remote data control.

6. FUTURE SCOPE

As Cranes are widely used in industries and at construction sites. And as it is wirelessly controlled so it has a great future ahead at small scale as well as large scale level, because wireless crane is replace the part of the PLC controller by zigbee module. Which save the cost of PLC controller and wiring cost in less investment it can be implement. In future it can be controlled and monitor in real time form remote location by using wireless sensor network.

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