

Surveillance Robot Using Zigbee

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Abstract— Disasters like earthquakes, tsunami, bomb explosion and floods often cause loss of precious human lives. Rescue operations are performed mostly by human often in very dangerous and risky conditions. Hence, to make the rescue operation more safe and effective, mobile robots have been proposed which detect live human beings and wirelessly communicate with the rescue team. This work aims to develop an economical robot, which works using human detecting and obstacle sensors. It can be used in areas where rescue is needed. The robot senses the human body temperature using PIR sensor and alarm/indicator indicates the signal when it detects live body and the message is sent to enable rescue operation using zigbee. Additionally a wireless camera will be fixed in the robot which can capture the environment and it can be viewed by audio video receiver.

Keywords— Robot, Motor, Sensors, PIC controller, Zigbee, camera.

Introduction

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. People are trapped in natural calamity like earthquake, flood, building destruction in many places. Design a mobile rescue robot using sensor a wireless camera to help those people on time. The mobile robot can b control using the remote control and human detection sensor can b us for detecting the human and wireless camera will transmit the audio and video of the environment. So the rescue team can reach the place on time to rescue the trapped people. The audio and video transmitted by the wireless camera can be received by an audio video receiver. It is connected with the television.

I. EXSISTING METHOD

Many areas of world are getting affected due to natural calamity. Disasters are exceptional & unstoppable events that are either man made or natural, such as terrorist attacks, earthquakes, wildfires and floods etc. Disasters create emergency situations to provide basic services to the victims must be coordinated quickly. Many times we observe that many people dies by trapping in these disasters but the people also dies on large scale just because they didn't get help at instant time or the help provided to them is late. This paper propose an mobile robot based on Wireless Sensor Network (WSN) which is designed for human existence & detection in an unmanned area can be done only by an automated system. This system proposed a monitoring system using sensors unit

and camera module to recording, analyze conditions of human body and transmit data. Mobile robots perform cooperative Simultaneous human body localization function and communicate over the WSN. The main objective of this Paper is to rescue more & more number of people from the adverse condition.

II. PROPOSED METHOD

People are trapped in natural calamity like earthquake, flood, building destruction in many places. Design a mobile rescue robot using sensor a wireless camera to help those people on time. The mobile robot can b control using the remote control and human detection sensor can b us for detecting the human and wireless camera will transmit the audio and video of the environment. So the rescue team can reach the place on time to rescue the trapped people. The audio and video transmitted by the wireless camera can be received by an audio video receiver. It is connected with the television.

1. Transmitter section

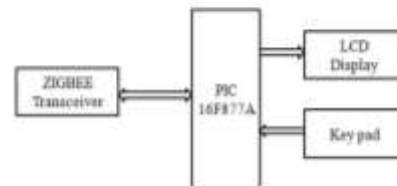


Fig.1 Transmitter Block Diagram

2. Receiver section

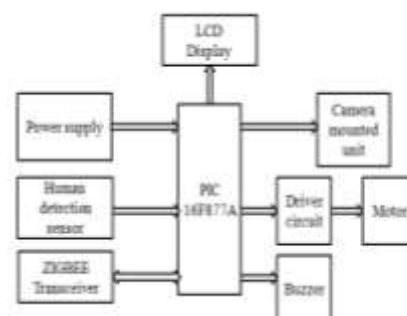


Fig.2 Receiver Block Diagram

3. Audio video receiver section

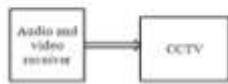


Fig.3 AV receiver Block Diagram

PIC is the main module of the project. A power supply is given to the PIC through a DC battery of 12V. Metal detection sensor is connected with PIC for detecting human beings in the affected area. Two DC motors are connected through a driver circuit for the movement of the robot. The purpose of connecting driver circuit is to amplify the signal from the PIC to drive the motors. Zigbee transceiver is used to communicate between the transmitter module at the user and the receiver module which is located in the affected area. Buzzer is connected for making sound if a human being is detected. Keypad is used for making movement of the robot in all the directions.

A. PIC16F877

The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS that uses separate bus for instruction and data allowing simultaneous access of Program and data memory.

The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main

Advantage of CMOS is that it has immunity to noise than other fabrication techniques. Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed.

The power supply is given to the controller is +5v, it will operated in +5v only. Here we are interfacing LCD display with the controller. It is 40 pin controllers. It consists of 5ports namely port A, port B, port C, port D and port E.

Each port has different number of pins.

- Port A have 6pins(RA0-RA5)
- Port B have 8pins(RB0-RB7)
- Port C have 8pins(RC0-RC7)
- Port D have 8pins(RD0-RD7)
- Port E have 3pins(RE0-RE2)
- VDD is for power supply
- VCC for to ground.

For clock input and output for 2pin is used (CLK IN/OUT).

For LCD interfacing, LCD data line is taken from the port B (0-7), for data line given to LCD. Here we are using trimpot variable resistor. This resistor is used for adjustment of LCD brightness.

Crystal oscillator is used for producing clock pulse. There are different types of oscillators like RC, LC etc; some of the oscillator produce clock pulse which is varies with voltage, temperature fluctuations. Only crystal oscillator produce stable clock pulse, it does not vary with the voltage fluctuations. We never get accurate operation of controller if clock pulse is not stable.

Then the port A port C is used for input/output purpose. Input/output is taken from the port. Data are given to the controller through input ports. Port RE (0-1) is for read and write. RD (0-7) is also for input.

B. Passive infrared

Most of the PIR-based methods follow a strictly geometric formulation, where the path of each person is calculated deterministically from intersecting sensing areas as in [Shrivastava et al. 2006]. More and more, however, PIR tracking approaches have been using data-inference tools such as Kalman or particle filtering [Schi_ and Goldberg 2006]. Shankar et al. construct spherical sensor nodes composed of multiple PIR sensors pointed radially away from the sphere's surface [Shankar et al. 2006]. This allows the bearing of a person to be estimated from the direction of the PIR sensor that detected them. Using several of these multi-PIR sensor nodes placed on walls, the authors show it is possible to detect and localize a moving person. Of course, occlusions become a dominating issue as the number of people in the environment increases. The main disadvantages of PIR sensors are: (1) they cannot detect people who are stationary, thus leading to a large number of false negatives; (2) their output is highly bursty. These issues are largely ignored by the vast majority of PIR-based research by limiting their system to single-person scenarios and/or assuming people are always moving.

C. Zigbee

The mission of the ZigBee Working Group is to bring about the existence of a broad range of interoperable consumer devices by establishing open industry specifications for unlicensed, untethered peripheral, control and entertainment devices requiring the lowest cost and lowest power consumption communications between compliant devices anywhere in and around the home. The ZigBee specification is a combination of Home RF Lite and the 802.15.4 specification. The spec operates in the 2.4GHz (ISM) radio band – the same band as 802.11b standard, Bluetooth, microwaves and some other devices. It is capable of connecting 255 devices per network. The specification supports data transmission rates of up to 250 Kbps at a range of up to 30 meters. ZigBee's technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power.

1. Dual PHY (2.4GHz and 868/915 MHz)
2. Data rates of 250 kbps (@2.4 GHz), 40 kbps (@ 915 MHz), and 20 kbps (@868 MHz)
3. Optimized for low duty-cycle applications (<0.1%)
4. CSMA-CA channel access Yields high throughput and low latency for low duty cycle devices like sensors and controls
5. Low power (battery life multi-month to years)

D. Relay

A relay is a switch worked by an electromagnet. It is useful if we want a small current in one circuit to control another circuit containing a device such as a lamp or electric motor which requires a large current, or if we wish several different switch contacts to be operated simultaneously. When the controlling current flows through the coil, the soft iron core is magnetized and attracts the L-shaped soft iron armature. This rocks on its pivot and opens, closes or changes over, the electrical contacts in the circuit being controlled it closes the contacts. The current needed to operate a relay is called the pull-in current and the dropout current in the coil when the relay just stops working. Relay driver circuit is used for on / off control of relay, it acts as a switch, normally open relay is used. Relay function is derived by controller unit. Relay working current is 40 ma. When the controller unit output is low relay should be in off condition. When the controller unit output is high, relay should be ready for doing specified function.

E. Liquid crystal display (LCD)

Liquid crystal displays have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

F. Keypad 4

Here we are going to interface the keypad (4) with the microcontroller. The diagram below shows how to interface a digital input (i.e. either high or low) to TTL. When the digital input is HIGH the transistor will be turned on. This results in a direct path from the port pin to ground, therefore the pin is logic 0. When the digital input is LOW the transistor is off which means there is no path for current from the collector to the emitter, therefore the port pin will read 5V. This circuit results in logic inversion, but this should not be a problem as

inverting the port pin through software is very easy. When the transistor is on the port pin is connected directly to ground. Therefore there is a path for the 1.6 mA from the port pin (TTL current when input is LOW). The 10 K emitter resistor ensures the current from the supply is kept low, an important consideration in battery powered devices. When the transistor is off the port pin is at 5 V (in reality it will not be exactly 5V because a transistor is never fully off and a small current will flow through the emitter resistor, resulting in a small voltage drop across the resistor - but the voltage level on the resistor will still be close to 5 V). Since there is very little current flowing, power consumption is kept low. Also, as mentioned above, a TTL input draws very little current when a HIGH is applied to it, so this circuit satisfies the requirements of a TTL input and keeps power consumption at a minimum.

G. Power supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

III. CONCLUSION

A robotic model with 360 degree movement has been designed which can be operated using a keypad. It detects the human and sends the information through Zigbee to the operator. The environment is captured and transmitted through a wireless camera and it can be viewed using audio video receiver and television. The model can be used as security purpose and in military applications for surveillance.

References

- An autonomous wireless sensor network deployment system using mobile robots for human existence detection in case of disasters Ad Hoc Networks 13 (2014) 54–68
- Sandeep Bhatia, "Alive Human Body Detection Using Autonomous Mobile Rescue Robot spireacademicexcellence.com/documents/Mr. SandeepB hatia.pdf"
- A joint network for disaster recovery and search and rescue operations journal homepage: www.elsevier.com/locate/comet 2012
- Alive human body detection system using an autonomous mobile rescue robot India Conference (INDICON), 2011 Annual IEEE
- Research on human body detection methods based on the head features on the disaster scenes Systems and Control in Aeronautics and Astronautics (ISSCAA), 2010.
- "The Microcontroller and Embedded System" by Muhammad Ali Mazidi Chen Xiaojuan, Bu Leping "Research of Fire detection Method Based on Multi-sensor Data Fusion" 2010, IEEE.