

Human Surveillance and Landmine Detecting Robot using Labview

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Abstract - Embedded system is an emerging field with immense applications in Science and Engineering. Right from the ancient times, the foot soldiers has fought and won the battle for the victor. The designed ROBOT is a portable virtual machine. Communication between ROBOT and the Control Unit is performed through Radio Frequency (RF) Communication. The system is the first of several such programs that are looking at revamping the infantry soldier's gear. The system basically has two modes. The automatic mode is the first mode and the user control mode is the second mode. ROBOT is controlled with the help of control unit. The automatic mode uses face recognition technique to combat intruders. In certain unavoidable circumstances the control comes to user who can control the operations of the robot from remote location using a computer. The system can also be used to detect and defuse the bombs along with terrain climbing. The robotic system is remote controlled. Thus the aim is to provide a robotic system that can combat in wars and other military purposes.

Keywords - Multipurpose Robot, Military, Bomb Detection and Diffusion.

I. INTRODUCTION

Right from the early stage millions of humans have fought for their country and have lost life. Here in my paper this issue is taken up to build a robotic system which can combat in wars and fight with the intruders. The first thing in the paper is to identify the intruders which are being carried out by using facial recognition technique. The robot not only fights it detects bombs and diffuse them. The robot also has the capability of detection and diffusion of the fire.^{[1][2]}

Embedded systems are controlled by one or more main processing cores that are either microcontrollers or digital signal processors (DSP). Hence, this project is designed using the concepts of embedded systems. Embedded Systems are mostly Processor and controller based like General Processors, Micro Processors, DSP and Microcontroller. In this paper, the 8951 Micro controller is used^[6].

Radio Frequency (RF) transmission uses radio waves like radio or television signals to transmit audio via a carrier from a transmitter to a receiver. The transmitter has an antenna attached to the transmitter unit which needs to be positioned to cover the listening area. Small hand held portable transmitter usually will have a built-in antenna. The receiver units are either single channel or multichannel and they receive the modulated radio waves and convert them back into an audio signal which is

sent to the headphone output. Radio frequency (RF) is a rate of oscillation in the range of about 30 kHz to 300 GHz, which corresponds to the frequency of electrical signals normally used to produce and detect radio waves. However, since the antenna will pick up thousands of radio signals at a time, a radio tuner is necessary to tune in to a particular frequency (or frequency range). This is typically done via a resonator with a capacitor and an inductor forming a tuned circuit. The resonator amplifies oscillations within a particular frequency band. Often the inductor or the capacitor of the tuned circuit is adjustable allowing the user to change the frequencies at which it resonates.

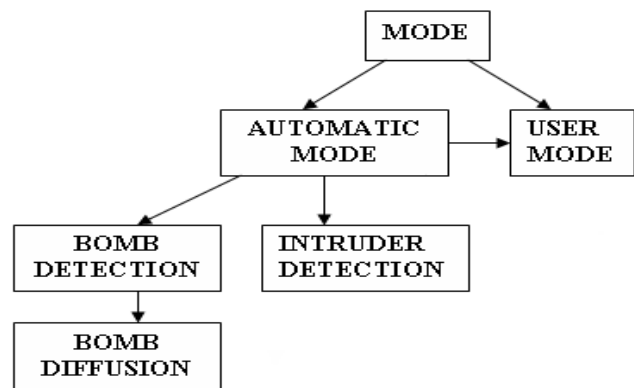


Fig 1: Process diagram

II. EXISTING SYSTEM

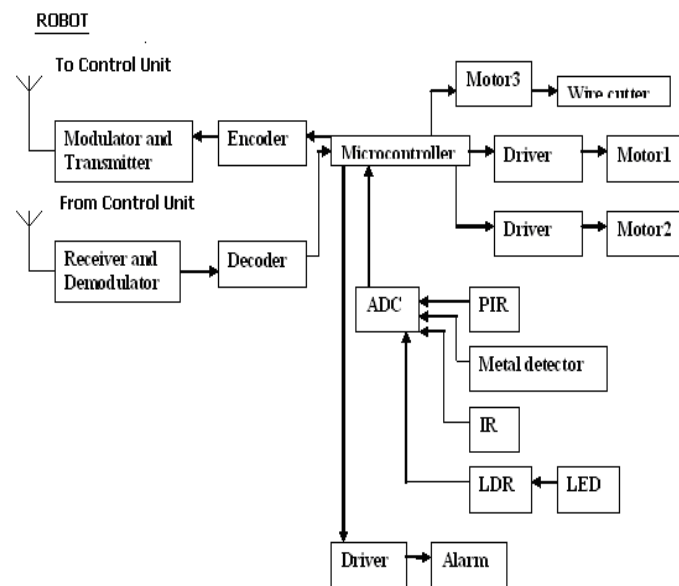
There is much advancement in the field of engineering, robotics in particular. Many robotic systems have been developed for various purposes. There are robotic systems which can be. The vision system is used to carry out human detection and tracking. The motion system is built by using embedded used for defense purposes. In addition to these advancements there are robotic systems which can combat in war times. This robot is named "Security Warrior" and consists of five systems including vision, motion; robot arms, power estimation and remote supervisesystems and used to achieve motion planning in real time. One of the main things to be noted is that all that have been discussed above is only under R & D (US DEFENCE) and are intended to be implemented by 2015.

III. PROPOSED SYSTEM

Here in the existing system there are only remote monitoring for robots. Here in my system the robot is controlled from remote location in addition to remote monitoring (i.e. User Mode). The system also has an automatic mode in which it can take its own decision for combating. In addition to this features like bomb detection, bomb diffusion, fire detection, intruder detection are included. Thus our system is more reliable to combat the enemy than the existing system. The robot is controlled from remote location by using a computer. The robot is also capable of detecting and diffusing the bombs more quickly. It can either be done through automatic mode or by user mode. The system also contains fire detection module and intruder detection module which is being carried out by using facial recognition techniques [7].

IV. OBJECTIVE

The main objective of the project is to design an explosive removing robot. It is a kind of unmanned wheeled equipment to dispose dangerous explosives. The robot also aims to determine the presence of intruders which is being carried out by using facial recognition technique. The presence of humans will be informed to the user through the RF transmission. The robot not only finds the intruders but it detects bombs and diffuses them. The robot also has the capability of detection and diffusion of the fire.



CONTROL UNIT

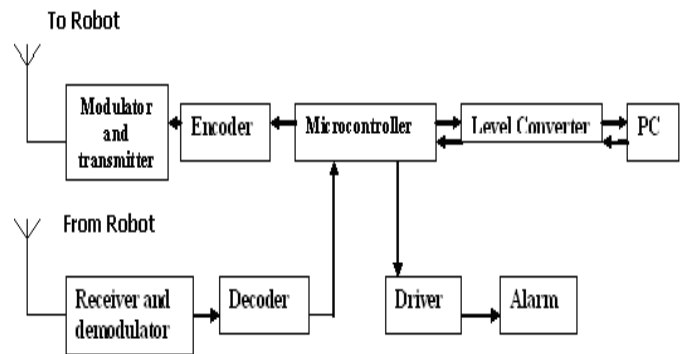
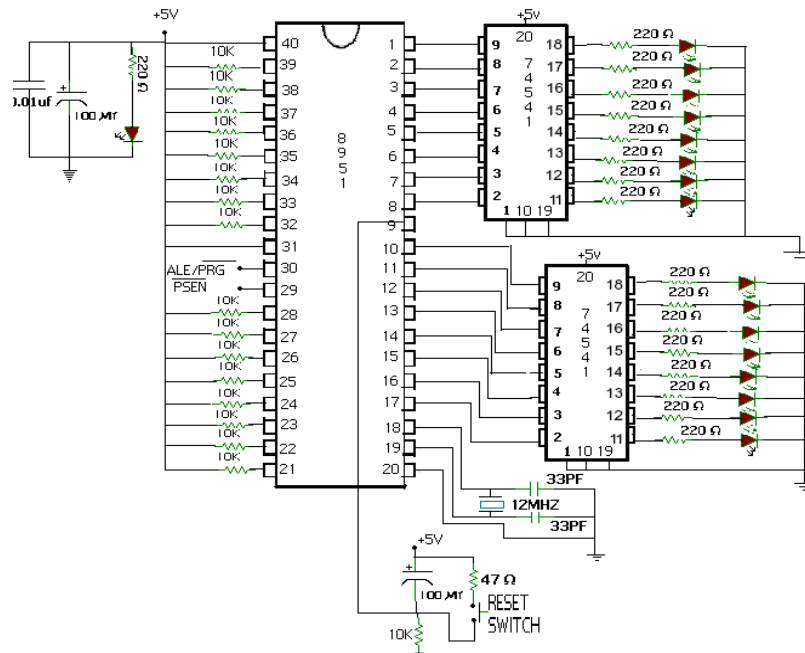


Fig 2 : Block diagram of Human Surveillance and Landmine Detecting Robot Implementation

V. HARDWARE REQUIREMENTS

A.. Microcontroller

Microcontroller is a microprocessor with memory unit [6]. The Microcontrollers that are used in the Main Station and the Robot is ATMELE 89S51. Micro controller can control external signals of Fire sensor, PIR sensor, Robot, Control Unit [6].



.Fig 3 : Microcontroller 89S51

B. PIR Sensor

The Robot will have the PIR sensor, which will help to detect the alive human beings. The human body radiates infrared waves with wavelengths of 8 to 12 micrometers. Whenever any human being comes in the vicinity of the system the IR system gives the

Signal. A Passive Infra Red sensor (PIR sensor) measures infrared (IR) light radiating from objects in its field of view. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source^[7]. All objects emit black body radiation which is infrared radiation that is invisible to the human eye but can be detected by electronic devices. The term *passive* means that the PIR device does not emit an infrared beam but passively accepts incoming infrared radiation. “Infra” meaning below our ability to detect it visually, and “Red” because this color represents the lowest energy level that our eyes can sense before it becomes invisible^[7].

C. Automatic Mode and User Mode

In automatic mode the user has no control over the robot. The robot takes its own decisions and performs the required operation using AI. At unavoidable circumstances the control automatically goes to the user. In User mode the user has the full control of the robot. The user can control the robot from the remote location and perform the required operation.

D. Bomb Detection

Metal Detector can be used to Detect Bomb. The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces an alternating magnetic field of its own. If another coil is used to measure the magnetic field (acting as a magnetometer), the change in the magnetic field due to the metallic object can be detected^[9].

E. Bomb Diffusion

Bomb diffusion can be made in both the automatic and in the user modes. In the automatic mode the robot detects the bomb and diffuses it by disabling the circuitry of the bomb. In case of failure in automatic bomb diffusion the control automatically goes to user mode. Once the user gets the control he can diffuse the bomb from remote location^[9].

F. RF Transmission

Radio Frequency (RF) transmission uses radio signals to transmit audio via a carrier from a transmitter to a receiver. Like a radio station transmitter the transmitter has an antenna usually attached to the transmitter unit which needs to be positioned to adequately cover the listening area. Small hand held portable transmitter usually with have a built-in antenna. The receiver units are either single channel or multi channel and they receive the modulated radio waves and convert them back into an audio signal. Multichannel receivers will have a channel selector which allows a user to select a specific transmission channel.

1) RF transmitter:

The TWS-434 transmitter is used for short-range RF remote controls. The TWS-434 transmitter is placed inside a small plastic enclosure. The transmitter is given a power supply of 5V. The output power of the transmitter is up to 8mW at 433.92

MHz. The coverage area of the transmitter will be 400 foot in open area or in the outdoors and in indoor the coverage area will be about 200 foot. The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC. The input is given to the pin-2. The power supply is provided in the pin-3. The RF output is produced in the pin-4, where the antenna is connected.

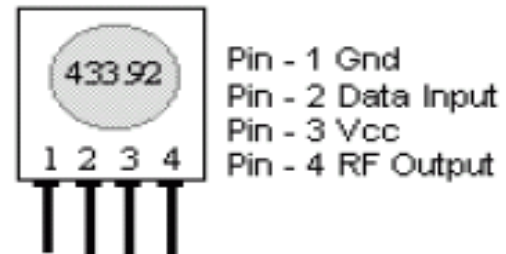
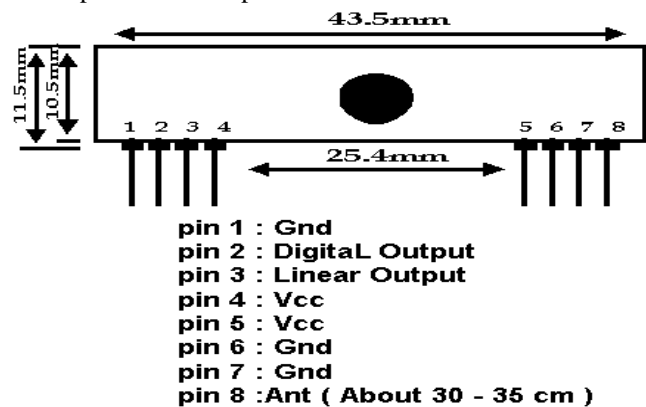


Fig 4: Transmitter Section

The transmitter transmits 4 words for each transmission of the signal. The 4 bit data from the pin 17 of the encoder moves to the data input pin of the transmitter and from there the data is transmitted through the antenna. The voltage consumed by the transmitter will be about 2.85v in the encoder. The carrier frequency is 433MHz.

2) RF receiver:

The receiver RWS 434 also operates at 433 MHz. The receiver has a sensitivity of 3μA. It operates at 4.5V to 5.5V. The output produced by receiver can be either linear or digital. The distance between the pin1 and pin 8 is 43.5mm. The distance between the pin4 and pin5 is 25.4mm. The digital output will reach the decoder from the pin2 and the linear output will be present in the pin 3. The receiver RWS 434 section is



used along with the HT-12D decoder IC for a 4-bit RF remote control system. For maximum range, the antenna size can be increased from 30-35cm.

Fig 5: Receiver Section

G. Fire Detection

LDR's are employed to sense the Fire and flame detection. Electronic optosensors are devices that alter their electrical characteristics, in the presence of visible or invisible light. Its

resistance varies according to the amount of light falling on its surface. It is a resistor whose resistance decreases with increasing incident light intensity. Light dependent resistors (LDRs) are made from cadmium sulphide containing no or very few free electrons when not illuminated. Its resistance is then quite high. When it absorbs light, electrons are liberated and the conductivity of the material increases. Its face diameter is 10mm.

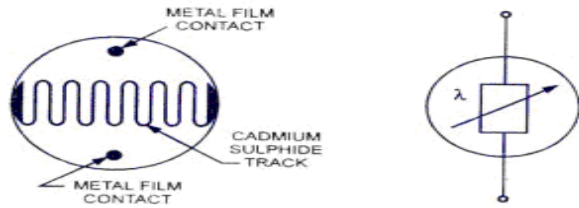


Fig 6 : Light Dependent Resistor and its symbol

Normally LDR senses all the lights. But in our case we have to sense only Blue and Yellow flame and reject sunlight and other luminaries. We have provided necessary circuit to reject ambient and luminaries lightings and senses only desired flame coloring.

H. Encoder

The encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information, which consists of N address bits and 12^N data bits. The encoders begin a 4-word transmission cycle upon receipt of a transmission enable (TE). This cycle will repeat itself as long as the transmission enable (TE) is held low.^[8]

I. Decoder

The 2^{12} decoders are a series of CMOS LSIs for remote control system applications. They are paired with 2^{12} series of encoders. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The 2^{12} series of decoders provides various combinations of addresses and data pins in different packages to pair with the 2^{12} series of encoders. The decoders receive data that are transmitted by an encoder. A signal on the DIN pin activates the oscillator, which in turn decodes the incoming address and data. The decoders will then check the received address three times continuously. If the received address codes matches with the contents of the decoder's local address, the 12^N bits of data are decoded to activate the output pins and the VT pin is set high to indicate a valid transmission. This will last unless the address code is incorrect or no signal is received. The output of the VT pin is high only when the transmission is valid. Otherwise, it is always low.

J. Analog to Digital Converter

ADC 0809 analog to digital converter is a successive approximation type analog to digital converter . The ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic^[10].

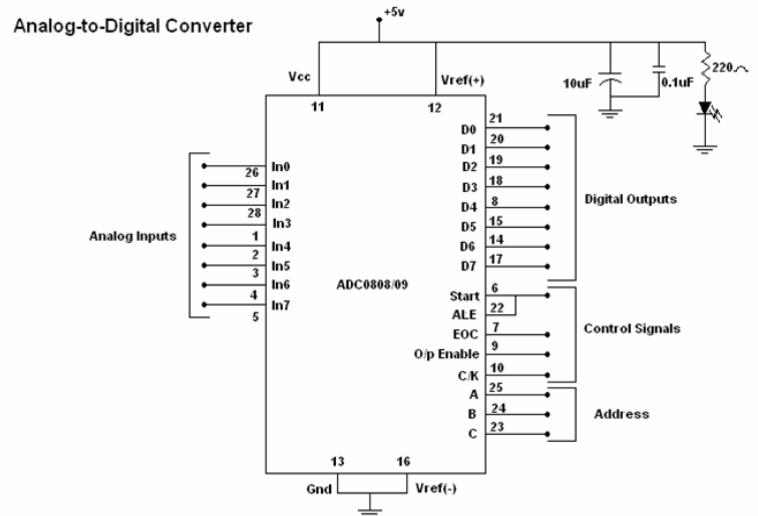


Fig 7 : Circuit Diagram of Analog to Digital Converter

K. Level Converter

When communicating with microcontrollers one needs to convert the RS232 levels down to lower levels, typically 3.3 or 5.0 Volts. Serial RS-232 (V.24) communication works with voltages -15V to +15V for high and low. On the other hand, TTL logic operates between 0V and +5V. Modern low power consumption logic operates in the range of 0V and +3.3V or even lower. Thus the RS-232 signal levels are far too high TTL electronics, and the negative RS-232 voltage for high can't be handled at all by computer logic. To receive serial data from an RS-232 interface the voltage has to be reduced. Also the low and high voltage level has to be inverted. This level converter uses a Max232 and five capacitors. The max232 is quite cheap. The MAX232 from Maxim was the first IC which contains drivers and receivers to adapt the RS-232 signal voltage levels to TTL logic. It became popular, because it just needs one voltage (+5V or +3.3V) and generates the necessary RS-232 voltage levels.

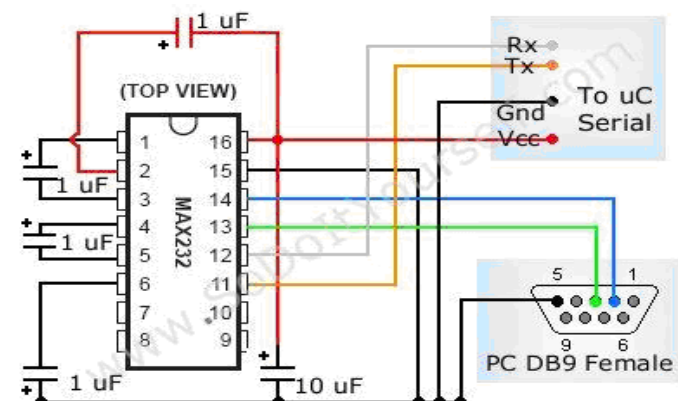


Fig 8: Circuit diagram of Level Converter

VII. CONCLUSION

The proposed system is aimed towards the welfare infantry to minimize the casualties to a great extent. This also helps on Intruder identification, remote bomb detection and bomb diffusion. Thus the ROBOT will be designed to trace intruders and hence it can also detect the guns and bombs that are in the combating places. On the other hand, the ROBOT in AUTO mode traces the fire accidents and transfers the information to the CONTROL UNIT. The movable and immovable objects can be traced using IR LED when operated in AUTOMATIC mode. This system is applicable in military, Hospitals, Hotels, Airports, Railway Stations, Restaurants and Educational Institutes. Hence, the robot is sure to create a revolution in its own field and ensure complete support from people of different societies.

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