



## WIRELESS DETECTION OF HEAT AND METAL IN A SUSPICIOUS OBJECT USING MICROCONTROLLER

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### ABSTRACT:

An intelligent system is mounted over the wheels. A micro controller is used to control all operations. All the AVR's are made compatible by single wire using USART via RF module and the I/O pins can be read or set using a protocol designed for sending and receiving instructions and messages from those places wherever any suspicious object is detected. The entire system is controlled using a remote which operates on radio frequency. For detection of bomb, it uses heat sensor as some chemical compositions in bombs produces heat. A specially designed lift mechanism is also employed for lifting the object and takes it to the safer place. A push out mechanism is also deployed for pushing the object out of the lifting tray which can also be used for detecting the temperature. A program for microcontroller for both ends is developed under Cygwin environment in the laboratory. A 12V battery is provided to power the MC to perform all the functions.

### INTRODUCTION:

An Embedded System is a combination of piece of microcontroller based hardware and typical software to undertake specific task. Embedded systems uses microcontroller to perform its own task. Embedded system prefers microcontroller as it contains RAM, EPROM, OSCILLATORS, TIMERS, COUNTERS are in built in microcontroller chip. So microcontroller reduces cost of product and space that gives more advantage in Embedded World. Many embedded products used in daily life Television, CD player, Palm Tops, Laptops, Washing machine, and so on. One of the most critical needs of an embedded system is to decrease the power consumption and space. This can be achieved by integrating more functions into the CPU chip.

### PART DESCRIPTION:

**Introduction to antenna-** An antenna is the most important part of any RF remote controlled device. An antenna should be properly tuned to the desired frequency, The antenna should have a good directivity and low SWR. The antenna's "HOT END" should be kept clear of any objects, especially any metal as this can severely restrict the efficiency of the antenna to receive power. Any

earth planes restricting the radiation path to the antenna will also have the same effect.

### **Introduction to RF module & Radio transmitter module-**

The Radio Transmitter module uses digital modulation technique called Amplitude Shift Keying (ASK) or ON-OFF Keying. In this technique, whenever there is LOGIC "1" to be

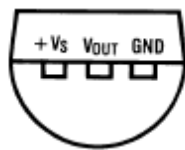
sent, only for that time the carrier is sent else nothing is sent for LOGIC "0". This modulated signal is then transmitted using antenna.

**Receiver-** This unit is highly sensitive receiver with range as long as 30 Feet without any problem. If a proper antenna is used then the range may be increased up to 30 mts. The radio receiver module receives the ASK signal and demodulates it to get back the address bits and the data bits.

### **Sensor-**

**Temperature Sensor-** Transducers convert physical data such as temperature, light intensity, flow, and speed to electrical signals. Depending on the transducer, the output produced is in the form of voltage, current, resistance or capacitance. The LM35 series are precision integrated-circuit temperature sensors,

whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 does not require any external calibration or trimming to provide typical accuracies. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, as it draws only 60  $\mu$ A from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a  $-55^{\circ}$  to  $+150^{\circ}$ C temperature range, while the LM35C is rated for a  $-40^{\circ}$  to  $+110^{\circ}$ C range ( $-10^{\circ}$  with improved accuracy).



**Fig. Plastic Package**

**DC motors-** This section begins with an overview of the basic operation of DC motors and interfacing with microcontroller AVR to control the direction of the DC motor. A Direct current (DC) motor is widely used device that translates electrical pulses into mechanical movement. In DC motor there only +ve and -ve leads. Connecting them to a DC voltage source moves the motor in one direction. By reversing the polarity, the DC motor will move in opposite direction. The maximum speed of a DC motor is indicated by RPM indicated and is given in the datasheet. The DC motor has two RPMs: no load and loaded. The no load rpm can be from a few thousand to tens of thousands. The rpm is reduced when moving a load and it decreases as the load is increased. DC motors have voltages and current ratings. The nominal voltage is the voltage for that motor under normal conditions, and can from 1 to 150V depending on the motor. As the voltage is increased the rpm goes up. The current rating is the current consumption when the nominal voltage is applied with no load from 25mA to a few amps. As the load increases, the rpm is decreased, unless the current or voltages

provided to the motor is increased, which in turn increases the torque. With a fixed voltage, as the load increases, the current (power) consumption of DC motor is increased. If the motor is overloaded then it will stall, and that can damage the motor due to the heat generated by high current consumption.

#### **SCANNING AND IDENTIFYING THE KEY:**

Figure shows the 4 x 4 matrix keyboard connected to the AVR micro controllers port A. If no key has been pressed, reading the input port will yield 1s for all columns since they are all connected to high (Vcc). If all rows are grounded and the key is pressed, one of the column will have 0 since the key provides the path to ground. It is the function of the microcontroller to scan the keyboard continuously to detect and identify the key pressed.

#### **GROUNDING ROWS AND COLUMNS:**

To detect a pressed key, the microcontroller grounds all the rows by providing 0 to the output latch, then it reads the columns. If the data read from the column is 1111, no key is pressed and the process continues until a key pressed is detected. However if one of the column bits has zero, this means that key

pressed has occurred. After a key press is detected the UC will go through the process of identifying the key. If the data read is all 1s, no key in that row is activated and the process is moved to the next row. It grounds the next row, reads the columns, and checks for any zero. This process continues until the row is identified. After identification of the row in which the key is pressed, the next task is to find out which column the pressed key belongs to.

#### **APPLICATION:**

This Embedded system can be used in Industries where there the object is to be shifted from one place to other, It can also be used in military applications such as finding the heat dissipating object and move it to the safer place such as BOMB etc. It can also be used in places where

there is a threat to the human life. Thus serving the purpose of providing the security to the human being

#### **FUTURE SCOPE:**

By interfacing the dedicated sensors such as QNR (Quadruple Nuclear Resonance) this robot can be made more efficient in detecting the suspicious or Dangerous objects such as RDX etc.

Chemical sensors can also be employed to detect the chemical composition in chemical industry where there is a heavy chance of accidents which can be avoided remotely which again in turn provides the security towards the human life.

The efficiency can also be increased by providing heavy torque dc motors so that the robot can be able to lift more weight and move the object accordingly.

It is likely that the program gets corrupted or there might be the requirement of modifying the program in the middle of the field, in that case a wireless BOOTLOADER provision is necessary to download the fresh program remotely.

#### **ADVANTAGES:**

- 1) Detects heat of various objects
- 2) Able to detect suspicious and hazardous object
- 3) Able to lift the object remotely and carry it to the safe place
- 1) Ability to communicate wirelessly with end user via remote control
- 2) Special mechanism to detect the heat as well as push the object out of carrying tray
- 3) Can communicate from a large distance (approx 400 fts through 3 fts antenna)

#### **DISADVANTAGES:**

- 1) IC L293d consumes 1.5 V, 7805 regulator IC consumes 1.5 to 2 v before application starts, therefore total of 3 -4 V is already reduced, Thus reducing the total power, due to which only two motors can be operated at a time, for more than two motors work at a time either battery of higher voltage or voltage doublers ckt has to be employed, which further increases the cost and complexity of the ckt as well as the weight which in turn reduces the efficiency.

- 2) The transmitter module has the tendency to transmit the wave packets when only +Vcc and is connected and no data is given to the transmitter.

#### **LIMITATIONS:**

- 1) Range of transmitter Receiver module is 30 fts without antenna, and 400 fts with antenna with min 4.5 V to 9 V
- 2) Max speed of DC motor without load 300 rpm with 12 V input.
- 3) Weight carrying capacity of lift mechanism 25 mg
- 4) Temp range -55° to +150°C

#### **CONCLUSION:**

With the available facilities and the infrastructure provided, the successful attempt of completing the project in the stipulated time using the AVR microcontroller was made. The testing of the project took a lot of time in the whole process. The demonstration was taken into account for transferring the entire string, as well as controlling the vehicle through remote. With the slight modifications it can also be used for lot many other different purposes also. The project proved to be an inexpensive to construct to the applications that it can provide. Given more time the same could have been developed with a lot of built features also

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