# DESIGN AND IMPLEMENTATION OF SSCBOT WITH HIGH SECURITY SYSTEM

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**Abstract: The proposed system introduces the architecture of a multiple application robot. Reduction of the human activities in dangerous environment is the first objective of employing the autonomous mobile robots in many applications. Explosive detection is a risky action that can be done by either human or robots. Wireless connection is established between the local host on the robot and general controller that is installed at the control center to handle the whole navigation procedure. A personal computer (PC) acts as the general controller which is responsible for monitoring. The camera is attached to the robot which continuously captures the surrounding areas and sends the same video data wirelessly with the separate channel to the control room simultaneously. If it detects presence of explosives or ordinances alarm/buzzer should be activated automatically, which alerts the control center people if there is any human error.**

**Keywords: Autonomous Mobile robot, Smart sensors, RF transceiver**

## I. INTRODUCTION

A robot is a virtual or mechanical artificial agent in practice. It is an electro-mechanical machine which is guided by computer or electronic programming and is thus able to do tasks on its own. Important feature of a robot is that by its physical looks or movements conveys a sense that it has intent of its own. The robotic industries association define robot as follows: "A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools or specialized device through variable programmed motions for the performance of a variety of tasks. Robotics is an increasingly visible and important component of modern business, especially in certain industries like automobile engineering, aircraft maintenance. Robotics-oriented production processes are most obvious in factories and manufacturing facilities, in fact approximately 90 percent of all robots in operation today can be found in such facilities [1]. Industrial robots were found almost exclusively in automobile manufacturing plants as little as 15 to 20 years ago. But industrial robots are now being used in research and development facilities, laboratories, hospitals, ware house, energy –oriented and other areas. Robots are programmed either by burning into ROM at once or by off-line programs. Most industrial robots are programmed by proprietary methods. This involves manually guiding a robot from point to point through different phases of an operation. The points of an operation are defined through host computer commands. This is referred to as manipulator level off-line programming. An important area of research is the development of off-line programming that makes use of higher-level languages in which robotic actions are defined by tasks or objectives[2]. The use of industrial robot is becoming more dominant. An industrial robot is used for monitoring the living conditions which include temperature, leakage of gases, humidity and explosives if any.

## II. EXISTING SYSTEM AND PROPOSED SYSTEM

*a. Existing system*

The existing system is pc operated robot but it doesn't have any camera, so we can't observe the surrounding areas of robot and it can't send the video data to the control room . It provides some limitations like the lack of guidance, scenario of the target locations.

*b. Proposed system*

In this proposed system the camera is attached to the robot which continuously captures the surrounding areas and sends the same video data wirelessly with the separate channel to the control room simultaneously. The robot developed can detect presence of explosives, bombs. If it detects any unwelcoming conditions, alarm will be automatically set, which alerts crew to vacate that area immediately. Here we are using separate channels for video transfer, to reduce the load on a particular wireless channel.

## III. BLOCK DIAGRAM OF MULTI-SENSOR ROBOT

The block diagram represents the hardware modules under use: 4 wheels, RF transceiver, MEMS sensor, GSM kit, GPS module, LCD module, metal detector and sets of batteries.

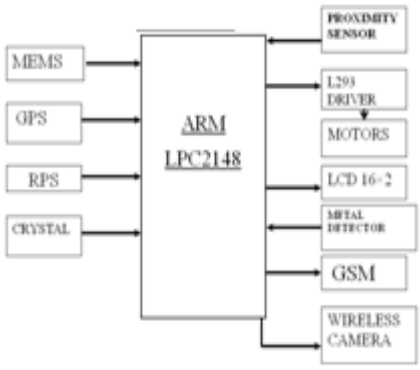


Fig: 2.1 Block diagram of Robot

*a. Description of block diagram:*

This system includes a computer and a RF transceiver for wireless communications among robot section and control & monitor section. The main working module of this robot consists of LPC 2148 ARM 7 processor. It is interfaced MEMS, GSM, GPS and mine detector sensor. The device framework of the robot works with L293D motor driving H-Bridge chips. Location of the robot is traced with camera and the RF transceiver is used to send the serial port data to the hyper terminal of the computer. MAX 232 is used as a connector device between the parallel ports of ARM 2148 communication to that of the RF Module.

## IV. ARM LPC 2148

The LPC 2148 is ARM based microcontrollers for embedded applications featuring a high level of integration and low power consumption. The ARM is a next generation core that offers system enhancements such as enhanced debug features and a higher level of support block integration. The LPC 2148 operates at CPU frequencies of up to 100 MHz The ARM CPU incorporates a 3-stage pipeline and uses Harvard architecture with separate local instruction and data buses as well as a third bus for peripherals.

The ARM CPU also includes an internal prefect unit that supports speculative branching. The peripheral complement of the LPC 2148 includes up to 512 kB of flash memory, up to 64 kB of data memory,general purpose DMA controller, 2 UARTs, 1 CAN channels, 2 SSP controllers, SPI interface, 2 I2C-bus interfaces, 8-channel 12-bit ADC, 10-bit DAC, motor control PWM, Quadrature Encoder interface, four general purpose timers, 6-output general purpose PWM, ultra-low power Real-Time Clock (RTC) with separate battery supply.

*a. ARM processor*

The ARM is a general purpose, 32-bit microprocessor, which offers high performance and very low power consumption. The ARM

offers many new features, including a Thumb-2 instruction set, low interrupt latency, hardware divide, interruptible/continual multiple load and store instructions, automatic state save and restore for interrupts, tightly integrated interrupt controller with wake-up interrupt controller, and multiple core buses which enables simultaneous accesses.

## V. DEVELOPED SYSTEM

The developed system is based on a communicating with a central station using GSM-GPS module (Figure 2). The robot is connected to different sensors, which gives analog voltage signals. These signals are measured and translated into the corresponding binary value. All of these values are send trough the RF Module to a base station, which stores the data into an Access Database. The Values can then be monitored using the personal computer.

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### a. 3-axes Analog Accelerometer ADXL335

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The sensor measures acceleration with a range of ±3 g.

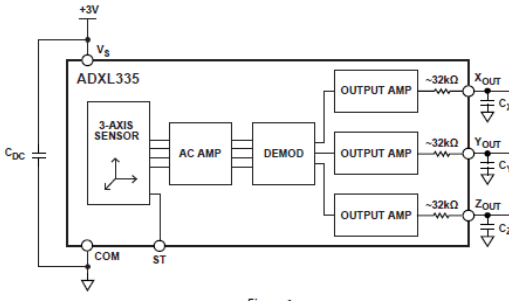


*Fig: 5.1.1MEMS*

The MEMS sensor is a complete 3-axis acceleration measurement system. It contains a polysilicon surface-micro machined sensor and signal conditioning circuitry and implements an open-loop acceleration measurement with respect to Earth's gravity. The output signals from module are analog voltages that are proportional to acceleration. The accelerometer can measure the static acceleration of gravity in tilt-sensing applications resulting from motion or vibrations caused on the sensor..

The sensor is a polysilicon surface-micro machined structure built on top of a silicon wafer. Polysilicon springs are suspended over the surface of the wafer and provide a resistance against acceleration forces. Structure's deflection is measured using plates attached to the moving mass and a differential capacitor that consists of independent fixed plates. 180° out-of-phase square waves are used to drive these plates. Acceleration deflects the moving mass making the differential capacitor unbalanced. This results in a sensor output whose amplitude is proportional to acceleration. Magnitude and direction are measured from the acceleration Phase-sensitive demodulation techniques.

### b. GSM module

GSM/GPRS RS232 Modem from is built using Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz It is compact in size and can be used as plug in GSM Modem. The Modem follows RS232 Level which allows for direct interface PC Serial port. The baud rate is configurable from 9600-115200 through AT command. Initially Modem is in Autobaud mode. The GSM modem has internal TCP/IP stack to enable internet via GPRS. It is suitable for SMS as well as DATA transfer application. The modem requires only 3 wires (Tx,Rx,GND) except Power supply to interface with microcontroller/Host PC. The built in Low Dropout voltage regulator allows wide range of unregulated power supply (4.2V -13V).

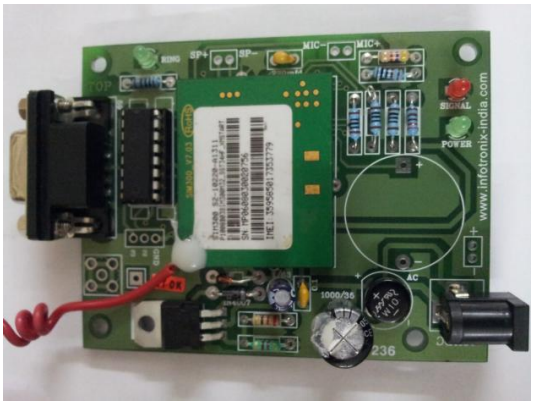

*Fig: 5.2 gsm Module*

c. METAL DETECTOR

In fact the *bomd/ordinance detector* is the most critical part in the Robot. The sensor detects the metal that is used inside an explosive. it can be considered as a metal detector. The type of metal detector on this Robot is pulse induction (PI) that exploits single coil configuration. Consequently only one search coil is fitted at the front of the robot. Diagram of the metal detector circuit is illustrated in Fig.

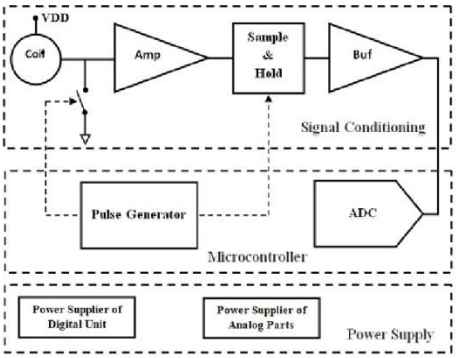


Fig: 5.4 Block diagram of metal detector

The main part of a PI detector is a MOSFET transistor as the coil switch, with a high current capacity and a high breakdown voltage [5]. A parallel resistor along with coil absorbs the energy stored in the coil to turn the coil current off instantly and it leads to energy dissipation in the form of heat.

d. RF CAMERA

The camera we are using in the project is the wireless camera which can transmit data and video using RF technology.

*Fig: 5.5 Block diagram of RF Camera*

*Specifications:*

Technical parameters of transmitting unit:

1. 1/3”- or ¼”-inch image sensor
2. System: PAL CCIR NTSC EIA
3. Horizontal definition: 380 TV lines

Technical parameters of receiving unit:

1. Wireless audio video receiver
2. Receiving frequency: 1.2G - 2.4G
3. Receiving signal: video, audio

e. RF TRANSCEIVER

RF is a new wireless technology developed by the RF Alliance to overcome the limitations of BLUETOOTH and Wi-Fi. RF is developed on the top of IEEE 802.15.4 standard. It is designed for low-power consumption allowing batteries to essentially last forever. Though we have couple of methods for multimedia applications, till now nothing was developed for sensor networking and controlling machines which require longer battery life and continuous working without human intervention. RF technology addresses this need in industry.

VI. OUTCOME AND ANALYSIS

In this project we have developed an environmental monitoring system using multi-sensor robot. Two sections are there, one is robot section and another one is monitor and control section. The main objective of this work is design

and implementation of multi-sensor versatile robot and results proved it.

For monitoring and controlling the robot the RF is connected to the PC with the help of serial communication. Now the software Tera Term is installed and the camera is attached to the robot which continuously captures the surrounding areas & sends the same video data wirelessly with the separate channel to the control room simultaneously. If it detects any dangerous conditions like high temperature and bomb, it will alert the host computer..

Fig .6.Robot section developed for detecting explosives

The developed robot sections include processor, RF, MEMS sensor and battery. the processor is interfaced with GSM-GPS,LCD and metal detector. For robot movement the H-Bridge[4] is connected to the port. For communication between control and monitoring the module RF is connected to the processor by using MAX-232.

## VII. CONCLUSION AND FUTURE SCOPE:

The proposed system detects any hazardous conditions leakage of gases and bombs , alarm can be activated manually and automatically, which alerts people to vacate that area immediately. The robot consists of LPC 2148 processor. It is interfaced with MEMS, GSM,GPS and metal detector. For robot movement the H-Bridge is connected to the port. For the communication between control and monitoring and robot section the RF is connected to the processor by using MAX-232. The further extension of this project is our robot chassis is made of four wheel which can be better replaced with tanker wheel or insect legs for its movement on improper surface.

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