HUMANOID ROBOT FOR REMOTE SURVEILLANCE

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ABSTRACT

Humanoid robot is developed using 4G Technology. Using video streaming technique the robot movements can be monitored from remote location. By implementing this technology in a robot, the robot is made to act like a human when he is not present at that location. Thereby it can be used to act as a working prototype. PIC16F877A microcontroller is used to control the entire operations of robot. These robots are deployed in Hazardous locations especially in military.

Keywords: Humanoid Robot, 4G Technology, PIC16F877A etc.


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1. INTRODUCTION

As Robots move from laboratories and into our daily lives, they are expected to interact with people and support daily activities. In particular, humanoid robots are already being used to provide help with physical activities. Moreover, researchers have started to consider how humanoid robots might be suitable for communication with humans. Their human-like bodies enable them to perform natural gaze motion and deictic gestures. These features of humanoid robots will allow them to perform such communicative tasks in human society spy, security and servant. The communication will consist of data transfer, controlling robot operations. We are using GSM for the wireless communication. The main advantage of using GSM is that the device requires very less amount of power so it can be operated from battery. The embedded controller used here is PIC16F877A micro controller. The PIC16F877A micro controller is a derivative of PIC16F877A micro controller whose architecture and instructions are same as PIC16F877A micro controller with some additional functionality. Since the micro controller has inbuilt peripherals it is called as embedded controller. The appliances like fridge, bulb, robot etc., are connected to the embedded microcontroller through the relay. We can switch on and off the appliances by using switches.
Humanoid Robot for Remote Surveillance

The robot is controlled by the end device i.e. Mobile. The mobile connected in the robot get connected to the user mobile by making a call ,after it get accepted by the robot side mobile ,full control is from the user side mobile only .The robot can performs all the actions through user side mobile. Robot perform the listed action by pressing the predefine number 1-cutting forward,2-forward move,3-cutting reverse,4-left move,5-over all stop,6-right move,7-cutting arm up,8-backward moves and 9-cutting arm down.

2. BLOCK DIAGRAM OF HUMANOID ROBOT

2.1. SOFTWARE REQUIREMENT

➢ MPLAB for creating an application for PIC16F877A.
➢ PIC FLASH for down load hex file.

2.2. HARDWARE REQUIREMENT

➢ Power Supply Unit: 5V DC
➢ GSM Signal Receiver Unit
➢ Embedded Microcontroller: PIC16F877A
➢ Relay and Charging Unit
➢ LCD (liquid crystal display)
3. POWER SUPPLY IN ROBOTIC SYSTEM
There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function.

![Power supply diagram]

**Figure 3** Power supply in Robotic System.

- Transformer - steps down high voltage AC mains to low voltage AC.
- Rectifier - converts AC to DC, but the DC output is varying.
- Smoothing - smoothes the DC from varying greatly to a small ripple.
- Regulator - eliminates ripple by setting DC output to a fixed voltage.

4. GSM SIGNAL RECEIVER UNIT
As GSM (Global System for Mobile communications) continues to assert itself as the world's leading cellular communications technology, the addition of LTE advanced with 300+ Mbps that enables "always on" data connectivity to IP-based systems and opened up a host of new applications. 4G LTE delivers more capacity for faster and better mobile broadband experiences. The GSM network can be used for setting up a kind of M2M communication either using SMS or GPRS Data Call services. This can be effectively used for the automation of various robots, offices and industries.

4.1. ADVANTAGES OF 4G TECHNOLOGY FEATURES
- Connect Faster due to Wider Channels and Flexible support for channels up to 20 MHz enabled with OFDMA
- More Antennas are used with Advanced MIMO techniques to create spatially separated paths
- Carrier Aggregation that is aggregate up to 100 MHz for higher data rates
5. EMBEDDED MICROCONTROLLER: PIC16F877A
An embedded system is a special-purpose computer controlled electro-mechanical system in which the computer is completely encapsulated by the device it controls. The first mass-produced embedded system was the guidance computer for the Minuteman missile in 1961. The crucial design features of the Minuteman computer

![Figure 4](image1.png)

**Figure 4** Circuit diagram of GSM Signal Receiver

Were that its guidance algorithm could be reprogrammed later in the program, to make the missile more accurate, and the computer could also test the missile, saving cable and connector weight.

![Figure 5](image2.png)

**Figure 5** Circuit diagram of GSM Signal Receiver
Since these early applications in the 1960s, where cost was no object, embedded systems have come down in price along with an enormous rise in processing power and functionality.

- PIC16F877A is a 8 bit microcontroller
- 40 pin dip package direct from Microchip
- Programmed using Mplab
- Hex File burned using suitable programmer

The PIC16F877A contains a non-volatile 64KB Flash program memory that is both parallel programmable and serial In-System and In-Application Programmable. In-System Programming (ISP) allows the user to download new code while the microcontroller sits in the application. In-Application Programming (IAP) means that the microcontroller fetches new program code and reprograms itself while in the system. This allows for remote programming over a modem link. A default serial loader (boot loader) program in ROM allows serial In-System programming of the Flash memory via the UART without the need for a loader in the Flash code. For In-Application Programming, the user program erases and reprograms the Flash memory by use of standard routines contained in ROM. The device supports 6-clock/12-clock mode selection by programming a Flash bit using parallel programming or In-System Programming. In addition, an SFR bit (X2) in the clock control register (CKCON) also selects between 6-clock/12-clock modes. Additionally, when in 6-clock mode, peripherals may use either 6 clocks per machine cycle or 12 clocks per machine cycle.

This choice is available individually for each peripheral and is selected by bits in the CKCON register. This device is a Single-Chip 8-Bit Microcontroller manufactured in an advanced CMOS process and is a derivative of the pic16xxx microcontroller family. The instruction set is 100% compatible with the PIC instruction set. The device also has four 8-bit I/O ports, three 16-bit timer/event counters, a multi-source, and four-priority-level, nested interrupt structure, an enhanced UART and on-chip oscillator and timing circuits. The added features of the PIC16F877A make it a powerful microcontroller for applications that require pulse width modulation, high-speed I/O and up/down counting capabilities such as motor control.

6. RELAY AND CHARGING CIRCUIT

Relay Unit consists of a relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field, which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical. Charging Unit consist 12v rechargeable batteries for running the dc motors successfully.

7. LCD (LIQUID CRYSTAL DISPLAY)

The HD44780U dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters and symbols. It can be configured to drive a dot-matrix liquid crystal display. Under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver.
8. HUMANOID ROBOT OPERATION
In this project we design a robot to avoid human in a critical work like bomb defusing using GSM technology. Embedded Micro controller is used for this robot, which will control the overall operation of the robot. Every action is controlled by micro controller using GSM Wireless technology. The robot is design in such way that it can go anywhere and it is also possible to control anywhere in the world. The user first make a call to the robot .after robot receive 3rd ring it accept the call, now the robot will come under the control of user mobile .when the user press the number that action will happen .The microcontroller is program to do different action to performed that particular action user will press the button in the mobile then robot receive the GSM signal by the robot side mobile and it get decoded by DTMF decoder and sent to the microcontroller. Microcontroller receives the decoded signal and calls the sub routine program to do that action.

1. Cutting forward: The cutting system provided in right side arm start cutting the wire.
2. Forward move: The robot will start moving in forward direction.
3. Cutting reverse: The cutting system provided in right side arm start cutting the wire.
4. Left move: The robot will start moving in left direction
5. Over all stop: To stop the robot whatever action in progress
6. Right move: The robot will start moving in right direction
7. Cutting arm up: The robot right arm move up
8. Backward moves: The robot will start moving in backward direction
9. Cutting arm down: The robot right arm move down
10. Bomb detection arm up :The robot left arm move up
11. Bomb detection arm down: The robot left arm move down

9. CONCLUSION
Thus, Humanoid Robot can be developed and controlled using 4G Wireless technology. This Robot can be deployed in vital locations for surveillance, search and rescue operations.4G facility helps for monitoring the robotic activity by video streaming from the remote end. Hopeful that our research will open a new discussion on socially interactive robot platforms, and thus, that such efforts will enrich the telecommunication and personal robot services in the near future.

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