Multi-Purpose Robot

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Abstract - *Today robotics is no longer limited to laboratory experiments; they have found their way into our homes. Being a physical entity itself. Several design ideas have been explored and are presented in an attempt to maximize the user awareness of the robot's interaction with the environment. In this system the advanced monitoring of the home is done. This is handling by the bluetooth controller software Apps and we are using bluetooth module for the purposed of the interfacing of android Mobile and system. In this system uses sensor which is used to detect gas leakage. We can detect thief or unwanted person who is enter in home when owner is not present at home. In the sense it will helps to monitor the home and capture the image of unwanted activities happened in home when owner is not present at home. The advantage of this system is that we can monitor, pick-n-place object and also alert owner when gas leakage detected via Sms.*

In this system we are using two microcontroller i.e. AVR microcontroller and 8051 microcontroller the main purpose of AVR microcontroller is to interface with the sensor so we can monitor gas leakage ,motion and if it is happened the system automatically send massage to owner number with which fault occur in home . The 8051 microcontroller is used for movement of system. This system is basically doing all operations of maid like cleaning or the dust cleaning home as well as pick up the material that present at here and there and put it on the proper place, As well as it keeps eyes on the home as in the security mode, like gas is detected or there is any thief in the home.

This system will operate on the Bluetooth that functions in the android mobile, there is application available in the mobile which will communicate with system and then will operate the function user wants like forward, reverse, left, right, cleaning, grip, leave and stop .

Key Words: PIR (PyroelectricInfra-Red Sensor), GSM Modem (Global System for Mobile Communications modem), Apps (Application), LCD (Liquid crystal display), GSM (Global System for Mobile Communications), GPS (Global Position system), D.C motor (Direct current motor).

1. INTRODUCTION

1.1 HISTORY OF ROBOTICS:

The word "Robot" is one of those volatile terms that have defied unique definition. One reason for this is that its use changes all the time. Initially, a robot was a humanoid or human-like being. The word "Robot" was derived from the Czech word meaning slave labor and was coined by Kapec in his play, Rossum"s Universal Robots in 1921. These robots were biochemical – what we would now call androids. This was followed soon after by a number of films featuring robots such as Fritz Langes 1922 Metropolis that excited the imagination of both the public and the science and engineering communities. Science fiction books such as Asimov's I Robot", from where we got the term robotics, were also popular at this time.

Fig -1: Cleaning robot

Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Robotics is a key technology in the modern world. Many robots do jobs that are hazardous to people such as defusing bombs, mines and exploring shipwrecks. Robotics' is the branch of mechanical   engineering, electrical

engineering and computer science that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing. Robotics can be defined as the science or study of the technology primarily associated with the design, fabrication, theory, and application of robots. While other fields contribute the mathematics, the techniques, and the components, robotics creates the magical end product.

2. SYSTEM DESCRIPTION

2.1 EXISTING SYSTEM:

Literature survey is the most important step in software and hardware development tool. Before developing the tool it is necessary to determine the time factor, economy. Once these things are satisfied, then next step is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration are taken into account for developing the proposed system.

Nirmal T M -"Multipurpose Robot for Patients and Military Applications", International Journal of Electronics Communication and Computer Technology (IJECCT) proposed a .

Farshid Amirabdollahian, Rieks op den Akker, Sandra Bedaf, Richard Bormann, Heather Draper, Vanessa Evers, Gert Jan Gelderblom, Carolina Gutierrez Ruiz -" Accompany: Acceptable robotics Companions for Ageing Years - Multidimensional Aspects of Human-System Interactions", Paladyn journal of behavioural robotics, Virsita,2013. This project responds to some overlooked aspects of technology design, divided into multiple areas such as empathic and social human-robot interaction, robot learning and memory visualisation, and monitoring persons' activities at Home. To bring these aspects together, a dedicated task is identified to ensure technological integration of these multiple approaches on an existing robotic platform, Care-O-Bot®3 in the context of a smart-home environment utilising a multitude of sensor arrays.

V. Prasanna balaji & Goutham, "A multipurpose robot for military ",International journal on theoretical & applied research in mechanical engineering(IJTARME), 2013.The main purpose of this robot is monitoring .if any intruder is detected then combat .it is also used in bomb detection & terrain climbing. This project is based on facial recognition technique.

Mr. M. Arun Kumar Mrs. M. Sharmila –"Wireless Multi Axis ROBOT for Multi-Purpose Operations", International Journal of Engineering Trends and Technology (IJETT), 2013.

K. Kannan, Dr. J. Selvakumar, "Aurduino based voice controller robot", International research journal of engineering (IJTARME), 2015.The main purpose of this robot

is load and release. This project is based on speech recognition technique.

V. Nagamani, Shanti Swaroop Kampa, CH. Shreedhar, Siddarth. G, "Voice Activated Programmable Multi-Purpose Robot", International journal of advanced research in computer engineering & Technology (IJTARCET), 2013. This project is based on dual tone multi frequency technique.

2.2 SYSTEM MODEL AND WORKING

During our literature survey we come across many journal papers in which robotics operated with the help of remote controls. In this manuscript, I am controlling a robot through wireless communication system using Bluetooth controller Apps. It's a wireless controlled robot here we are utilize the concept of GSM communication and this robot is controlled by using mobile phones. One is operator mobile and bluetooth device is stacked on the robot. The Control of Robot Involves Three Distinct Phases: Perception, Processing and Action. Generally, the Preceptors Are Sensors Mounted on the Robot, Processing is done by the On-board Microcontroller or Processor, and the Task is Performed Using Motors. In This Project the Robot is connected to GSM mobile which is task is monitor the home in ideal mode.

With the Help of Commands we can Move Our Robot in Desired Direction as Per Our Requirements. So we have found out about the bluetooth controller apps which is installed in android mobile first connect bluetooth device which is place or mounted on robot could be in corporate in system for controlling the movement of this robot. When the command is received by the robot it follows the command and perform task as per requirement. When the user pushes mobile phone keypad buttons command is transmitted which is receiving by bluetooth module place on robot. The remote control technologies have been used in the fields like factory automation, space exploration, in places where human access is difficult or risky. As the mobile phone enables us to connect with the outside devices via mobile communication network regardless of time and space, the mobile phone is a suitable device to control domestic systems.

The proposed method uses the bluetooth controller apps to send command when a keypad button of the mobile phone is pressed by the user i.e. stop, left, right, forward, reverse, leave, clean, stop, secure .

In the advanced market these robots are further imple mented using the new technologies like GSM, GPS and LCD displays. Using these GSM technologies we can operate the robot from the far distances and we can identify the location using GPS. Using Camera at the Robot and LCD display at the user section we can operate the device accurately and it provides live section. Gear wheels can provide the accurate movement in all areas. In our project we are using the popular 8051 microcontroller. The microcontroller is used to control the motors. It gets the signals from the PIR sensors and it drives the motors according to the

sensor inputs. In ideal mode live person can be detected by the body temperature radiation. The PIR sensor will be designed like that it will activate when it will detect that much temperature.

3. PRPOSED WORK MULTI-PURPOSE ROBOT SYSTEM

3.1 DETAILED DISCRIPTION OF PROPOSED WORK:

Figure2 presents the block diagram of the Multi-purpose robot using PIR. The main hardware components are 8051 microcontroller, GSM modem, Bluetooth (HC-05), PIR sensor, LCD, ROBO motor, mobile phone (android), LPG sensor (MQ6), camera and power supply. The main scope of project is to send commands from one cell phone via bluetooth controller apps to be received by another bluetooth device which is mounted on the robot. The controller also connected to the GSM module, which sends information to owner if any motion is detected in the absence of owner GSM module sends massage on required cell phone to alert owner. Also attached camera can send the required information in the form of video which is easily displayed on tele-vision.
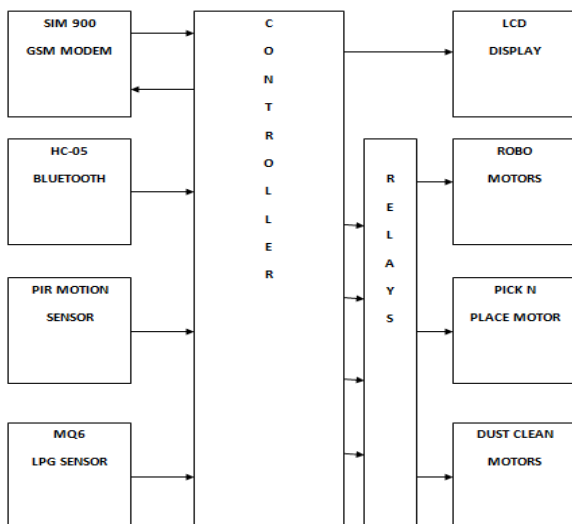

Fig -2: Multi-Purpose robot

Here the robot is controlled through bluetooth technology and robot is autonomous based on moving wheels. Here the robot is equipped with PIR sensor, GPS and cameras in order to send required information to owner. On GSM controlled robot we have mounted a 12V battery as the power supply for the circuit and the motors.

Now, your robot is ready to operate wirelessly using GSM facility once you connect bluetooth controller apps with bluetooth module which is place on robot. By pressing the command keypads in your cell phone, you will be able to move the robot in various directions. The 8051 microcontroller acts as processing unit. The controller is mainly interfaced to driver circuits to drive the motors connected to the robot. The controller also connected to the GSM module, which sends information to owner personnel

about the dangerous situation like gas leakage at home and any motion is detected during ideal mode. Also attached camera can send the required information in the form of video.

Power Supply: A device or system that supplies electrical energy to an output load or group of loads is called as power Supply unit. In our proposed system +5V DC supply is required for 8051 microcontroller and +9V DC supply is required for camera and as an input to 7805 regulator to get +5V DC supply.

Mobile unit: This unit will receive the commands from the mobile if we have to operate this robot.

Microcontroller: The brain of the circuit is the microcontroller. AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family. ATMEL 89C51 has 4KB of Flash programmable and erasable read only memory (PEROM) and 128 bytes of RAM. It can be erased and program to a maximum of 1000 times. In 40 pin AT89C51, there are four ports designated as P_1, P_2, P_3 and P_0. All these ports are 8-bit bi-directional ports, *i.e.*, they can be used as both input and output ports. Except P_0 which needs external pull-ups, rest of the ports have internal pull-ups. When 1s are written to these port pins, they are pulled high by the internal pull-ups and can be used as inputs. These ports are also bit addressable and so their bits can also be accessed individually.

PIR Sensor: Here we are using PIR sensor for detect the which are detect human. The project is mainly used in the PIR Sensor for motion detection. The infrared sensors are used to sense the live persons. All the above systems are controlled by the microcontroller. Two DC motors are used to drive the robot.
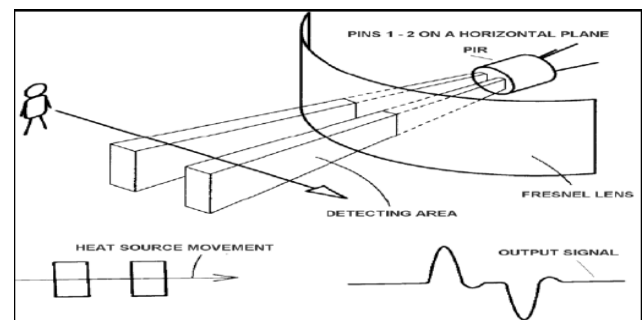

Fig -3: PIR working and Output Signal

A body passing in front of the sensor will activate first one and then the other element as shown in figure 3 whereas other source will affect both elements simultaneously and be cancelled. The PIR sensor internally is split into two halves, one half is positive and the other is considered as negative. Thus, one half generates one signal by detecting the motion of a hot body and other half generates another signal. The difference between these two signals is generated as output signal. Primarily, this sensor consists of Fresnel lens which is bifurcated to detect the infrared radiation produced by the motion of hot body over a wide range or specific area. If once the sensor gets warmed up, then the output remains low until

it detects motion. If once it detects the motion, then the output goes high for a couple of seconds and then returns to a normal state or low. This sensor requires settling time, which is characteristically in the range of 10 to 60 seconds.
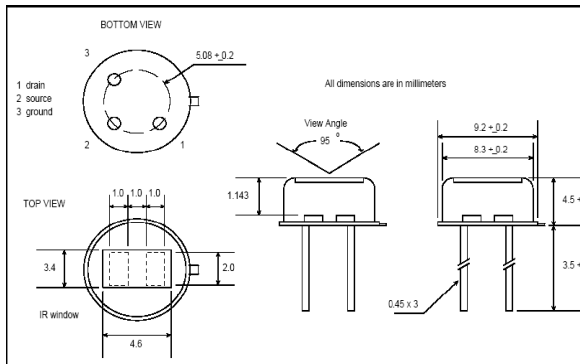

Fig -4: Specification and dimension

The radiation source should pass in a horizontal direction so the elements are sequentially exposed to the IR source. The sensor also has a built-in infrared filter window. The detection range without a lens is about three feet but can be extended to up to 90 feet or more by placing an infrared Fresnel lens in front of the sensor. An infrared Fresnel lens with a focal length of 0.65 inch is recommended for longest range.
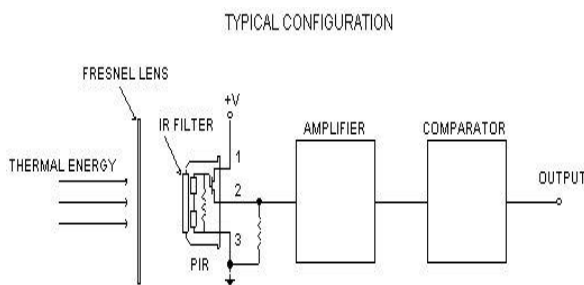

Fig -5: Typical configuration

Fig-5 shows the pin configuration of the PIR sensor . PIR sensor consists of three pins, ground, signal, and power at the side or bottom. Generally, the PIR sensor power is up to 5V, but, the large size PIR modules operate a relay instead of direct output. This robots job is to detect the live person and indicates the signal to the helpers.

It is very simple and easy to interface the sensor with a microcontroller. The output of the PIR is (usually digital output) either low or high. This robot is very helpful in detecting live persons under the buried and pillars etc., whenever there is any earthquake occurred and building collapse. At the time of these effects people may fell down and buried under the bridges and under the pillars etc., in some cases we can't get into that felled contacts and we can't help them. In such cases to save them immediately we use this robot

GSM: GSM stands for Global System for Mobile Communications. GSM Controlled Wireless Robot is wireless robot which capable of receiving call and performs the necessary actions**.** In this project GSM is the important part to send alert when absence of owner at home. Operators can easily getting massage when motion is detected in absence of him/her.

DC motor: Output of controller is given to the dc motor driver. In this project we are using dc motor for the movement of robot. Following controls can be carried out using the dc motor by the crane. In this car we use two 12V dc motors for their motion. These motors are fixed with back wheels each with one. Front wheel is free to rotate. A motor is used for driving the robot i.e., whenever the signals are given by the user the robot moves forward, backward, right, left ,pick up with the help of the motor.

Web camera: Here the robot is equipped with PIR sensor. Main function of camera is to monitor home and if motion is detected in the absence of owner then send required information in the form of massage send to mobile no which is feed in program.

LPG gas sensor: This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm.

This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

This sensor comes in a package similar to our MQ-3 alcohol sensor, and can be used with the breakout board.
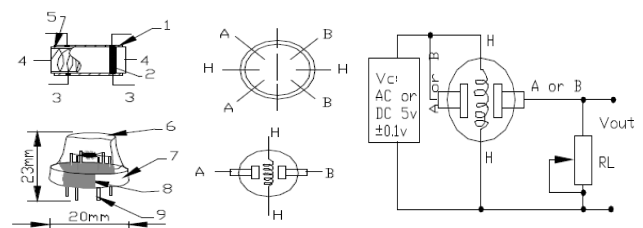

Fig -6: Typical Structure and configuration of MQ-6

Structure and configuration of MQ-6 gas sensor is shown as Fig. 1 (Configuration A or B), sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-6 has 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

Electric parameter measurement circuit is shown as Fig.2

ROBO MOTOR:

There are three types of d.c motors are used to perform three different task namely as moving robot (D.C 10 rpm

motor), cleaning floor and pick-n-place object. For these purpose different rpm motors are used such as 30 rpm, 10 rpm and 1000 rpm. 10 rpm motor is used to perform task. 30 rpm motor is used to perform task. 1000 rpm motor is used to perform task. Motor details are discussing bellow.

30 RPM Side Shaft 37mm Diameter Compact DC Gear Motor is suitable for small robots/ automation systems. It has sturdy construction with gear box built to handle stall torque produced by the motor. Drive shaft is supported from both sides with metal bushes. Motor runs smoothly from 4V to 12V and gives 30 RPM at 12V. Motor has 6mm diameter, 22mm length drive shaft with D shape for excellent coupling. This motor will be bit noisy while running. For long life, this motor is not recommended for application requiring dynamic torque of more than 3 kg-cm.

Fig -7: 12v D.C motor (30 rpm)

10RPM 12V DC geared motors is used for wheels of robot. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel.

Johnson geared DC motor is a very high torque motor which should be used to make big robots or robotised platform. Gear box is built to handle the stall torque produced by the motor. Shaft has a metal bushing for wear reissuance.

Fig -8: 12v D.C motor (1000 rpm)

3.2 OVERVIEW OF THE TECHNOLOGY USED

Proteus ISIS is the best simulation software in the world for various designs with electronics & microcontroller. It is mainly popular because of availability of almost all microcontrollers in it. So it is a handy tool to test programs and embedded designs for electronics hobbyist & expert. You can simulate your programming of microcontroller in Proteus 8 Simulation Software. After simulating your circuit using Proteus Software you can directly make PCB design with it so it could be an all in one package for students and hobbyists.

4. ALGORITHM:

1. Start
2. Initialize serial communication
3. Check serial port if serial port=Get f then Move Robo forward.
4. Check serial port if serial port=Get r then Move Robo reverse.
5. Check serial port if serial port=Get L then Robo Left.
6. Check serial port if serial port=Get R then Robo Right.
7. Check serial port if serial port=Get s then Robo Stop.
8. Check serial port if serial port=Get c then Robo cleaning mode on.
9. Check serial port if serial port=Get C then Camera mode on.

5. Performance Analysis:

Firstly system is connected with android phone via bluetooth .The android phone is connected to the system with the help of bluetooth controller apps. With the help of this app we directly access system and control system. These systems basically monitor the home absence of owner at home. If any unwanted activity is happened or any unwanted person is detected in home then it sends msg to the number which is feed in program i.e. on owners phone with the help of sim 900 GSM module the below the msg which is displayed on system display is shown in figure9.

Fig -9: Massage displayed on system

The robot can do these basic tasks:-
1. Move forward
2. Move back
3. Turn right
4. Turn left
5. Stop (stops doing the current job)
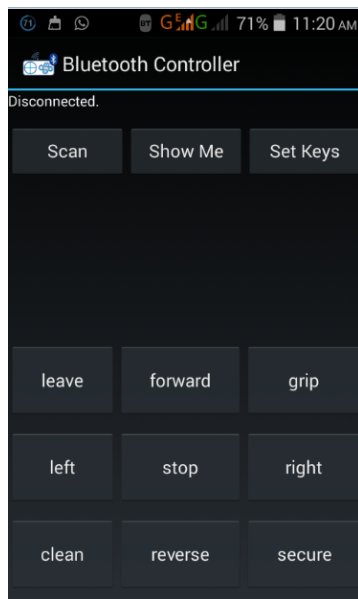6. Grip
7. Secure
8. Clean
9. Leave

Fig -10: Screen short of bluetooth controller apps

The screen shot of bluetooth controller apps shown in figure 11. When we press any key on android phone it is send to the system with the help of this apps and the system will receive command with the help of bluetooth module place on system. When clean key is press the brush will rotate and clean the floor.
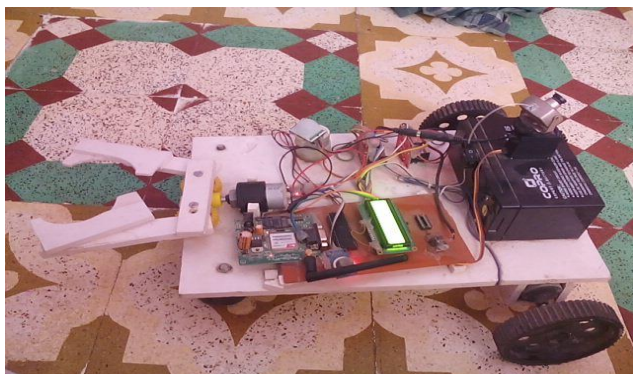
6.   HARDWARE IMPLEMENTATION:

Fig -11: Multi-Purpose Robot

3. CONCLUSIONS

The main aim of this paper is to explaining the monitoring method used to operate the robot, with the help of android phone we can monitor, clean and pick and place object. The circuit was assembled on the PCB. Check When switched on system the massage displayed on LCD display or not. After switching on system check camera is rotated 360' or not. If the system is properly working then in the absence of owner it will properly work. The power supply the PIR module was checked for detection of human. The GPS receiver details were checked. Finally microcontroller takes a decision and gives command to motor driver in order to drive the motor in different directions.

REFERENCES

[1]   Nirmal T M -"Multipurpose Robot for Patients and Military Applications", International Journal of Electronics Communication and Computer Technology (IJECCT), 2014.

[2]   V. Nagamani, Shanti Swaroop Kampa, CH. Shreedhar, Siddarth. G, "Voice Activated Programmable Multi-Purpose Robot", International journal of advanced research in computer engineering & Technology (IJTARCET), 2013.

[3]   Farshid Amirabdollahian, Rieks op den Akker, Sandra Bedaf, Richard Bormann, Heather Draper,Vanessa Evers, Gert Jan Gelderblom, Carolina Gutierrez Ruiz -" Accompany: Acceptable robotics Companions for Ageing Years -Multidimensional Aspects of Human-System Interactions",Paladyn journal of behavioural robotics, Virsita,2013.

[4]   Mr.M.Arun Kumar Mrs.M.Sharmila –"Wireless Multi Axis ROBOT for Multi-Purpose Operations", International Journal of Engineering Trends and Technology (IJETT), 2013.

[5]   Farshid Amirabdollahian, Rieks opden Akker, Sandra Bedaf, "Assistive technology design and development for acceptable robotics companions for ageing years", Paladyn journal of behavioural robotics ,Virsita, 2013.

[6]   V.Prasanna balaji &Goutham, "A multipurpose robot for military ",International journal on theoretical & applied research in mechanical engineering(IJTARME), 2013.

[7]   K. Kannan, Dr. J. Selvakumar, "Aurduino based voice controller robot", International research journal of engineering (IJTARME), 2015.

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