

Two Wheel Controlled Spy Robot

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ABSTRACT

Spy robot is a Wi-Fi controlled robot. A camera mounted on the robot sends real time video signals on to the user side, which can be seen on a display. Robot movements can be monitored looking at the display. Saving human life and providing security to the same both are two different aspects, but both are essential and instead mandatory. A robot is a sort of human replacement which is controlled by human itself. Areas where human cannot be sent, or life of human is endangered; robots can be used in such cases. In various military applications and for security purposes our project can also provide live streaming of various on goings which the robot witness at the site.

The more advanced features used in this spy robot is to climb the vertical and inclined surfaces, obstacle detector, night vision camera to detect the objects in darkness. The goal of spy robot is to search interesting stuff from where people are not able to reach. This project has three subsystems: Hardware, Software & Mechanical. The project is comprised of basically three modules, which handles all the basic Functionalities of the robot.

KEYWORDS: spy robot, human life, live streaming, and night vision camera.

I. INTRODUCTION

A robot is a machine especially one programmable by a computer capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device or the control may be embedded within. Robots may be constructed to take on human form but most robots are machines designed to perform a task with no regard to how they look. Robots can be autonomous or semi-autonomous and range from humanoids such as Honda's Advanced Step in Innovative Mobility (ASIMO) and TOSY's TOSY Ping Pong Playing Robot (TOPIO) to industrial robots, medical operating robots, patient assist robots, dog therapy robots, collectively programmed swarm robots, UAV drones such as General Atomics MQ-1 Predator, and even microscopic nano robots[1]. By mimicking a life like appearance or automating movements, A robot may convey a sense of intelligence or thought of its own. Autonomous things are expected to proliferate in the coming decade, with home robotics and the autonomous car as some of the main drivers.

The branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing is robotics. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior or cognition. Many of today's robots are inspired by nature contributing to the field of bio-inspired robotics. These robots have also created a newer branch of robotics: soft robotics.

From the time of ancient civilization there have been many accounts of user-configurable automated devices and even automata resembling animals and humans, designed primarily as entertainment. As mechanical techniques developed through the Industrial age, there appeared more practical applications such as automated machines, remote-control and wireless remote-control.

Defense is the most heavily funded sector of any country. India spends half of GDP in defense for importing of weapons and ammunition. India holds the first position for importing weapons but India is not the richest country in the world. India is a developing country where the people requires food, medicine, education and many other basic amenities so India spending huge money on defense is not feasible for further development of the country. Even though the investment made by India is huge the casualties caused to Indian soldiers are still large. The advantage of robotics is that the human casualties can be minimized and the cost of implementation is comparatively low to the fund provided for man power.

II. LAWS OF ROBOTICS

There are three basic laws of Robotics stated by science fiction author Isaac Asimov, and he later added Zeroth law of robotics

Zeroth Law: A robot may not injure humanity or through inaction, allow humanity to come to harm.

First Law: A robot may not injure a human being or through inaction, allow a human being come to harm, unless this would violate a higher order law.

Second Law: A robot must obey the orders given it by human beings, except where such orders would conflict the higher order law.

Third Law: A robot must protect its own existence as long as such protection does not conflict with higher order law.

III. TYPES OF ROBOTS

There are many ways how you could possibly define different types of robots. As we have seen the possible divisions vary widely. The main reason of these differences is that different tutors often tend to have different views on what should be taught under "robotics".

For example - some tutors that teach robotics usually focus mainly on industrial robotics, neglecting service robots completely. Therefore, when talking about types of robots they usually talk about types of industrial robots. There is a strong reason for this though - most robotics engineers will have to deal mostly with industrial robots in their careers. Nevertheless, industrial robots are not the only ones. Therefore, as I see it when dividing robots into types this division should be broad enough to include everything that can be understood as a robot.

There are two possible ways how this could be done. First, you could divide robots into types by their application and second - by the way they move.

A. TYPES OF ROBOT BY APPLICATION

Now, as you can see there are examples that fit into more than one of these types. For example, there can be a deep sea exploration robot that can gather some valuable information that can be used for military purposes.

B. TYPES OF ROBOT BY LOCOMOTION AND KINEMATICS

As you can understand, robot's application alone does not provide enough information when talking about a specific robot. For example, an industrial robot - usually, when talking about industrial robots we think of stationary robots in a work cell that do a specific task. That's alright, but if there is an AGV (Automated Guided Vehicle) in a factory? It's also a robotic device working in an industrial environment. So, I propose to use both these classifications together.

Industrial Robots - Designed to move materials, parts and tools, performs variety of programmed tasks in manufacturing. Usually these are articulated arms specifically developed for such applications as welding, material handling, painting and others. If we judge purely by application this type could also include some automated guided vehicles and other robots.

Domestic or Household Robots - Robots used at home. This type of robots includes many quite different devices such as robotic vacuum cleaners, robotic pool cleaners, sweepers, gutter cleaners and other robots that can do different chores. Also, some surveillance and telepresence robots could be regarded as household robots if used in that environment.

Medical Robots - Robots used in medicine and medical institutions. First and foremost - surgery robots. Also, some automated guided vehicles and maybe lifting aides.

Service Robots - Robots that don't fall into other types by usage. These could be different data gathering robots, robots made to show off technologies, robots used for research, etc.

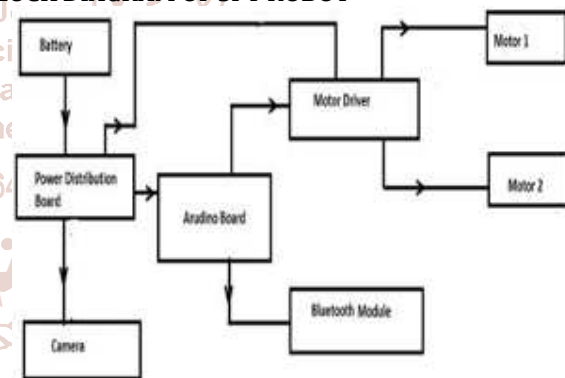
Military Robots - Robots used in military. This type of robots includes bomb disposal robots, different transportation robots, reconnaissance drones. Often robots initially created for military purposes can be used in law enforcement, search and rescue and other related fields.

Entertainment Robots - These are robots used for entertainment. This is a very broad category. It starts with toy robots such as Rob sapiens or the running alarm clock and ends with real heavyweights such as articulated robot arms used as motion simulators.

Space Robots - This type would include robots used on the International Space Station, Canadarm that was used in Shuttles, as well as Mars rovers and other robots used in space.

Hobby and Competition Robots - Robots that you create. Line followers, sumo-bots, robots made just for fun and robots made for competition.

IV. MATERIALS USED BLOCK DIAGRAM OF SPY ROBOT



COMPONENTS OF SPY ROBOT

The construction of Spy robot is simple and components used for this robot

- Arduino Uno
- Arduino shield
- DC motors
- Battery
- Power distributor
- Voltage regulator
- Bluetooth
- Camera
- Radio AV Receiver
- USB TV tuner
- Jumper Wires
- Supporting wheels
- Bolt and nuts
- Switch

A. ACRYLIC SHEET

Acrylic sheet, generally known as Plexiglas is a great material for building robot bodies which allows you to see-



B. ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software, based on Processing.

Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using TX and Rx pins.

The current version of Arduino Uno comes with USB interface, 6 analog input pins, 14 I/O digital ports that are used to connect with external electronic circuits. Out of 14 I/O ports, 6 pins can be used for PWM output.

The software used for Arduino devices is called IDE (Integrated Development Environment) which is free to use and required some basic skills to learn it. It can be programmed using C and C++ language.

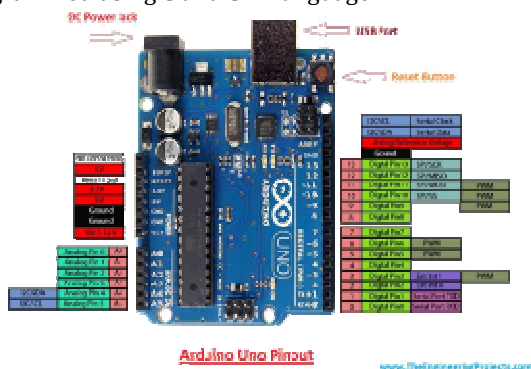


Fig. 2 Arduino UNO

Arduino Uno comes with USB interface i.e. USB port is added on the board to develop serial communication with the computer.

There are 14 I/O digital and 6 analog pins incorporated in the board that allows the external connection with any circuit with the board. These pins provide the flexibility and ease of use to the external devices that can be connected through these pins. There is no hard and fast interface required connecting the devices to the board. Simply plug the external device into the pins of the board that are laid out on the board in the form of the header.

Only 5 V is required to turn the board on, which can be achieved directly using USB port or external adopter, however, it can support external power source up to 12 V which can be regulated and limit to 5 V or 3.3 V based on the requirement of the project.

C. UNO SHIELD

Shields are boards that can be plugged on top of the Arduino printed circuit board (PCB) to extend its capabilities. The different shields follow the same philosophy as the original toolkit: they are easy to mount, and cheap to produce. Mouser Electronics lists original Arduino and Arduino Certified products as “Arduino.” Arduino shields are grouped according to which boards they are compatible with. Not all Arduino shields are compatible with all Arduino boards. The Arduino Certified program is designed for companies using processors not currently supported by Arduino who want to certify a basic level of compatibility with the Arduino platform.

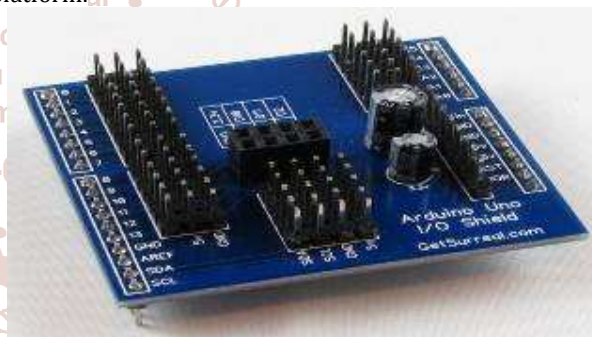


Fig. 3 Uno shield

D. VOLTAGE REGULATOR

A voltage regulator is a system designed to automatically maintain constant voltage level. A voltage regulator may use a simple feed forward design or may include negative feedback. It may use electromechanical mechanism or electronic components.



Fig. 4 Voltage regulator

E. DC MOTOR

Motor is a device which transforms the electrical energy into mechanical energy. The working principle of the motor is the interaction between the magnetic field and the current to produce a force within the motor which helps the motor to do work. DC motor is one type of motor that uses the DC current to convert electrical energy into mechanical energy. When the electric current passes through a coil in a magnetic field, a magnetic force will be generated, this produces a torque in the DC motor.



Fig. 5 DC Motor

F. POWER DISTRIBUTOR

PDB's are often an overlooked area of multi rotor drone building, mainly because they are fairly simple but despite this, they are a crucial part of your drone and if you don't choose the right one you could end up losing your drone. A distribution board is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure. Normally, a main switch, and in recent boards, one or more residual-current devices (RCD) or residual current breakers with over current protection (RCBO), are also incorporated.



Fig. 6 Power Distributor

G. BATTERY

A rechargeable battery of Lithium-ion technology in a pouch format.



H. SWITCH

Switch is an electrical component that can "make" or "break" an electrical circuit, interrupting the current or diverting it from one conductor to another



Fig. 8 Switch

I. RADIO AV RECEIVER

A radio AV receiver sends audio and video signals wirelessly to a recording device, typically for surveillance and security purposes. The system uses a remote camera and microphone assembly to transmit picture and sound to the radio AV receiver, which can then be connected to a monitoring and recording device, such as a personal computer. The connections should take less than five minutes.

- High receive sensitivity: 18 dB
- Receive signal: picture, sound
- Frequency control: 0.9/1.2 GHz
- Voltage: DC 9V
- Current: 500mA



Fig. 9 Radio AV Receiver

J. Camera

A wireless camera relies on communication between video transmitters and receivers. Most new digital-video cameras come with a built-in wireless feature that allows the cameras to connect to a computer or the device being used to receive the signal. The receiver must also maintain a wireless connection to a monitor or time-lapse recorder for the wireless camera to capture the feed going into the receiver.

- Picture sensor: 1/4
- Scan frequency: 50 Hz
- Sensitivity: 18db
- Output power: 50mv
- Frequency control: 0.9/1.2 GHz
- Transmission signal: picture, sound
- Deliver distance: 50 meters
- Voltage: 9V DC
- Current: 200 mA
- Power consumption : <= 400mw



Fig. 10 Camera

K. USB TV TUNER

The most obvious use of a TV tuner is to watch live TV, but that's not all it can do. While not all recording programs are created equal, you can use your tuner to give your PC the

power of a Personal Video Recorder like the cable companies try to get you to rent. You will be able to record and pause live TV, as well as fast forward or skip through things that are in your video buffer. Taking screenshots is generally a breeze, and if you have a dual tuner you can record two things at the same time.



Fig. 11 USB TV Tuner

I. BLUETOOTH MODULE

Bluetooth is a type of wireless communication used to transmit voice and data at high speed using radio waves. It is used for short range radio communications between many different types of devices, including mobile phones, computers and other electronics. Bluetooth module has a range of around 10 meters and data transfer rate of 3 Mbps. Bluetooth is a global specification for a small form-factor, low-cost radio solution providing links between mobile computers, mobile phones, and other portable handheld devices, as well as connectivity to the Internet has. The Institute of Electrical and Electronics Engineers (IEEE) given the IEEE 802.15 standard. Its main strength is its ability to simultaneously handle both data and voice transmissions. A mobile computer equipped with Bluetooth technology, for example, could link to a similarly equipped mobile phone to connect to the Internet. Multiple Bluetooth units form a Wireless Personal Area Network, called and up to seven client devices. A Bluetooth WPAN is capable of supporting an asynchronous data link with each client and synchronous voice links with up to three client devices. It provides a range of up to 10m at a transmit power of 1 m watt. The range can be extended to 100m if the transmit power is increased to 100 m watt.

Bluetooth has a data rate of 1 Mbps. Bluetooth is a standard for a small (9mm x 9mm), cheap radio chip to be plugged into computers, printers, mobile phones, etc. A Bluetooth chip takes the information normally carried by the cable, and transmits it at a special frequency to a receiver. Bluetooth chip, which will then give the information received to the computer, phone whatever. Bluetooth offers the most economical solution for low-to-medium-speed device connectivity. It aims at low power consumption and provides security for both stationary and mobile devices. The basic function is to provide a standard wireless technology to replace the multitude of propriety cables currently linking computing devices.



Fig. 12 Bluetooth Module

II. MOTOR DRIVERS

L298N 2A Based Motor Driver is a high power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L298 motor driver IC and has an on board 5V regulator which it can supply to an external circuit. It can control up to 4 DC motors, or 2 DC motors with directional and speed control. This motor driver is perfect for robotics and mechatronics projects and perfect for controlling motors from microcontrollers, switches, relays, etc..

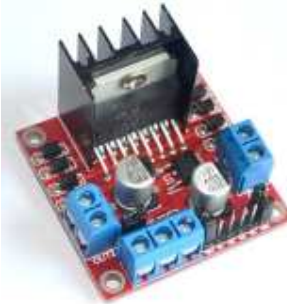


Fig. 13 Motor Driver

III. NUTS AND BOLTS OR SCREWS

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads friction, a slight stretching of the bolt, and compression of the parts to be held together.

In applications where vibration or rotation may work a nut loose, various locking mechanisms may be employed: lock washers, jam nuts, specialist adhesive thread locking fluid such as Loctite, safety pins or lock wire in conjunction with castellated nuts, nylon inserts (nylon), or slightly oval-shaped threads.

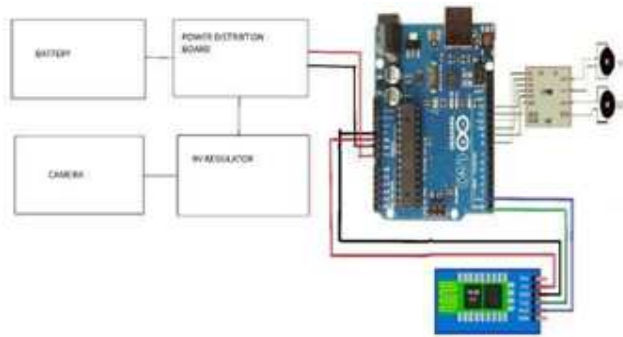
Square nuts, as well as bolt heads, were the first shape made and used to be the most common largely because they were much easier to manufacture, especially by hand. While rare today due to the reasons stated below for the preference of hexagonal nuts, they are occasionally used in some situations when a maximum amount of torque and grip is needed for a given size: the greater length of each side allows a spanner to be applied with a larger surface area and more leverage at the nut.

The most common shape today is hexagonal, for similar reasons as the bolt head: six sides give a good granularity of angles for a tool to approach from, but more corners would be vulnerable to being rounded off. It takes only one sixth of a rotation to obtain the next side of the hexagon and grip is optimal. However, polygons with more than six sides do not give the requisite grip and polygons with fewer than six sides take more time to be given a complete rotation. Other specialized shapes exist for certain needs, such as wing nuts for finger adjustment and captive nuts for inaccessible areas.



Fig. 14 Screws and Nuts

IV. EXPERIMENTATION CIRCUIT DIAGRAM



SPY ROBOT PROGRAMMING

```
#define E1 3
#define MA1 2
#define MB1 4
#define E2 6
#define MA2 5
#define MB2 7
char data;
void setup() {
  Serial.begin(9600);
  pinMode(E1,OUTPUT);
  pinMode(MA1,OUTPUT);
  pinMode(MB1,OUTPUT);
  pinMode(E2,OUTPUT);
  pinMode(MA2,OUTPUT);
  pinMode(MB2,OUTPUT);
}
void forward(){
  digitalWrite(E1,HIGH);
  digitalWrite(MA1,HIGH);
  digitalWrite(MB1,LOW);
  digitalWrite(E2,HIGH);
  digitalWrite(MA2,HIGH);
  digitalWrite(MB2,LOW);
}
void backward(){
  digitalWrite(E1,HIGH);
  digitalWrite(MA1,LOW);
  digitalWrite(MB1,HIGH);
  digitalWrite(E2,HIGH);
  digitalWrite(MA2,LOW);
  digitalWrite(MB2,HIGH);
}
void left(){
  digitalWrite(E1,150);
  digitalWrite(MA1,LOW);
  digitalWrite(MB1,HIGH);
  digitalWrite(E2,150);
  digitalWrite(MA2,HIGH);
  digitalWrite(MB2,LOW);
}
void right(){
  digitalWrite(E1,150);
  digitalWrite(MA1,HIGH);
  digitalWrite(MB1,LOW);
  digitalWrite(E2,150);
  digitalWrite(MA2,LOW);
  digitalWrite(MB2,HIGH);
}
```

```
void breakk()
{
  digitalWrite(E1,HIGH);
  digitalWrite(MA1,HIGH);
  digitalWrite(MB1,HIGH);
  digitalWrite(E2,HIGH);
  digitalWrite(MA2,HIGH);
  digitalWrite(MB2,HIGH);
}
```

```
void stopp()
{
  digitalWrite(E1,LOW);
  digitalWrite(E2,LOW);
}
```

```
void loop()
{
  if (Serial.available())
  {data = Serial.read();}
  if(data== 'F')
  {forward();}
  if(data== 'B')
  {backward();}
  if(data== 'R')
  {right();}
  delay(300);
  breakk();
  delay(300);}
  if(data== 'L')
  {left();}
  delay(300);
  breakk();
  delay(300);}
  if(data== 'S')
  {stopp();}
}
```

V. RESULT

The Two wheeled spy robot is successfully executed. The camera is used to capture photos and record videos where human can't go. This photos and videos are transmitted to PC which is connected with TV tuner and AV receiver.



Fig. 15 Two Wheeled Spy Robot

VI. CONCLUSION AND FUTURE SCOPE

The proposed system shows how the Android smart phone can be used as remote controller for robot and various embedded technologies with the help of the Bluetooth technology and the system also shows that how a robot can be used for spy & rescuing purpose by transmitting the audio and video to the user. It also moves on rough surface due to the grippers on wheels. In this robot the data is transmitted in real time.

It could be improved by adding Wi-Fi module for large area coverage and by minimizing the size of the robot it can be used in the open areas without recognized by the enemies. The range of the camera transmission can be increased. Night vision cameras can be used to take videos during night. Obstacle detector can be used which helps the self-navigation.

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