A SURVEILLENCING SYSTEM USING SERPENTINE BOT

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ABSTRACT-Now-a-days robotics has grown beyond leaps in almost every aspects of life and the most important fields are rescue, search and medical field .Every year number of people are losing their life because of natural calamities such as earthquakes and fire accidents. Often, many are trapped in the debris. Our idea is to design a robot which can easily penetrate through small gaps in debris to track the people trapped inside and rescue them.

Serpentine resembles the motion of the snake and it is highly flexible to navigate through the small gaps.Basically, the proposed bot moves with serpentine and linear motion. Camera on the head continuously provides visual information to outside world through which we can track the trapped people and rescue them

The rescue team canlocate the people under debris quickly using this bot which can move easily due to its sleek design and provide visual information to the people outside .Thusthe rescue time is reduced and the rescue operation can be much easier

Index terms – Serpentine motion, Rescue Operation, Debris ,Camera.

I. INTRODUCTION

Natural calamities takes places quite often which causes more damage to human beings. In this case the top priority of rescue group is to localize the victim as quickly as possible.our rescue team currently use manpower and trained dogsto find the trapped people but the rescues operation takes more time due to the natural disabilities of human. There is a need of well trained and well equipped rescue team with additional support to overcome their natural disability to provide a timely rescue to save life.

II. OVERVIEW OF DESIGN

In the proposed system is a bot named serpentine bot which can easily move inside small gaps of debris with two motions namely serpentine and linear. Serpentine is a zigzag motion of the snake which provide good flexibility for the bot to travel on twist and turned paths and the linear motion is for narrow paths. Using the sensors, buzzer and the camera placed on the head of the snake the human detection can be easily. This will help the rescue team to locate the trapped people quickly.

III. LITERATURE SURVEY

In the journal of Serpentine locomotion with robotic snakes by [1] M. Sato, M. Fukaya and T. Iwasaki explained about that many mobile robots used for ground operations are wheel driven, but serpentine robots offer many advantages over the wheeled variety. Snakes and found that their bodies take on the so-called serpenoid curve when they locomote with a serpentine gait.Moreover, the key property of snakes in achieving serpentine locomotion is the difference in the friction coefficients for the tangential and the normal directions with respect to the body. In particular, the normal friction tends to be much larger than the tangential friction, leading to avoidance of side slipping

In the journal of The kinematics of hyper-redundant robot locomotion by [2]Johns Hopkins Univ., Baltimore, MD, USA it is briefed that Hyper –redundant robot locomotion is the process of generating net displacements of a hyper-redundant robotic mechanism via internal mechanism deformations. Two classes of gaits, based on stationary waves and traveling waves of mechanism deformation, are introduced forhyper-redundant robots of both constant and variable length.

Modelling of hyper-redundant robots is based on a two-step modelling process. In the first step regardless of mechanical implementation, the important macroscopic features of a hyper-redundant robot can be captured by a backbone curve. The second step of the backbone curve modelling approach, the continuous backbone curve geometry is used to specify the actual mechanism's joint displacements.

In the journal of Study on the 3D shape of active cord mechanism by [3] H. Yamada , S.Hirose described that Snake-like robots and hyper-redundant manipulators have been called active cord mechanism (ACM), and they have been one of fields of robotics. Effective method for analysis of the 3D shape of ideal continuous ACM models. In addition, it some important characteristics of ACM using this method. The results help us understand the characteristics.

In the journal of V-shift control for snake robot moving the inside of a pipe with helical rolling motion by [4] TetsushiKamegawa, Toshimichi Baba, and Akio Gofuku shows that A snake robot would be applied to a machine that goes into a narrow space to investigate the inside of a structure. Recently, multiple locomotion modes of snake robots have been realized. This paper achieved some kind of locomotion modes such as undulatory locomotion mode, sidewinding locomotion mode, lateral rolling locomotion mode and helical rolling locomotion model to move along a pipe. The shape of the robot in each locomotion mode is calculated by using mathematical continuum curve model.

IV. BLOCK DIAGRAM

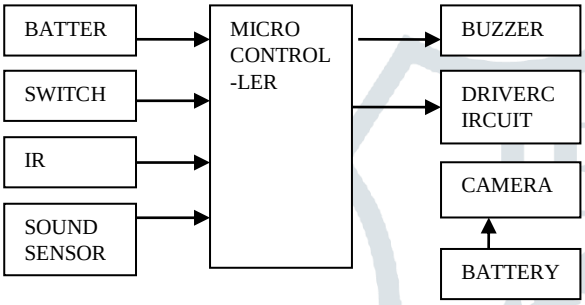


Fig 1.Block Diagram

In the proposed system a switch connected to the microcontroller. If the switch is turned ON then the microcontroller will send the details to the driver circuit and it will activate the snake robot mechanism. The snake robot will be moving in the serpentine motion and in linear motion but in only one direction (forward direction-automatically). In addition to that we are using WI-FI camera attached to the snake robot which will give the live video streaming. If the switch is turned off then the details will send to the microcontroller and from there snake robot receives the command and will stop moving. The IR sensor is used to find any obstacle presents in the snake robot path and if obstacle is identified then the robot will take a curve to eliminate collision with obstacle and moves in same path. The Sound sensor used to find the presence of sound by trapped humans which in turns turn on the buzzer. By this method we are achieving the proposed system.

V. SYSTEM COMPONENTS

The list of modules required for the implementation of the proposed system are Arduino MEGA, 3D printed parts,Dc motors, Servo motors, Wheels, Voltage Regulators, Drive Circuit, IR sensor, Sound Sensor, Buzzer, Battery, Switch, PC, Camera.

1. ARDUINO MEGA

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the ArduinoDuemilanove or Diecimila.

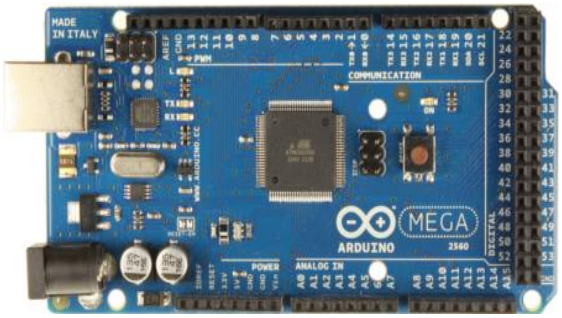


Fig 2.Arduino Mega board

The following are the features of Arduino Mega

Operating Voltage 5V,Input Voltage (recommended) 7-12V,Input Voltage (limits) 6-20V ,Digital I/O Pins 54 (of which 14 provide PWM output),Analog Input Pins 16,DC Current per I/O Pin 40 mA, DC Current for 3.3V Pin 50 mA,Flash Memory 256 KB of which 8 KB used by boot loader,SRAM 8KB,EEPROM 4 KB, Clock Speed 16 MHz.

2. VOLTAGE REGULATOR

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground. The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

3. WI-FI CAMERA

A Wi-Fi camera is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment.

When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), awebcam is

generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

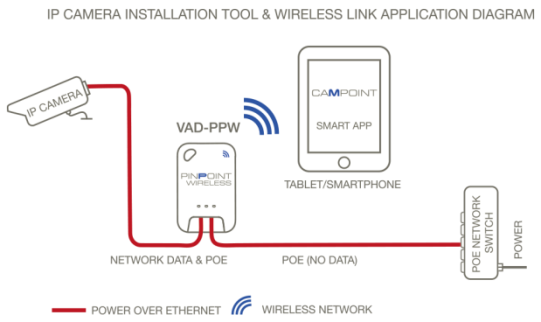
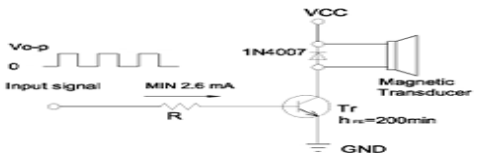


Fig 3. Wi-Fi camera

4. Buzzer

Buzzers like the TMB-series are magnetic audible signal devices with built-in oscillating circuits. The construction combines an oscillation circuit unit with a detection coil, a drive coil and a magnetic transducer. Transistors, resistors, diodes and other small devices act as circuit devices for driving sound generators. With the application of voltage, current flows to the drive coil on primary side and to the detection coil on the secondary side. The amplification circuit, including the transistor and the feedback circuit, causes vibration. The oscillation current excites the coil and the unit generates an AC magnetic field corresponding to an oscillation frequency. This AC magnetic field magnetizes the yoke comprising the magnetic circuit. The oscillation from the intermittent magnetization prompts the vibration diaphragm to vibrate up and down, generating buzzer sounds through the resonator.

Fig 4.Buzzer



5.DRIVER CIRCUIT

L293D is a typical motor driver circuit which allows dc motor to drive in either direction. It isa 16 pin IC which can control the DC motor simultaneously in any direction. It means that we can control the two DC motor in a single L293D driver circuit.It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in any direction.

There are two enable pins. Pin 1 and pin 9 need to be drive the circuit so both the pins should be high. For driving the motor with left H-bridge pin 1 should be high. And for driving the motor with right H-bridge pin 9 should be high. If anyone of the pin goes very low then the pins will suspend working.Its like a switch. There are 4 input pins for L293D, pin 2 and pin 7 on the left and pin 10,15 on the right. Left input pins will regulate the motor connected across left side and right input on the motor for the right side.The motors are rotated based on the input pins as LOGIC 0 and LOGIC 1.

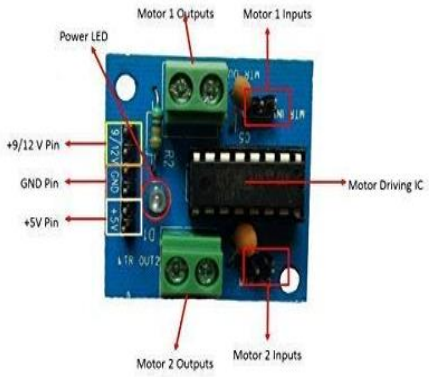


Fig 5. Driver circuit

6. SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. A servomotor is closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is some signal, either analog or digital, representing the position commanded for the output shaft.

Fig 6.Servo Motor

7. DC MOTOR

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty. By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense.

Fig 7. DC Motor

8.3D PRINTING

3Dprinting is any of various processes in which material is joined or solidified under computer control to create a three-dimensionalobject,with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer. In the 1990s, 3D printing techniques were considered suitable only for the production of functional or aesthetical prototypes and a more appropriate term was rapid prototyping. Today, the precision, repeatability and material range have increased to the point that 3D printing is considered as an industrial production technology, with the name of additivemanufacturing. 3D printed objects can have a very complex shape or geometry and are always produced starting from a digital 3D model or a CAD file.

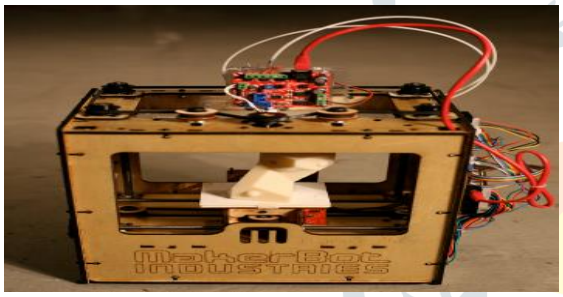


Fig 8. 3D Printer

9.TOGGLE SWITCH

Toggle switches are among the most basic and most common of all electronic components.At thesimplest level, they consist of a rocker device—usually a lever, though there are other designs—that allow a circuit to be powered or depowered by throwing the switch from the open to closed position or vice versa.

Fig 9.Toggle Switch

10. WHEELS

In its primitive form, a wheel is a circular block of a hard and durable material at whose centre has been bored a circular hole through which is placed an axle bearing about which the wheel rotates when a moment is applied by gravity or torque to the wheel about its axis, thereby making together one of the six simple machines. When placed vertically under a load-bearing platformor case, the wheel turning on the horizontal axle makes it possible to transport heavy loads; when placed horizontally, the wheel turning on its vertical axle makes it possible to control the spinning motion used to shape materials (e.g. a potter's wheel); when mounted on a column connected to a rudder or a chassis mounted on other wheels, one can control the direction of a vessel or vehicle (e.g. a ship's wheel or steering wheel); when connected to a crank, the wheel produces or transmits energy (e.g.the flywheel).

Fig 10.wheel

11.SOUND SENSOR

The sound sensor module provides an easy way to detect sound and is generally used for detecting sound intensity. This module can be used for security, switch, and monitoring applications. Its accuracy can be easily adjusted for the convenience of usage. It uses a microphone which supplies the input to an amplifier, peakdetector andbuffer.When the sensor detects a sound, it processes an output signal voltage which is sent to a microcontroller then performs necessary processing.

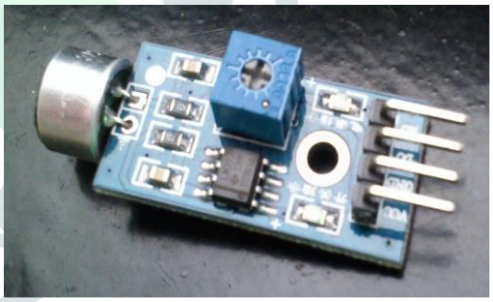


Fig 11.Sound Sensor

11.IR SENSOR

An IR sensor is an electronic device that emits in order to sense the surroundings. An IR sensor can measure the heat of the object as well as the detects the motion. The sensor which measures only infrared radiation rather than emitting is called passive IR sensors

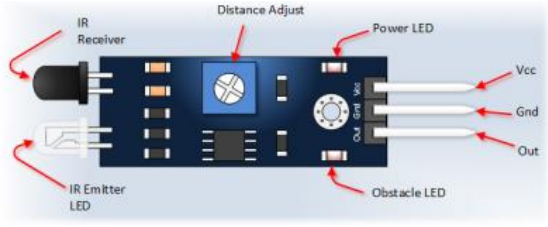


Fig 12. IR Sensor

VI. RESULT

In the designed system a switch connected to the microcontroller. If the switch is turned ON then the microcontroller will send the details to the driver circuit and it will activate the snake robot mechanism. The snake robot will be moving in the serpentine motion and in linear motion but in only one direction (forward direction-automatically). In addition to that we are using WI-FI camera attached to the snake robot which will give the live video streaming. If the switch is turned off then the details will send to the microcontroller and from there snake robot receives the command and will stop moving. The IR sensor is used to find any obstacle presents in the snake robot path and if obstacle is identified then the robot will take a curve to eliminate collision with obstacle and moves in same path. The Sound sensor used to find the presence of sound by trappedhumans which inturns turn on the buzzer. By this method we are achieving the proposed system.

VII. CONCLUSION

The performance of the system includes the effective use of hardware and software to enable the improvising techniques. The system ensures the quick rescue operation. It is an accurate and eco-friendly method employed. The future scope is we can use the image processing techniques for further accuracy.

VIII. REFERENCE

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