Arduino Based Snake Robot

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Abstract: *Development of robotic vehicles becomes an important tool to explore the human's life. Here a remotely operated robotic snake is taken into consideration over Autonomous vehicle to overcome the unavoidable loss and it is highly maneuverable. This remote vehicle adopts the environmental approach in the design aspects. The appealing nature of biomimetic approach is helpful for the robotic model. The possible design shape is analyzed and embedded with electronic subsystem like sensors: IR sensors, the actuation is provided by the dc motor. The kinematics and controllability of the snake robot is compared with the biological snake and the escape response is given to the robotic snake to avoid the obstacle. The brain of this snake robot is an Arduino Uno microcontroller in addition to that wireless camera is interfaced with the board, placed in the area of front head portion of the snake and the whole body is made up of aluminum which is suitable and reliable for the fabrication purpose.As the wireless camera is placed in front really useful for the surveillance and monitoring purpose. The oscillating body of the snake is imitating the anatomical form of snake.*

Keywords: *snake robot, environment, IR sensors, remotely operating robot.*

I. Introduction

Scientific innovations have always helped mankind to explore the extremes and reach to the avenues beyond our imagination from simple agricultural tools to sophisticated spaceships, satellites. With ever growing innovations & inventions man has explored the outer space. From simple tools like knife, pen to advanced computerized systems technology has helped us achieved the so called 'beyond human capabilities'. The project does not mimicking a snake but to take inspiration of their body shape and their neuronal control mechanism to develop novel type of robot.

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 is now being practically used in every field from agriculture to aeronautics, from education to medical, from production to entertainment, from domestic help to advance research. Dedicated specialized robots are being developed for every field and world has already witnessed the successful use of robots in many spheres. The time of development of snake mechanism, the locomotion and obstacle avoidance have many limitations. The complete system architecture was designed as each module separately. So controlling depends on different levels. Industrial robots**,** Domestic or household robots**,** Medical robots**,** Service robots**,** Military robots**,** Entertainment robots**,** Space robots**,** Hobby and competition robots are some of the examples.

II. System Implementation

Present system

In many of the present system have a more number of motors and wheels that makes the system bigger in size and more bulky. The many of snake robots in application is large in size as well as controlled by using wired connections. This type of systems is not compatible for many of the operations. Here it is clearly can get the idea that each link carries the pair of wheels and the joint. This type of snake robot is not flexible in structure, and also in operation. The power supply and hardware requirement of robot is increases, this type of snake robot is not compatible to work in small and rescue places. The control of locomotion of the robot is also creating a problem due to its length and wired controlled. The development of snake robot is expensive to produce; many parts are required because of the many section and joints. It is important to develop robot structure in that way to reduce size and price because in rescue application we would place the robot in location where it likely that destroyed.

System implemented

The robot that we are going to made is a command and control robot. This robot takes commands from the user in the form of control signals and performs the required action. The main idea of this robot is to provide the operator with safety and security from the risks that they face every day. In addition, events recorded by a robot's camera can provide evidence for further analysis. Figure shows the complete block diagram of snake robot. It is divided in two sections first one is control section and second is snake robot. The first section is controller of robot. It consist of PC console application which be in visual basic 6.0(VB 0.6). This shows a graphic arrow for left, right direction by pressing such arrow we will move the snake robot in respective direction. RF transceiver sends this command to the robot and another transceiver which is mounted on robot is receiving a commands. The video receiver is receiving a video which is send from wireless camera mounted at frontend of robot and this video is send to the USB TV tuner card.TV tuner card is connected to the computer through USB port. It will provide a video captured by the camera, by using this card we will process on video. It provides high quality video, audio support for recording in DVD. By this live visualization we can control the direction or location of robot.

In second section of the block diagram of snake robot, it consist a RF transceiver, arduino board, DC motors, wireless camera, IR sensor and battery as power supply i.e. overall mechanism of snake robot. First the RF transceiver receives a command from controller and send to the arduino board. After receiving a command from transceiver, arduino will work as per programing. They will send signal to motor driver IC. PWM output of arduino is given to the motor driver. Motor driver drives the two DC motors and the locomotion of robot is done through two DC motors. If any obstacle is found in front of snake robot IR detects and output of IR get high. That movement motors stop rotating. The power supply is provided to the whole robot circuit through the battery which is of 12 volt .At the same time the wireless camera is captures and transmits video of received area to the receiver. Wireless camera is working on 9 volt therefore we provide the separate 9 volt battery for camera.
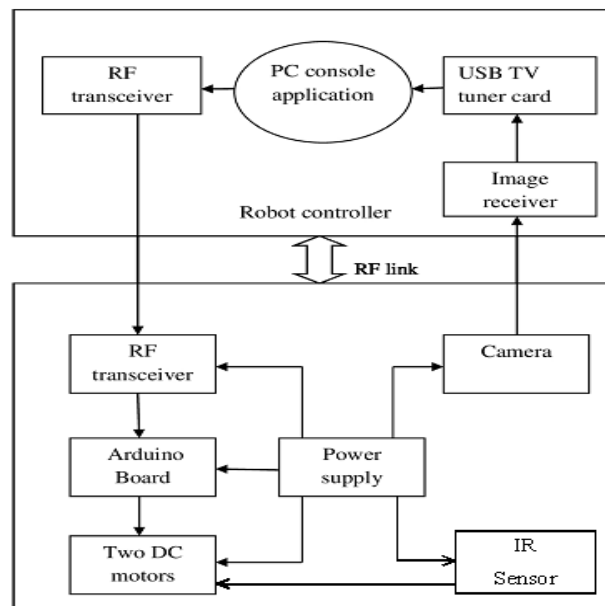
Fig No 1: Block Diagram of Snake robot
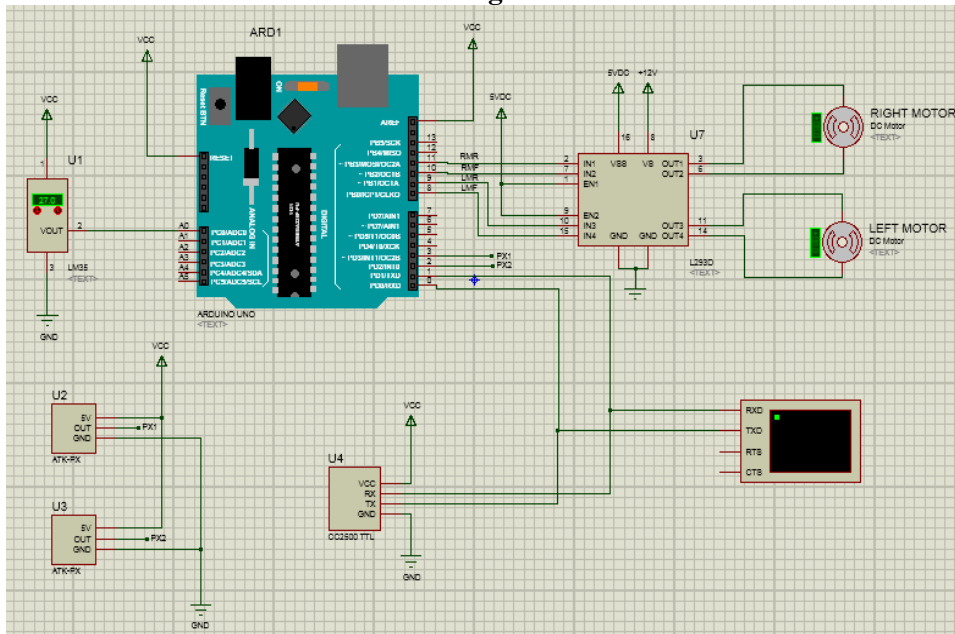
III.   Figures
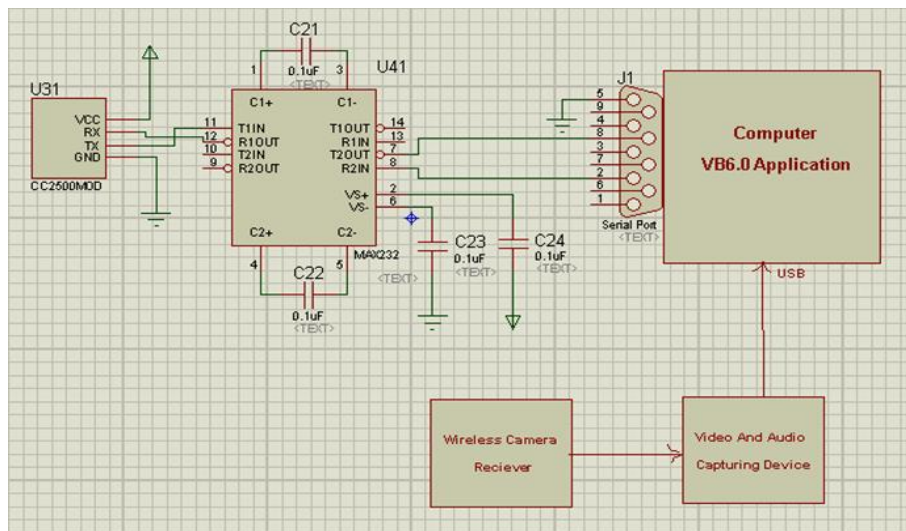

Fig No2: Circuit Setup of Robot

Fig No3: Circuit of Robot controller

Figure no.2 shows the circuit diagram of robot, output of RF transceiver is connected to the arduino at pin 0, 1 in between the serial communication is formed. As the command received from controller (user) arduino take action as per the command they will programed for drive a motor as per given commands. It generates a PWM signal and it will give to the motor driver IC L293D.The PWM output pins no.8 and 9 are connected to the motor driver IC. As per received signal motor driver drives the two DC motors connected to it. The 500 ns delay is introduced between the two motor rotations in programming, therefore motors rotate one after another and robot movies like snake. The two IR sensors are mounted in front of the snake robot they act like eyes of snake. The two IR sensors is output given to the arduino controllers analog input pin no. 2 and 3. At normal condition the output of IR sensor is high and when any obstacle is present in front of IR receiver then the output is goes low. Then the arduino signals to motor driver and then respective side motor is continuously rotating another motor is stop at that time. This will prevents the robot from striking or collision on any obstacle. On the other side wireless camera continuously captures a video and transmits to its receiver.

Figure No.3 shows the controller section of snake robot it consist RF transceiver, VB6.0 application, camera receiver, TV Tuner card. As power supply of robot is on and the forward, left or right command is given from computer the snake robot will in locomotion. When the command is given through application this will be send through RF transceiver to robot. Four commands are given from the controller forward, left, right and stop.

For controlling robot we use VB6.0 and creating the application as per requirement. Same time the video is view on the screen of computer as per direction of robot wireless camera capture video by its range and sends to the receiver. The USB video adapter gives a better quality video as well as audio. It also provides useful features like recording of video, supporting brightness, contrast and saturation control. By viewing this video we can move robot as per required direction, and using this video we can use the robot for different applications like rescue, hazardous conditions, defense application and surveillance.

IV.   Conclusion

This paper has described overall design for biological snake inspired robotic implementation. This robotic snake is less expensive, robust and it is a helpful tool for the clustered areas.The department for scientific survey and surveillance purpose. The ongoing and future work is concentrated on the improvement of body design by implementing the multi-link body joints to attain the enhanced snake body sign motion and to some extent of military purpose it can locate the mines with help of advanced Sonar. The main objective of our work is to provide a powerful embedded real time system for search and rescue operations, surveillance and several.

References

[1]   Nidhi Chaudhry, Shruti Sharma,"A Review Study on Future Applicability of Snake Robots in India", IOSR Journal of Computer Engineering, Vol.17,Issue 5, Ver.1, Oct.2015

[2]   M.Vignesh Kumar, P.Sabthagiri Rajan, "Design And Development of Snake Like Robot Based on Environmental Condition Using Arduino", International Journal on Application in Mechanical and Production Engineering Vol.1, Issue 8, Aug.2015.

[3]   Alessandro Crespi, Andre Badertscher, "AmphiBot I: an amphibious snake like robot", School of Computer and Communication Sciences,EPFL,Swiss Federal Institute of Technology, Lausanne, Switzerland, Sep. 2004.

[4]   Aksel Andreas Transeth, K.Y. Pettersen, "A Survey on Snake robot Modeling and Locomotion", Journal Robotica archive, Vol.27, issue 7, Dec. 2009.