REVIEW OF SNAKE ROBOT

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ABSTRACT

This paper presents the design and development of an Autonomous Snake-Like Robot that can move through narrow spaces, detect obstacles, and avoid them without any external control. The robot is designed to be flexible like a real snake and is equipped with a camera for visual monitoring. The main goal is to create a robot that can be used in areas where normal robots cannot go, like disaster zones, pipes, or search and rescue missions. The robot uses sensors to detect obstacles in its path and changes direction automatically. This paper explains the robot's design, working, components used, and how it performs in different situations. The project aims to help in creating low-cost and effective solutions for tough environments.

Keyword: *Snake Robot, Rescue Mission, Microcontroller, Visual Feedback.*

1. INTRODUCTION

Robots are becoming more useful in many fields like medicine, industry, and rescue operations. But in some situations, normal wheeled or legged robots cannot move properly, especially in narrow or uneven areas. This is where snake-like robots can be very helpful. These robots are inspired by the way real snakes move, and they can go through tight spaces, climb over obstacles, and move on rough surfaces.

The main aim of this project is to build an Autonomous Snake-Like Robot that can move, sense obstacles, and avoid them without human control. The robot is also equipped with a camera to give a live view of its surroundings, which makes it useful in places where it is hard or dangerous for humans to go, like collapsed buildings, pipes, or underground areas.

In this paper, we explain the design and working of our snake robot, the hardware and software used, and the testing process. Our goal is to make a low-cost, efficient, and flexible robot that can work in real-world situations where traditional robots cannot reach.

2. COMPONENTS

Microcontroller (Arduino ESP-8266):

It is the mind of the robot. It commands the motors, reads sensor values, and determines the movement depending on the program.

Ultrasonic Sensors :
They are employed to sense obstacles in front of the robot. Upon detecting an obstacle, the robot alters direction to evade it.

Camera Module (ESP32-CAM):
A mini camera is incorporated to provide a live video output of the robot. It is useful for observation and navigating through places.

Battery / Power Source:
A 9V DC battery powers the robot. It provides power to the microcontroller, motors, sensors, and camera. It is a light-weight and readily available battery, but it will have to be replaced or recharged after a few hours, depending on the number of motors the robot carries.

Motor Driver Module (L298N):
This module assists in regulating the direction and speed of the motors according to the instructions of the microcontroller.

Software (Arduino IDE):
Utilized to create and upload code to the microcontroller. The code manages obstacle avoidance, movement logic, and camera functions.

3. WORKING

The snake robot is programmed to travel independently and navigate obstacles without the use of remote control. It operates step by step as follows:

- First, when the robot is powered on, the microcontroller begins executing the program. It drives the DC motors to cause the robot to move forward. The motors are positioned in various sections, so when they move in unison, the robot appears as if it is slithering, similar to a real snake.
- During movement of the robot, the ultrasonic sensor continuously checks whether there is an object in front. In case of an obstacle, the sensor reports to the microcontroller.
- As soon as the microcontroller receives the signal, it reverses the forward movement and determines a new direction to move in—left or right—so it does not collide with the obstacle. Then the robot moves forward again.
- There is also a camera installed at the front of the robot. It provides a live video feed, which is useful if the robot is employed in locations such as pipes, under rubble, or any small spaces where humans cannot move easily.
- All of these are powered by a 9V battery, which provides electricity to all the components such as the microcontroller, motors, sensors, and camera.
- Briefly, the robot advances, looks for obstacles, turns around if necessary, and continues to send video. It can be employed in search and rescue, pipe inspection, and other applications in hard-to-reach areas.

4. APPLICATION

Search and Rescue Missions:
The robot may venture into thin or hazardous environments (such as collapsed buildings) where it's difficult for human beings or large robots to pass. It can assist in the location of missing people in a disaster.

Pipe Inspection:
It may travel inside water or gas pipes to detect leaks, clogs, or damage, without wasting time or putting workers in harm's way.

Military and Surveillance:
The robot can be employed to secretly infiltrate enemy zones or structures and transmit live video without being easily detected.

Underground or Cave Exploration:
It can search narrow spaces in caves, tunnels, or mines where it's not safe for humans to enter.

Hazardous Environment Monitoring:
The robot can be deployed in a region with toxic gas, fire, or radiation where it's not safe for humans to enter.

5. CONCLUSIONS

We will develop and construct an Autonomous Snake-Like Robot that can travel on its own, sense obstacles, and sidestep them without the need for external control. The DC motor configuration and flexible body enable the robot to move like a live snake, so it can be applied in narrow or hazardous areas. We have also incorporated a camera for real-time video observation, which provides additional value in search and rescue or inspection operations.

This robot is an affordable and effective solution for scenarios where regular robots cannot function effectively. It can be applied to various real-world applications such as pipeline inspection, disaster relief, and surveillance. With additional advancements, such as improved battery life, wireless operation, or AI-driven decision-making, the robot can become even more effective and useful in the future.

6. REFERENCES

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