Unmanned Ground Vehicle Using Ultrasonic Ranging module.

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Abstract-The Unmanned Ground Vehicle comes under fields such as Robotics and Artificial Intelligence. Using the obstacle avoidance algorithm and some navigation techniques, UGV can operate autonomously. The architectural model of UGV consists of ARM7 microcontroller, which will operate and manage the different small integrated modules and sensors. The Prime purpose of UGV is to avoid obstacle by using ultrasonic ranging module.

Keywords- Navigation, obstacle avoidance, mapping, autonomous, Unmanned Ground Vehicle (UGV).

I. INTRODUCTION

Over the years technology in robotics and artificial intelligence have achieved great heights, the application of these technologies vary from micro technologies to building huge integrated devices. UGV is an example of the same. UGV is an unmanned ground vehicle which consists of number of sensors, modules which helps to collect and navigate the data from the surrounding environment. Navigation and real time obstacle avoidance are the main fields of Autonomous vehicle. UGV will automatically avoid the obstacle and navigate itself, or provide control towards the human operator. The primary requirement of this project is to create autonomous environment and control the UGV without human intervention. Objective of this project is to develop UGV system using embedded micro-controllers. Vehicle can start when it is in contact with ground without human presence. UGV's are actively developed for military purpose, spying, and dangerous works where humans don't have easy access.

II. ALGORITHM USED TO MAP THE NAVIGATION OF UGV

Obstacle avoidance is the key field of UGV, where it can traverse by using ultrasonic ranging module. Previously, light sensors where use to map the obstacle, but it had a disadvantage because of its Hence ultrasonic ranging module is used. The disadvantage of light sensor is overcome by ultrasonic ranging module. When the Ultrasonic waves travel, if an obstacle is encountered the waves reflect back to the UGV and helps it to detect an obstacle. The distance can be set according to the ranging module used. The intensity of beam of light increases as the object goes near to any obstacle and vice versa, but due to this the distance covered to map an obstacle is less.

III. PROPOSED ALGORITHM

Obstacle avoidance:
A. Input: Data collected from the surrounding environment through actuators (sensors).
B. Output: UGV avoided obstacle successfully.

C. Method: In Step1 when an UGV starts all the circuit board integrated on an UGV get initialised. In step2, the control goes to ultrasonic ranging module. The obstacle avoidance module Check for obstacles and discover them. If the obstacle is found, it avoids obstacle and it returns the detected data and transmit it to host machine. In step3, now control goes to DC motor drive, to move the ultrasonic ranging module to detect for nay surrounding obstacle. In step4, the electronic compass check for the UGV direction which has been already set, if the direction is proper the UGV will move forward. In step5, if any deviation in direction is observed by the UGV then the DC motor drive is activated. If deviation is not observed, measure, transmit and store temperature data, illumination data, and humidity data.

In step 6, the temperature status is checked. If the temperature is greater than the set temperature the UGV will get switched off and transmit the Visual surveillance data of environment. UGV will again check for any obstacle in its surrounding environment. The same process will be iterated.

IV. HARDWARE REQUIREMENT
A. RS232
B. IC 7805 (Voltage Regulator IC)
C. LPC2148 ARM 7 circuit board
D. AT 89C51 Microcontroller board
E. Camera
F. Electronic compass HDPM01 circuit board
G. SY-HS-220 HUMIDITY SENSOR MODULE
H. Photocell Light Sensor PDV-P8001 (3K-11K OHM 5.10MM)
I. LM35 Temperature Sensor
J. Photocell Light Sensor PDV-P8001 (3K-11K OHM), 400 to700 nm.
K. Four channel relay board
L. LM35 Temperature Sensor
M. ULN2003APG Motor Driver
N. Ultrasonic Ranging Module HC - SR04
O. Zig-Bee board

V. FUTURE WORK

The IR sensor can be used to detect the terrain region which have deep depressions and detect it, which will help UGV to navigate almost every place on the terrain without harming itself. UGV and UAV which is Unmanned Arial Vehicle can be used together to get the best result for any military or any other purpose. UAV can give the data which is not on zero ground level; it can also detect the depression which will help UGV to move in its direction.

In the future, we would like to explore multi-vehicle collaboration scenarios such as: Sharing obstacle mapping data with platforms lacking obstacle detection sensors. Obstacle mapping algorithm using multiple vehicles.

VI. CONCLUSION

In this paper we are proposing obstacle avoidance algorithm using ultrasonic ranging module for an UGV. Ultrasonic ranging module helps to detect obstacle more efficiently and effectively. This is one of the usable and effective modules on a basic level which can be easily afforded for any usage.

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