Multipurpose Defence Robots

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ABSTRACT: *Human life is inevitably the most valuable resource and to accomplish the safety standards for the life of humans, it is necessary that these vulnerable machines are the physical excellence of human intellect. These Machines include UAV's, Guided Missile systems, Military robotic vehicles, unmanned ground vehicles and much more. These Machines are vulnerable to software threats and attacks from the enemy and can lead to serious issues if the communication algorithm is easy to override by the enemies and revert back the attack. Our work focuses on the overall development of the stable and reliable communication system with low latency of error and to contribute to safety of these military systems.*

Keywords: Radio Frequency, advanced regulator, military operations, war fields

1. INTRODUCTION

The Era of Modern warfare and robotics equipment has led to security awareness among the usage of Military Robots throughout the world. Our work focuses mainly on the communication module and methodological algorithm to reduce the interception of the enemy signals and prevent hijacking of these vulnerable military robotic vehicles. The channel hop technology is carried out in a HC12 radio frequency module to establish communication up to 1km to carry out ground and aerial military operations and reconnaissance.

2. HC12 COMMUNICATION ALGORITHM

Radio frequency communication involves Electromagnetic waves in the frequency range of 3 KHz to 300 GHz Wireless transmission. We have used HC12 Wireless RF module with frequency 433.4 MHz to 473MHz with 100 channels and 1km Range [4]. We have implemented a unique communication algorithm using frequency hopping to secure the communication between the robot and controller as well as eliminate threat attacks.

The Algorithm is designed such that the signal sent is unpredictable to both the user and the attacker.

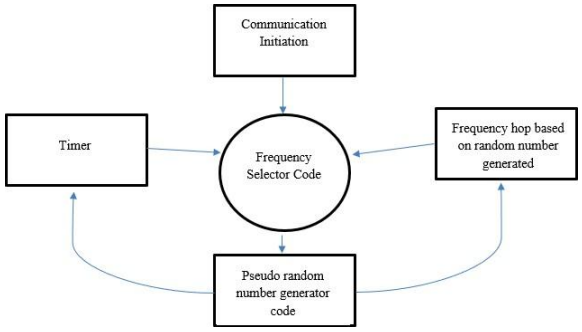

Fig. 1.1 RF Communication Block Diagram

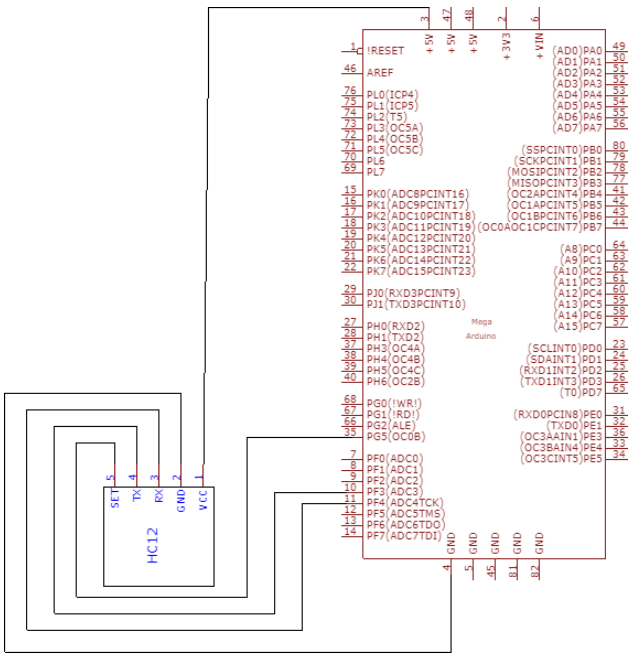

Fig. 1.2 Connection of HC12 with Arduino mega

Communication Initiation: Communication is established between ATmega2560 with HC05 RF module with AT commands.

Timer: We have written code to expire the timer with an indication signal to the frequency selector code snippet. Once the timer expires it sends an indication to restart the timer again

Pseudo Random number generator code: Based on a predefined function timer input a random number is generated from 1 – 100 mapped to 100 channels in the HC12 module.

Frequency Selector Code: Based on the indication received by the timer and Pseudo random number which is generated with particular frequency range and channel is set between 1 and 100.

3. SENSORS AND MOTORS

Foremost, for the robot to sense the surrounding, it has to be equipped with several types of sensors. Giving the robot sensory parts such as light, touch and pressure sensors, gas sensors, ultrasonic sensors, sonar sensors and infrared sensors enable it to be alert of the setting. The ultrasonic sensor can be used to sense obstructions between one to four meters. Additionally, the temperature and humidity sensor, which is a constant, low-cost digital temperature and moisture sensor, uses a capacitive moisture sensor and a thermistor to amount the air in the surrounding and produce a digital indication. The temperature sensor, which is an IC temperature sensor, works to provide the temperature of the surrounding air. Moreover, the gas sensors detect the concentrations of various harmful gases in the atmosphere. The gas sensors can operate at temperatures from -20 to 50 ºC and have a fast response rate once it has pre-heated.

In the communication unit, the robot has a transceiver, a wireless module board with maximum transmission data rates, and high reliability. It can be used in various occasions including short-range wireless Communications and industrial remote control. The GSM module works to communicate with the control unit of the robot from any distance within the GSM network. Moreover, the video transmitter and receiver have an antenna that can work in a range of up to 500 meters.

The robotic body is crucial as it has to be made to suit its motive or area of use. The DC gear motor has a gear assembly affixed to the engine that increases the torque and reduces the rate. Additionally, the Servomotor is a rotary actuator that lets for specific regulation of angular position, speed, and acceleration. Hence, it needs a comparatively advanced regulator, a frequently dedicated component intended precisely for use with servo motors. The wheeling system is also designed to be suited to the field of application. Since the surface is rough, the robot should have an adaptive wheeling system. Also, the wheel's radius and traction on the surface is crucial for enabling obstacle-crossing ability and moving on a slippery surface. Similarly, the robotic arm aids in picking and placing objects and is usually programmable.

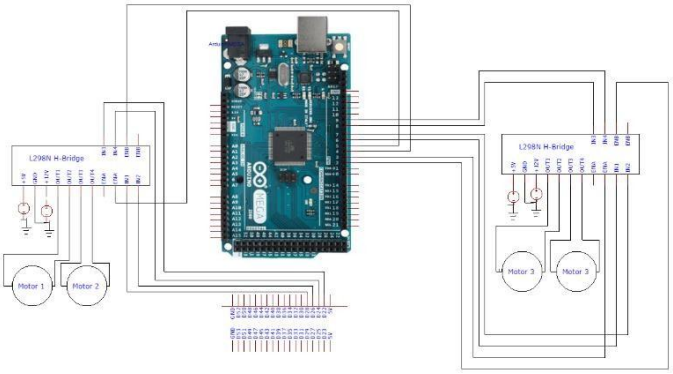

Fig. 3.1 Connections of the motors to Arduino mega

Furthermore, the body frame needs to be made using a substance with exceptional physical ability and performance features. Similarly, the content has to be resistant against impact, chemicals and industrial gases as well as endure under continued exposure to elements. Lastly, the processing unit is crucial in coordinating the defensive robotic system due the onset of technology. Hence, incorporating artificial intelligence into the robot's movement has been essential in making autonomous decisions.

The defence robot can accomplish missions far away in the open zones, without any real destruction to human lives. Moreover, these robots are more robust and more proficient in enduring damage than humans. Hence, they offer more significant odds of accomplishment in hazardous settings. On every occasion a robot is shot down or destroyed, it can be repaired or replaced with a new one. Similarly, the camera feature in a military robot enables humans to control it via a computer as a spy. More research and development of robots that can perform various tasks would be impactful in the field of military operations.

4. TURRET GUN MECHANISM

The principle behind turret gun is the compressed air where we have made use of compressed air stored in a cylinder and is let out of the nozzle which increases the velocity of air going out. This air is let to pass through a plastic pipe to which plastic bullets are fed and the air carries bullets out with very high velocities reaching the target. The flow of air is controlled by a solenoid valve which is pulsed with a 24 volt battery through a relay which in turn is pulsed by the Microcontroller. This ensures that there is no accidental triggering of the gun. Fig. 3.16 shows the mechanism of the turret gun.

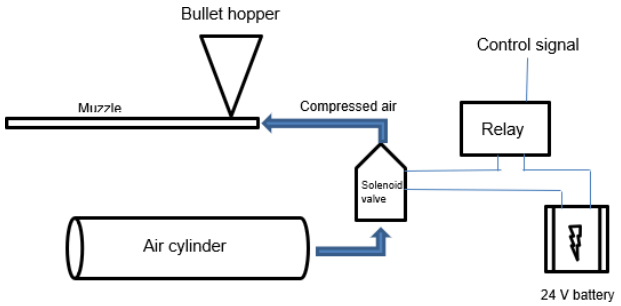

Fig. 4.1 Turret gun Mechanism

CONCLUSION

In conclusion, the defence robot has been and is still being successfully designed, constructed, and integrated into military operations. It can also be successfully deployed in war zones for military use. The robots successfully detect any harmful gases or substances in the environment that can cause harm. Moreover, the various crucial parts of a robot are vital in meeting its objective.

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