

BORDER SECURITY ROBOT USING AI

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Abstract - It is very important to keep our border security forces well equipped with the least technologies to prohibit unwanted occurrences and strengthen the troops. Our borders extend thousands of miles and therefore our soldiers will not be able to provide complete security. Illegal immigration, smuggling and trafficking in drugs and arms can be prevented if the borders are secured. As technology increases new threats and risks arise towards national security. To improve the border security, sensor technology and computer processing power can be used. Keeping these facts in mind, the idea of building a boarder security robot using AI which can patrol the borders and keep close eye on the sensitive areas.

Key Words: Artificial Intelligence (AI)

1. INTRODUCTION

Security is the degree of protection, which separates the assets and potential threats. Security can be classified into different types; they are information technology security, physical security, potential security, monitory security etc. The design and development of robots now a day's focuses on unstructured and natural environments rather than for industrial environment. Robots are used for rescue security and surveillance. The skill of robot can be utilized were a human is not capable for doing it. For monitoring remote areas an intelligent robot can be designed with reliable economic communication.

Robots have replaced humans in performing repetitive and dangerous tasks which humans prefer not to do, or are unable to do because of size limitations, or which take place in extreme environments such as outer space or the bottom of the sea. There are concerns about the increasing use of robots and their role in society. Robots are blamed for rising technological unemployment as they replace workers in increasing numbers of functions. The use of robots in military combat raises ethical concerns. The possibilities of robot autonomy and potential repercussions have been addressed in fiction and may be a realistic concern in the future.

The proposed border security robot using AI can perform surveillance around areas of boundaries for monitoring of any illegal or suspicious activities inclusions or ceasefire violations. The number of soldiers who are recruited in the borders can be reduced by deploying the AI robot. Here the robot can identify trespassers using video surveillance, which provides a 24-hour surveillance. Intruder detection is performed with image processing. There are mainly three sections, namely software section,

hardware section and Robotic action. It has the capability to automatically detect the trespassers in borders and to inform nearby control unit. This robot is working with the help of artificial intelligence.

2. PROPOSED ARCHITECTURE

2.1 Raspberry Pi 3B+

The Raspberry Pi 3 Model B is a third-generation Raspberry pi. This powerful, low cost and small size single board computer can be used for many major and minor applications. Raspberry pi 3 has most powerful processor and it is 10 times faster than previous generation. This third generation pi has additional wireless LAN and Bluetooth connectivity which is making it the ideal solution for powerful application. The Raspberry pi 3 contains many ports like camera connector, Ethernet port, GPIO pins which is mainly used for interfacing sensors and switches, USB port for external I/O devices, HDMI ports for monitor and audio jack port. These all are attached with a single board. It does not have any internal storage or own operation system, but we can insert an SD card with Linux based OS.

2.2 Raspberry pi camera

The Raspberry Pi No IR Camera Module is a custom designed add-on for Raspberry Pi that does not have an IR cut filter installed. Like the regular Pi camera, it attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data. The sensor itself has an active resolution of 5 megapixel, and has a fixed focus lens on board. In terms of still images, the camera is capable of 2592 x 1944-pixel static images, and supports 1080p 30, 720p 60 and 640x480p 60/90 video.

2.3 Servo Motor

A unique design for servo motors are proposed in controlling and for control applications. They are basically used to adjust the speed control at high torques and accurate positioning. Parts required are motor position sensor and a highly developed controller. These motors can be categorized according the servo motor controlled by servomechanism. If DC motor is controlled using this

mechanism, then it is named as a DC servo motor. Servo motors are available in power ratings from fraction of a watt to 100 watts. The rotor of a servo motor is designed longer in length and smaller in diameter so that it has low inertia.

2.4 DC Motor

A DC motor is any of class of rotary electrical machines that converts direct current electrical energy into mechanical energy. DC motors have some internal mechanism, either electromechanical or electronic to periodically change the direction of current flow in part of the motor. There are 2 types of dc motors - brushed dc motor and brushless dc motors. Dc motor is use to drive the robot for that we Use 500 rpm 4 dc motor. The speed of motor is depend on diameter of wheel and Rpm (Resolution per minute) of motor. Rpm is inversely proportional to torque. If the speed of motor is gradually increase torque of motor will be decrease.

2.5 GPS

Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth. GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS. GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites.

2.6 GSM

SIM800L is a miniature cellular module which allows for GPRS transmission, sending and receiving SMS and making and receiving voice calls. Low cost and small footprint and quad band frequency support make this module perfect solution for any project that require long range connectivity. After connecting power module boots up, searches for cellular network and login automatically. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking).

2.7 Power Supply

The power supply for the Border security robot is provided by using rechargeable batteries. A 12 volt lead acid battery is used to provide the required power. In addition to that we will be using PCA9685 which will be providing power up to 16 servo motors. Raspberry pi has ports for power supply. So an external battery is necessary for more connections and to give power to the Raspberry. Also it provides power to the motor driver.

3. IMPLEMENTATION AND WORKING

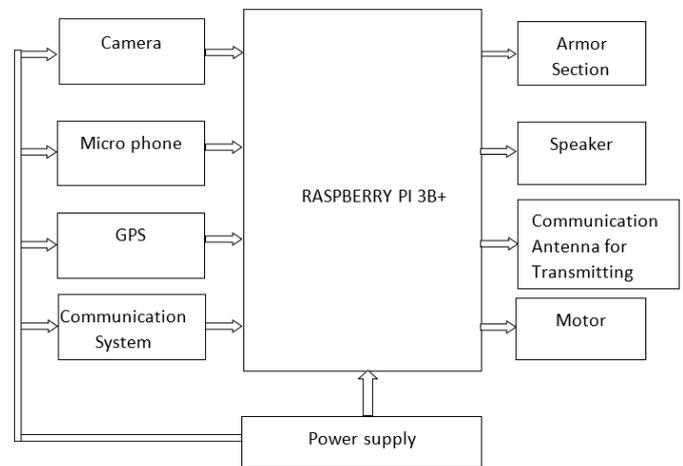


Fig-1. Block diagram of the border security robot using AI

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. AI is considered as the most trending and fastest growing technology. AI is the combination of several computer algorithms which performs different tasks and the output is combined together to make a decision. It is capable of communicating with human activities.

Figure 1 explains about the working of border security robot. In this raspberry pi 3B+ acts as a CPU, which process the information acquired by various sensor and execute proper output by analyzing the fetched data. Any changes occurs in the environment from the predefined data the robot starts the counter activities, same time it sends the details to headquarters using communication system which mounted on the device. So that the person in the headquarters can monitor and decide what can be do. But in some critical condition the robot itself take action. The microphone is used to capture the explosion or bursting of guns. The GPS will give the exact location of the robot. DC motors, Servo motors are used move the body parts and locomotion.

4. RESULT AND CONCLUSION

Using python, Tensorflow and other libraries we did the coding and our robot can detect the intruder activities taking place in the border area and able to take the necessary action toward that.

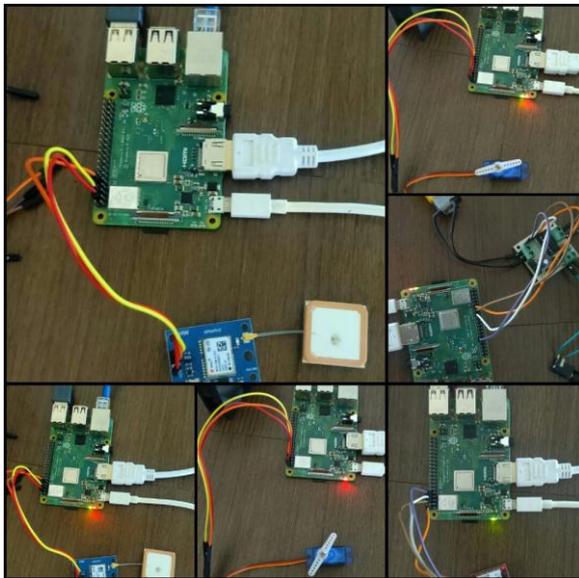


Fig-2. Connections of different modules with raspberry pi 3B+

The connection of various modules with the raspberry pi is shown in figure2.

Border security is an important factor for every country. To avoid illegal migration we can use these robots . A single robot can only monitor small area, but a large number of robot can monitor the intruder widely.

4.1 CONCLUSIONS

The robotics is a progressive sector in the current era of electronics. In the future, most of the jobs done by the humans may be replaced by the robots. Here in this project the robot is able to solve certain problems which human cannot solve.

Since the Indian government is also spending more amounts for robots which can help in military applications, the proposed robot is having high importance. In the future the robot can be used for bigger purposes. It can be used to do spying operations even during night and can be used for bomb detection and bomb defuse as well.

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