AUTONOMOUS INTELLIGENT ROBOT FOR BORDER SECURITY

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ABSTRACT

"Security" one of the major concerns in today's life. Be it in-house, society and interstate or among countries, a huge loss of lives is associated with it. When it comes to border security, many soldiers lose their lives due to trespassing/intruding or a bomb explosion. As technology increases new threats and risks arise everyday towards safeguarding our national security. In this regard there is a need for many advanced technologies in improving the border security. In this work we propose an autonomous robot for continuous monitoring of borders and safeguarding of soldiers lives from various threats. Each robot is installed with a PIR motion sensor and Camera. On any detection of an intruder by the PIR motion sensor, the camera is activated to capture the image and live videos, which are processed by the processor for further action. If the action needs to target the intruder, each robot is also facilitated with a laser gun which can be triggered instantly. Bombs and any dangerous metal obstacles can also be readily detected by the proximity sensor installed in each robot. This facilitates the base station in diffusing them and safeguarding the lives.

***Keywords -** PIR motion sensor, Proximity sensor, Laser gun, Base station.*

I. INTRODUCTION

The use of robots in warfare, although traditionally a topic for science fiction, is being researched as a possible future means of fighting wars. Already several military robots have been deployed by various countries, However not many have used robots to safeguard the border security. Soldiers being the greatest asserts of our country, safeguarding their security and safety is also of utmost importance. As technology advances new threats and risks arise as a toughest challenge for the soldiers to overcome every day. And not many are within their reach. Thus robots play an important role in these situations where soldiers can't keep an eye and where soldiers can't make their presence in some high altitude areas. Huge amount is invested by Military towards research and development of robotic based automated systems. These systems are used to detect hazardous materials like bombs, avoid smuggling, controlling the movement of intruders across the borders etc.

In this paper we introduce an enhanced way of assuring border security using advanced security devices like PIR motion sensor, proximity sensor, Laser gun, email alerting, real time image capturing and live video streaming.

II. RELATED WORK

The robots are mainly used in border for security purpose. The intelligent robot detect the human and inform the control unit to check whether the human is intruder or not by sending the video [1]. Machine vision will detect a human body and inform the police officer and shoot the person [2]. PIR Motion sensor sense the human and alert the military authority person by SMS using GSM and captures the image of intruder using camera and mail to the prescribed mail id using android based application[3]. In this work the smart car robot detects the human motion, bombs or hazardous objects, fire, metal objects, gas detection once it's get detected its send the information to the base unit [4]

III. PROPOSED METHOD

Fig.1 shows the block diagram of robot for border security. It consists of Raspberry Pi, PIR motion sensor, Proximity Sensor, Power Supply, Motor driver, DC motor, Laser gun and a Camera.

Raspberry Pi is the core/heart of the project, which controls the main activities of the robot. It has 1 Giga Bit(GB) RAM, SD Card Port, Wi-Fi, camera Port, 40 pin general pin input output(GPIO), 4USB ports, Micro USB Port and High definition multimedia interface(HDMI)screen. Putty tool is used to program the Raspberry Pi using Python.

PIR Motion sensor is an electronic sensor which measures the infrared light radiated by the objects. It is mainly used to sense the movement of the human or animals.

Proximity sensor is used to sense the presence of nearby objects. It emits uniform electromagnetic radiation and identifies the objects by calculating the changes in the field strength. As a result these sensors are highly reliable.

DC Motor is an electromechanical device that converts electrical energy into mechanical energy in the form of motor rotation. It has an inductor inside, which produces the magnetic field used to generate the movement. Driver circuit is a dual H-bridge motor driver IC used to drive the motor independently in all directions.
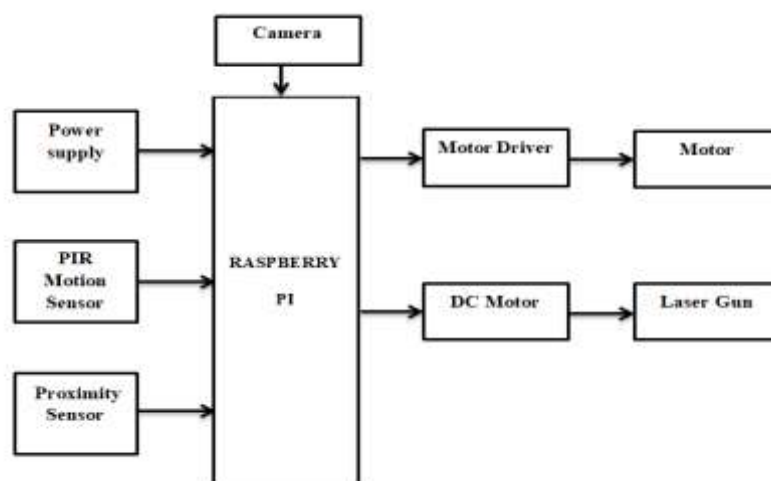

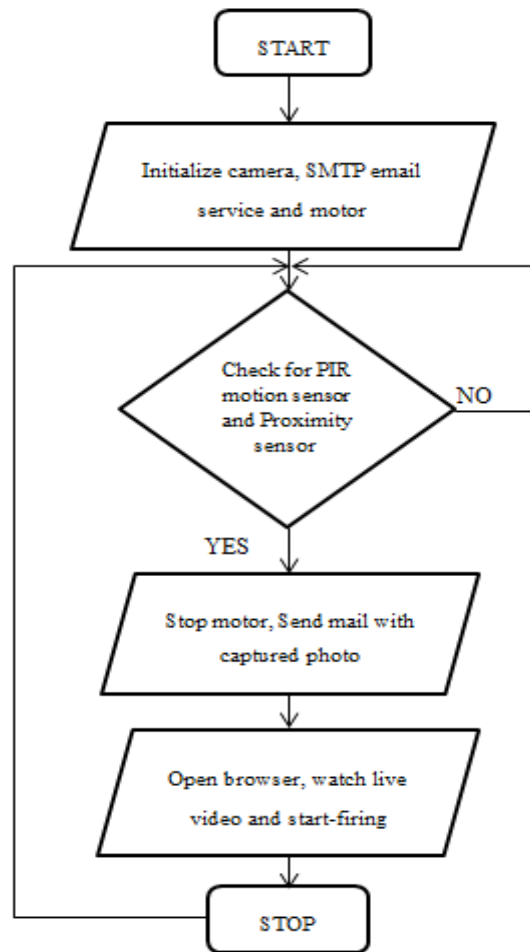Fig. 1:   Proposed block diagram of autonomous robot for border security

Fig. 2:   Flow chart of Border security.

3.1 Working Description

To start with, we first initialize the camera, Raspberry Pi, simple mail transfer protocol (SMTP) Email service and motor to configure the functions.

The PIR motion sensor is an electronic device connected to the input/output pins of the Raspberry Pi to sense the human motion. Proximity sensor is used to sense the nearby hazardous objects. Once an intruder or a bomb gets detected the robot stops moving and immediately captures the images. These images are transferred via SMTP to the military authority at the base station for any further action. If an intruder is identified then the Authorities at the base station can invoke the live video streaming to further command the movement of the robot or even fire at the intruders using the laser gun attached with each robot. Whole flow and working of our proposed autonomous robot is depicted in the flowchart presented in Fig.2.

IV. RESULTS

Fig.3 shows the image of hardware components used in proposed method, like Raspberry Pi, PIR motion sensor, Proximity Sensor, Power Supply, Motor driver, DC motor, Laser gun and a Camera.
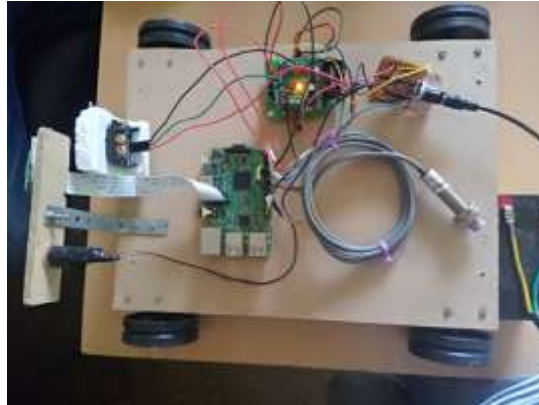
Fig. 3:   Shows the image of Proposed robot

Fig. 4 shows the image captured by camera when human is dectected, The PIR motion sensor sence the human motion once human or intruder is detected the robot stops moving and immediately captures the images. These images are transferred via SMTP email to the military authority at the base station
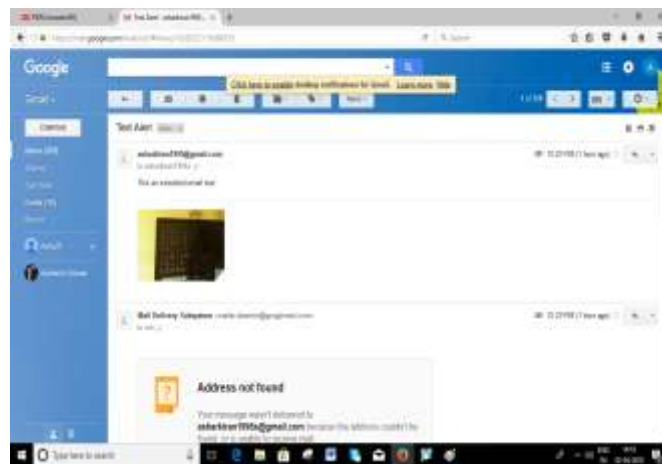

Fig. 4:   Image captured by camera when human is detected.

Fig. 5 shows the snapshot of live video streaming, If an intruder is identified then the military authorities at the base station can invoke the live video streaming to further command the movement of the robot or even fire at the intruders using the laser gun attached with each robot.

Fig. 5:   Snap shot of live video streaming.

V. CONCLUSION AND FUTURE SCOPE

Reducing human interface at the borders and ensuring proper security is very important. This method has PIR motion sensor that monitors human activity and proximity sensor that monitors objects like explosive continuously. The live video streaming ensures that there is always an eye at the borders. The laser gun facility plays a key role when intruder enter the border.

In this proposed method, the main source of energy for the robot is provided through battery life is durable. It's important to continuously monitor battery condition. The draining of battery is the main disadvantage, so in future can develop a robot that uses solar energy for its functionality.

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