MULTIFUNCTIONAL ROBOT FOR MILITARY APPLICATION USING CAMOUFLAGE TECHNIQUE

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ABSTRACT: Nowadays, many expenses are made in the field of defense in adopting primitive security measures to protect the border from the trespassers. Some military organizations take the help of robots in the risk prone areas which are not that effective when done by army men. These Army robots are confining with the camera, sensors, metal detector and video screen. The main objective of our system is to get camouflaged including some additional parameters like built-in Wi-Fi module for real time data processed by the camera at the video screen and PIR sensor to trace the intruders.Thus the proposed system using Wi-Fi reduces errors at defence and keeps the nation secure from thefoe.

KEYWORDS – Raspberry Pi, Open CV, Robot, Camouflage.

I. INTRODUCTION

A robot is a mechanical device which often resembles a human or animal. In today's world, humans are replaced by these robots in performing repetitive and dangerous tasks. The Robot which we designed is much more advanced than a normal robot, our Camouflage robot which can be controlled via Wireless communication. We mainly focused on the word "Artificial Intelligence" which gives the perfect meaning that the robot can do the tasks or actions automatically without any human interference

These kinds of robot can be designed better for Military operations or terrorist attacks, as it is small in size and camouflaged, it is barely noticeable by terrorists and we can use this robot for Wildlife photography. We tried to include as many functions and features possible to create one machine to protect and serve day to day with the soldiers like Metal Detector for Mines and Bombs, Remote Control from a Mobile Device etc.

Objective of this work :
To capture and identify unknown/enemy foe and trigger an automated gun/laser against the enemy. To blend with the present environment by enabling camouflage mode.

To detect metal objects like mines and bombs from the ground and report. To detect the friendlies or enemies by the camera and PIR Sensor.To control the movement of the robot by the Smartphone.

II. LITERATUREREVIEW

Laura Rodríguez Carlos-Roca, Isabelle Hupont Torres and CarlesFernándezTena, "Facial recognition application for border control". This paper provides an overview of border control processes and how the inclusion of different biometric technologies contributes to its improvement. In particular, facial recognition is one of the latest biometric technologies to have been added to this list of technologies[1].

DawoudALshukri, VidhyaLavanya R, Sumesh E P and Pooja Krishnan, "Intelligent Border Security Intrusion Detection using IoT and Embedded systems",This system uses thermal imaging cameras (FLIR) for detection of

various objects and infiltrators. FLIR is assigned an IP address and connected through the local network to the control center. Software code captures video and subsequently the intrusion detection. A motor controlled spotlight with infrared and laser gun is used to illuminate under various conditions at the site[2].

NehaBhadwal, VishuMadaan, Prateek Agrawal, Awadesh Shukla and AnujKakran, "Smart Border Surveillance System using Wireless Sensor Network and Computer Vision" ,This system is the most important task in the field of national defense and security hence this system which can perform the surveillance task without requiring any human assistance. It can eliminate the need of deploying humans at hostile conditions at all times. Moreover, in case if something suspicious is detected by the system, it must be able to take the necessary decisions and hence actions along with issuing alert messages for the human controllers. The central control rooms can be set up at a distance from the border area. Once the human controller is aware of the intrusion, it is upon him to decide the next course of action. Such systems if deployed successfully, can not only save resources but also can reduce the risk to human life significantly[3].

Hitesh Shinde, KirtiSonawane, PranitRane, Atharva Pathak, SumitaChandak, "Camouflage Color Changing Robot", According to the survey, the reviewed systems The camouflage robot is the solution for reducing loss of human life by replacing it in such operations. The proposed system consists of one camera for surveillance & one camera for color sensing purposes. The robot senses the color of the surrounding through this camera & changes its color to in with it. This makes it difficult to be spotted by the unaided enemy eyes. The robot can be remotely controlled via a computer & wireless Trans Receiver is used to establish the connection between them system analyses the surrounding area & also provides live footage to the observer[4].

III. ARCHITECTURE

The system is based on the ARM Processor connected to the Ultrasonic sensor, Infrared sensor, Laser and Proximity sensor. The Figure

1 Shows the diagrammatic representation of ARM Processor Based Border Security detection system .The Figure 2 shows the diagrammatic representation of Use-Case of robot.

Hardware components included : Raspberry pi loaded with Raspbian-operating system, USB camera-8 megapixel digital, Infrared sensor, ARM processor, Relay circuits, DC Motor, H-Bridge, Laser.
Software tools used: Open CV, Raspbian OS, Python.

Camouflage mode
- Therobothas3sidedLEDstripsattachedtoshiftcolorsaccordingtotheenvironment.
- Thecamerainfrontoftherobotcapturestherealtimevideoanddetectsthecolors,andpasses thehexcode of the color to the Raspberry Pi, as then the primary colors RGB will emit viaLED's.
- If any color change is detected by the camera, it automatically detects the new color and passes the hex code to theprocessor.

Border Security Control
- This system is designed for secure the border and secure our soldiers, and to detect enemy foe around the border.
- The robot's camera, PIR sensor and IR sensor detects for any object or human movements, and detects a face automatically if any human appears in the camera range, once it detects the face, it also reads whether he/she is a friendly or anenemy.

- Now we will already store a little information of our friendlies in the dataset, so that if a friendly face is detected, it should do nothing. If an unknown person is detected, then the attached laser gun should be triggered.

Metal Detection
- The robot can also detect any mines or bombs by a simple metal detector that is attached with the main raspberrypi.

- When it detects a metal object, it sends a warning to the display and triggers a metal stripe that we attach so that it can dig up or it can be a bait and warns othersoldiers.

Remote Control via Smartphone
- The robot can also be controlled via asmartphone.
- The robot and the device will be connected to a private Wi-Fi network, and by the mobile application we can control the movement of the robot to ourconvenience.
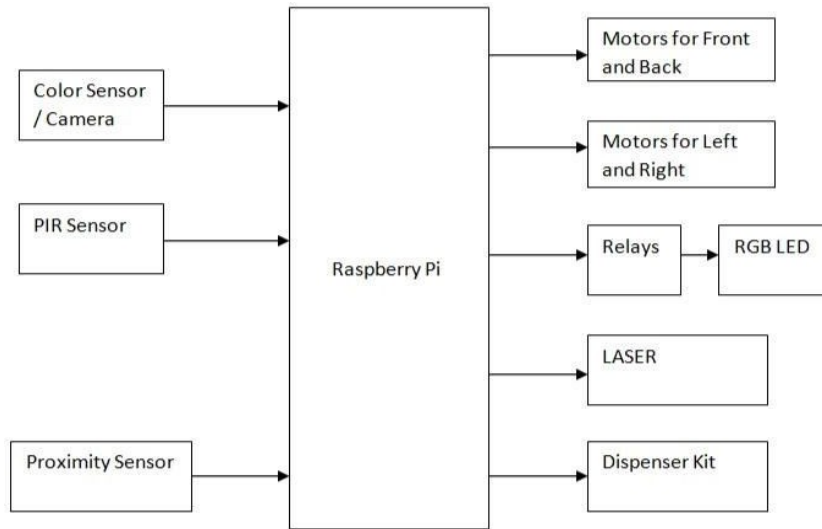
Figure 1. ARM Processor Based Border Security detection system
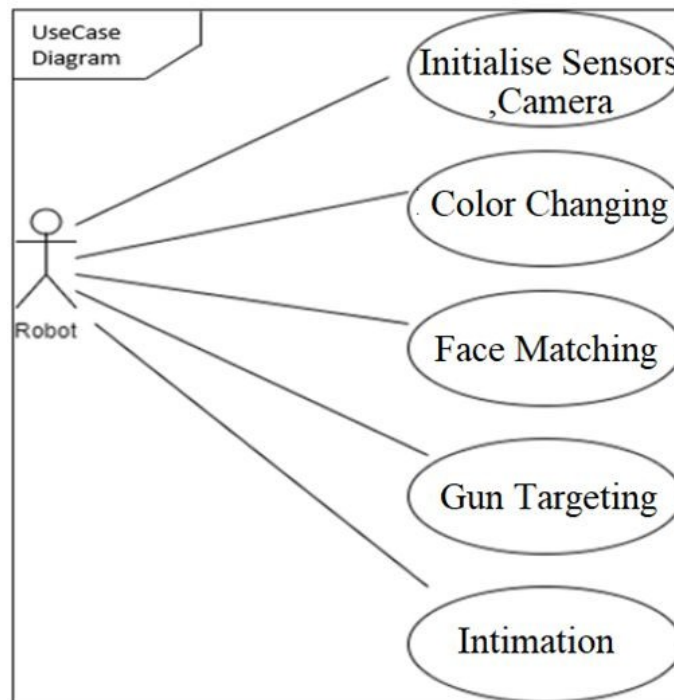

Figure 2. Robot's UseCase Diagram

IV.METHODOLOGY

In this section results are obtained to achieve the objectives of Robot based on the border security system. In this work we classify the border security system based on 4 categories such as camouflage mode, border security control,metal detection and remote control via smartphone. Firstly, system detects for any

object or human movements, and detects a face automatically if any human appears in the camera range, once it detects the face, it also reads whether he/she is a friendly or an enemy, we will already store a little information of our friendlies in the dataset, so that if a friendly face is detected, it should do nothing. If an unknown person is detected, then the attached laser gun should be triggered. After this, the system detects the camouflage mode where the robot has 3 sided LED strips attached to shift colors according to the environment. The camera in front of the robot captures the real-time video and detects the colors, and passes the hex code of the color to the Raspberry Pi, as then the primary colors RGB will emit via LED's.

In this section results are obtained using software and hardware platforms to achieve the objective of driver drowsiness detection and alcoholic intoxication. OpenCV is open source software, which is used for creating computer vision. OpenCV is available in C, C++, Python and Java programming languages extension.The metal detection main role is to detect any mines or bombs by a simple metal detector that is attached with the main raspberry pi and When it detects a metal object, it sends a warning to the display and triggers a metal stripe that we attach so that it can dig up or it can be a bait and warns other soldiers.The last function of the system is remote controlling via smartphone i.e The robot and the device will be connected to a private Wi-Fi network, and by the mobile application we can control the movement of the robot to our convenience.Hence this system is made keeping the soldiers in mind,wherethe should be no human loss in our Army system.

V. **IMPLEMENTATION**
The software we have used is OpenCV for face recognition in which the eyes and mouth will be detected. And if any human face is detected then it processes the data and detects whether he/she is friendly or enemy. In hardware, we have used Raspberry Pi, Camera, DC Motors, PIR Sensor and IRSensor.

Here Raspberry Pi 3 Model B is a 1.4 GHz 64-bit quad core processor. It has on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities. An PIR (Passive Infrared sensor) emits or detects infrared radiation to sense its surroundings. A Metal detector detects any

metal objects that interfere with the sensor and reports the detection. We can control the movement of the robot via a Smartphone Application, i.e an Android application is used to connect wirelessly to the robot via a private network. Once connected, we can give signals to the robot to control the movement and can be operated from a safe distance.

VI. **CONCLUSION**
The proposed system is a substitution to human life. As Human life is always more prioritized this proposed robot helps to act as a security system and also a life savior. It enacts and plays an important role in keeping an eye on the war field areas and captures the surroundings. As it is based on the Chameleon's color changing effect, the robot changes its color according to the surrounding environment and is hidden from the enemy's insight. Moreover, the camouflaging feature makes it difficult to detect the robot by naked human eye. So, in all the proposed system provides a helping hand to our security forces in detection of intruders, can be triggered armory against the enemy and can be controlled from a safe distance. The robot can also be used in high altitude areas where humans cannot survive.

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