

Smart Triggering Weapon System for Military Application

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Abstract: *In India, Border security depends completely on the soldiers. This is a task taken up by the military which is important and also necessary. To reduce the burden on the soldiers we use robots which also helps in increasing the security around the border areas. The current weaponized robotics system which is very useful for border security and surveillance is too expensive, while the demand for their application has been increasing which is why they are taking the help of the existing human teams to solve the dangerous missions. This project aims to solve this problem as we develop a robotic device of low cost that is capable of firing precisely and secured by using a variety of semi-automatic weapons at the targets. This project consists of 3 steps: detection of the human intruder face, wireless communication, and triggering of the weapon. For the purpose of this project, we use a microcontroller-based automatic system. The basic idea of this system is to detect the human intruder by using an ultrasonic sensor. By wireless communication, the information will be sent to the military camp, which will trigger the gun to shoot the enemy. The main objective of our paper is to develop a low-cost robotic device to secure the border area, where surveillance is very difficult for soldiers.*

Keywords: Human intruder, wireless communication, ultrasonic sensor, Microcontroller

I. INTRODUCTION

The security system is a novel concept for intelligently securing our borders without the need for human participation. It protects our country while simultaneously conserving energy and resources. It also regularly patrols the border to safeguard the country from foreign invaders. It necessitates a significant amount of people and funding. The deployment of a smart border monitoring system is critical when considering the relevance of border security. It is described, along with design techniques and the broader design process. The design outcomes are adequately documented, and the appendix includes significant design information. The project's future work is planned and reviewed, and the project's general conclusions are formed. Military robots have been in development for several decades. For surveillance, the bulk of today's systems use a mobile robot with a camera. The camera on the robot can be moved to different locations. Fixed cameras are less flexible than these types of robots. Wheel robots are the most commonly utilized surveillance robots. Wheel-based robots are more suited to a level surface. Thanks to developments in wireless communication and the internet, wheel robot photos may now be seen remotely on a computer or laptop. This research proposes a cutting-edge technique to distant and border monitoring for defense and military purposes. This robotic vehicle can take the place of a soldier at the border and offer surveillance.

Until now, border security has been solely dependent on soldiers. The soldier discovered the enemy and targeted him in a high-security area. However, if the soldier is unable to notice the attacker, the enemy will be able to quickly breach the security perimeter. As a result, a microcontroller-based automatic pistol targeting system is implemented to improve security. The main goal of this automated rifle targeting system is to secure the border with the least amount of human labor possible.

The main objectives of this project is to design an automatic gun targeting system using microcontroller for automation which will reduce the human effort, Control the weapon arm direction with the help of ultrasonic sensor to detect the presence of an intruder and make use of MATLAB for face recognition for auto-triggering if the face is not in database. This initiative is aimed to protect the borders in harsh conditions where human intervention is difficult and to save our soldiers' lives. It employs OS ideas to decrease the microcontroller's power consumption. Concerned about risks to the

nation's security near the border, where opponents have blown up base camps, weapons, machines, and a slew of high-priced battle Resources.

II. RELATED WORK

In the past, projects on automatic firing systems were developed and implemented. The system as a whole isn't brand new. Various parts of the system, such as motion tracking and a gun based system to execute impending targets, were implemented for various purposes. These are distinct and innovative technologies that, when combined, will aid in the development of our automated imaging system. The impact of present technologies has expanded the possibilities for developing various prototypes for future solutions. Previous project failures and triumphs are studied so that the design for this project will aid in the improvement of our system. The creators of this system plan to incorporate multiple current similar technologies into a specific design after evaluating all of the existing similar technologies that have been effectively implemented in the past. body. The system will have numerous roles, the most important of which is to hold guns defensively. The system can be optimized for use, however it can first be employed for local security by businesses or homeowners. It can even be employed on the battlefield to defend military bases from approaching enemy, and it can detect and intercept approaching planes, helicopters, and missiles. The concept of system can be applied in a variety of ways, depending on the needs of the individual. Internet of things based high security border surveillance strategy [6] Proposed a design for low-energy intrusion detection systems which activate if any unusual event occurs. It consists of a freestanding camera along with embedded video processing capability and wireless communication. We can get two benefits from this. The first concern is the effectiveness of the video analysis algorithm as it provides many details also in such a way that it reduces false information due to occlusions or moving objects. The second concern is power consumption. There will be limiting of the all overpower consumption of the system by limiting the activity when it is not required. Surveillance system for detection of suspicious human activities at war field [7] Proposed a design for detection of the enemy at the war field, specifically during the night times because most of the attackers will attack at the night time due to the reason that human vision cannot identify the enemy location. So for this reason, they have used Night vision cameras to be useful for monitoring, especially at night, because they require less light intensity. Design and Implementation of Automatic Multifunctional Military Robot [8] proposed a design and execution of an automatic multi-tasked military robot to monitor the border area continuously. It has sensing, processing, rotating, and triggering units. The sensing unit consists of an IR sensor and a Raspberry Pi Camera which will sense the object is detected by the sensor, it captures a picture of it. Survey of intelligent surveillance system for monitoring international border security [9] This paper proposes a surveillance method to monitor international border security in this study. They employ a Raspberry Pi-based robotic system for this type of surveillance, which suggests that it can automatically detect intruders and alert the administrator. Image processing with an open CV an SMS or e-mail alert is provided through means. Cognitive science based inclusive border management system [10] this paper proposes the Inclusive Border Management System for cross-border monitoring. The radar system sends a 360degree view of the area to the control room. In the realm of Human Interaction, they use a Brain Computer Interface to recognize motion in drones as well as displays

III. METHODOLOGY

To operate this Smart Triggering Weapon System for Military Application, accurate hardware components and software components are required in addition to weapon base setup. The methodology of the project involves a 12V power supply is given for the whole circuit. The Atmega328 microcontroller, which is the main component, brain of circuit is loaded with a program to control the other components through Arduino IDE software. All the components are handled by the Microcontroller.

Two DC motors with two terminals (positive and negative) each are used in the surveillance system, one of which provides an up and down motion of the weapon arm while the other provides right to left motion of the weapon arm. These motors are driven by a 4-terminal relay. As Microcontroller works under 5V but DC motor requires 12V relay also acts a electrical switch to switch the voltage levels from 5V to 12V and 12V to 5V accordingly. Apart from driving the relays, it is also used to trigger the Laser of the weapon arm. A Laser is used to show the triggering status of the gun.

MEMS sensor which is an analog sensor is used to change the axis movement of the weapon arm. It is used for the head movement of the weapon system When the weapon is triggered, laser is ON and its OFF when the weapon system is not

triggered. A PC with camera is fixed at the surveillance area, to detect authorized and unauthorized face recognition using Viola Jones algorithm with MATLAB software installed in it. When the intruders' face is captured on the camera, it is matched with the pre-defined dataset which consists of the face images of the soldiers. The face captured is checked with the data file of faces to match with it. If the face is not recognized, a signal is sent to take action and the Laser is triggered.

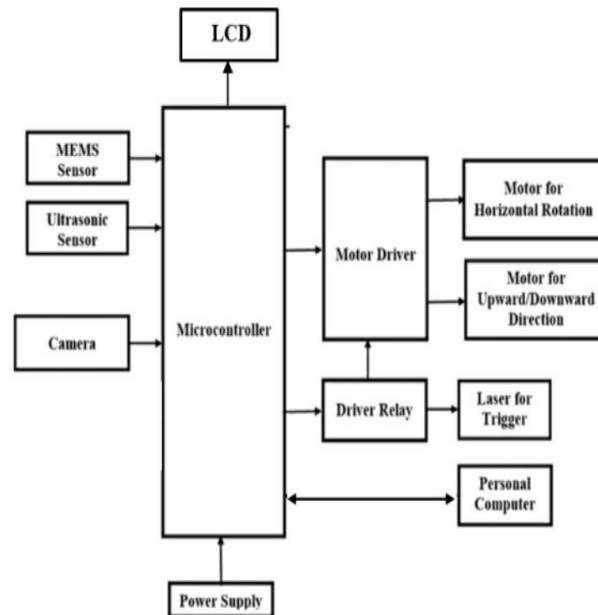


Fig 1: Block Diagram of the proposed methodology

An ultrasonic sensor is also used to recognize the distance at which the intruder is approaching. This distance is displayed on the LCD display along with the arm movement and triggering status of the laser upon face recognition. A threshold limit (here we have taken 5 metres) is set for the distance where an intruder can pass, past which the laser is activated and a trigger is given to the weapon arm when the intruder crosses the threshold distance. The weapon arm is automatically controlled.

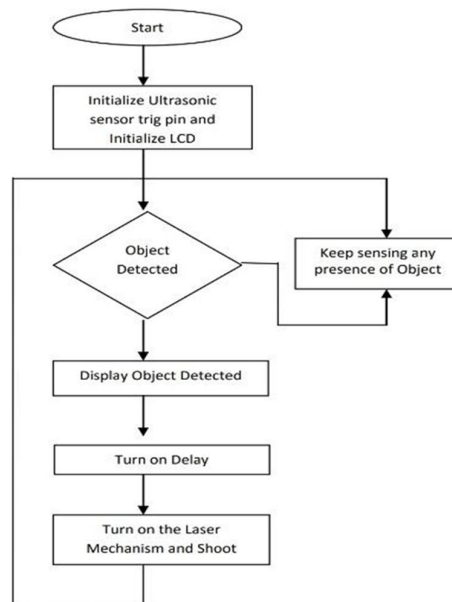


Fig 2: Flowchart of the proposed methodology

The data obtained from the Arduino is stored in the MATLAB. MATLAB is a programming platform and we are using this software for human face detection and display if the face is authorized or unauthorized person using Viola Jones algorithm. Laser automatically gets triggered when the face is unauthorized and this triggering status is displayed on LCD.

IV. RESULTS AND DISCUSSION

The objectives of this project have been successfully accomplished. The following picture is the prototype of our project which can automatically detect intruder and trigger the laser.

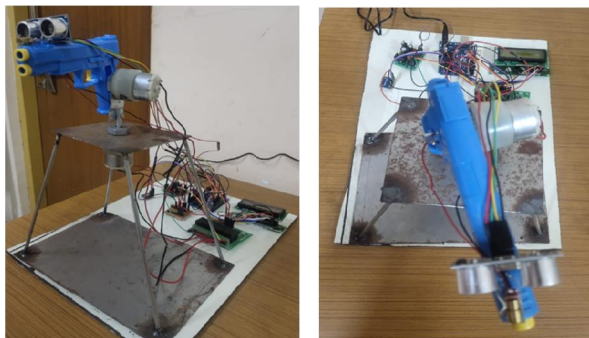


Fig 3: Proposed methodology implementation (a) Diagonal view (b) Top view

We have got the expected results from this project which is showed in lookup table in Table 1.

From that table we can conclude that the model is very accurate in recognizing authorized and unauthorized faces.

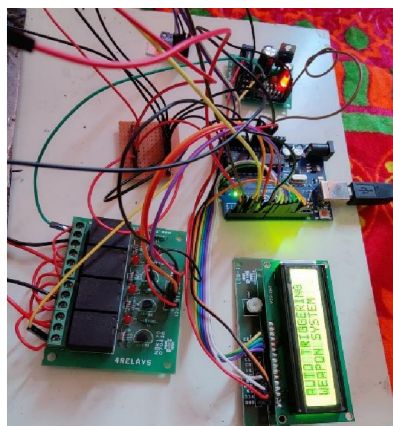


Fig 4: Hardware Components assembled at the weapon base



Fig 5: LCD Display showing (a) Name of our project (b) Distance of the intruder (c) Weapon arm direction (d) Triggering status

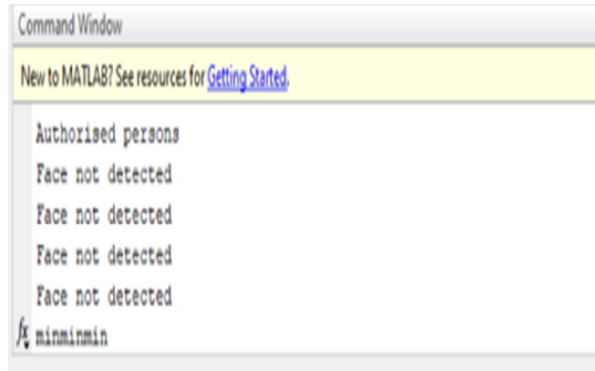


Fig 6: MATLAB displaying Authorised person upon face detection

MODE	DIRECTION	DISTANCE	FACE DETECTION	TRIGGERING STATUS
AUTO MODE 1	LEFT	155	AUTHORISED PERSON	NIL
AUTO MODE 2	RIGHT	82	AUTHORISED PERSON	NIL
AUTO MODE 3	UP	56	AUTHORISED PERSON	NIL
AUTO MODE 4	DOWN	25	AUTHORISED PERSON	NIL
AUTO MODE 5	LEFT	188	UNAUTHORISED PERSON	GUN FIRING
AUTO MODE 6	RIGHT	192	UNAUTHORISED PERSON	GUN FIRING
AUTO MODE 7	UP	67	UNAUTHORISED PERSON	GUN FIRING
AUTO MODE 8	DOWN	80	UNAUTHORISED PERSON	GUN FIRING

Table 1: Lookup table to denote the Weapon arm direction and Auto- Triggering status

V. CONCLUSION

This project aims to secure the border in extreme circumstances where human involvement is difficult and to save our soldiers' lives. It is used to lower the microcontroller's power consumption by utilising operating system ideas. The LASER is pointed in a certain direction. Due to the use of relays, LASER consumption is minimised. Concerned about the adversary posing a threat to the country by blowing up base camps, weapons, machinery, and other high-value war materials on the enemy's border. This model is constructed in such a way that it will collect data with a minimal amount of effort and high-resolution camera, process it, and then turn it on. A pistol aiming system that works automatically can be used in high-security places like borders. Microcontroller, sensor module, and target laser are all part of the system. Sensor is an ultrasonic wave-based automatic pistol targeting device. This approach decreases border security liability and soldiers' efforts in areas. Because a microcontroller is used, the system is cost-effective. The obligation for secrecy rests with the automatic incomplete object detection and targeting system. Home security can also benefit from automatic object detection and the targeting system. However, in the area of high security, the system performs better.

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