Design and Implementation of War Field Spy Robot using Android Application

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Abstract: The prime goal of this project is to design a robot that will survey human activities in areas of conflict and border regions. The purpose is to minimize enemy incursions and risks to human life. The robot features a wireless camera equipped with night vision technology, capable of transmitting real-time video footage from the field. This device will prove invaluable to the defense industry by reducing the loss of lives and preventing illegitimate activities. It will provide military personnel and armed forces with the necessary intel to assess the terrain before entering it, ensuring the safety of all involved. The monitoring and controlling of robotic movements through wireless network by using a Bluetooth app A camera is affixed to the robot to enhance visual clarity of the surroundings. The IR sensor detects a person If an entity intrudes into a surveillance area and the smoke detector registers an increase in the level of smoke in the atmosphere, it signifies a potential fire incident. n this situation, we are employing a metal sensor to detect the presence of an explosive device as we are aware that most bombs contain a specific amount of metallic substances. This mobile robot can be operated from Bluetooth app and sensor data is update to app.

Keywords—IR SENSOR, MQ-02, HC05BLUETOOTH, 360 WIFI CAMERA

I INTRODUCTION:

The Spy Robot using is an advanced technology that has been designed to provide a safe and efficient way of monitoring war fields. It is capable of gathering real-time information, which can be used to make informed decisions, and can be customized to meet the specific needs of different military operations. The primary aim of the robot is to provide visual coverage of war fields by recording real-time videos, which can be sent to remote locations using a wireless network. This allows military personnel to observe the field and make decisions without putting themselves in harm's way. The invention of new technology has brought drastic changes in the field of robotics and automation in different sectors like domestic, defence sectors etc. In the current global market, smartphones have brought about a revolution in altering people's way of life and presenting a plethora of applications across different operating systems. Android operating system is one such system developed on an open-source platform, which has had a more impact by offering various applications for robotics, enabling people to improve their everyday existence. The chief technology employed for serial communication with robots in this instance is Bluetooth technology. Bluetooth technology can be used to transfer data between the two devices with in 10 meters. The Bluetooth module HC-05 will be paired with the robot, and android application will be used to send commands to control the robot.

A. PROBLEM STATEMENT

National Security problem rises with major threats, even if government provide bulletproof jackets and quality guns to our armed forces yet it is hard to resolve issues. In situations where military personnel are unable to exert more force than what is humanly possible. Army person loses the life. The problem is to design and develop an Arduino controlled spy robot that can be operated wirelessly using an Android application, with a focus on its deployment in war fields. The robot should have the capability to move in all directions and turn 360 degrees, with a wireless camera that can transmit real-time video to the operator's device. The wireless communication between the robot and the operator's device should be reliable and secure, with a user-friendly interface for the Android application that allows easy control of the robot. Ultimately, the spy robot should provide real-time information to assist soldiers in collecting intelligence and planning their operations by providing them with a better understanding of the terrain and potential threats.

B. OBJECTIVES

The objectives of the Spy Robot in the proposed system are:

- Spy robot can easily send the important data of the surrounding environment to the android applications.
- Capable of identifying dangerous arms like sharp knives, swords, and other deadly weapons.
- Spy robot can detect smoke presence in it surrounding.
- Spy robot can monitor the temperature of it surrounding.
- Detects the obstacle.

C. MOTIVATION

The robot can be operated remotely via phone calls, regardless of the operator's location or distance. The primary objective of the robot is to closely monitor human activities in war zones, with the added benefit of nocturnal and night vision cameras that can transmit videos and recordings to prevent enemy attacks. Military personnel can use the robot to ensure safety and identify potential threats before entering an unknown area, with the added protection of metal detectors to locate hidden bombs. The robot's system can be controlled through phone call, regardless of its distance from the operator, allowing for remote monitoring and control. The robot's main purpose is to surveil human activities in war zones, with additional capabilities including night vision cameras, which can help detect enemy intrusions, and metal detectors, which can identify hidden explosives.

II. LITERATURE SURVEY

An Arduino Uno robot that can be controlled and monitored via Bluetooth using an Android app. The robot is equipped with a Wireless Network Camera that can be accessed and viewed on other Android/iOS devices. To create the chassis, simple materials such as plastic wood, cycle spokes, and an L293D motor driver are utilized, along with two 600 rpm DC motors that allow for movement in four directions: front, reverse, left, and right. Bluetooth module HC-05 receives string commands from the Android application to control the robot's actions. The robot is designed to blend into its surroundings and is covered with a mask. By using basic materials instead of preassembled kits, the robot is lightweight and can be customized to any desired size.

J. Azeta, et.al (2019) [1] designed a robot using an Arduino microcontroller with a motor shield and a smartphone that runs the operating system. Robot consists of a video camera and some hardware that satisfies the requirements.

Mubarak Shah, et.al (2019) [2], the different task like object detection, object tracking, object classification is performed in this paper. The object can be a person, vehicle or an animal in images and video frames. The path of an object over the time is generated by using object tracking task. The detected objects are categorized using object classification task as a person, a vehicle or an animal.

Deepika R, et.al (2015) [3], designed a robot that works based on the gesture using image processing. The sign language gestures made by the user are captured using image recognition and block detection. The movement of the robot is controlled by the image processing techniques or algorithms.

K. Shantanu, et.al (2014) [4], designed a robot along with PIR sensors and a camera. The robot can be controlled through the internet. The PIR sensor is used to detect moving bodies and the webpage is used to control the camera.

Harindravel, et.al (2013) [5], described a robot with GPS (Global Positioning System) facility. By collecting the information through GPS, the user can provide the coordinates of the destination to minimize the distance and avoid the near objects from the collisions.

A T. Chao, et.al (2018) [6], designed an autonomous war field spy robot. It is designed using navigation algorithm. The obstacle and metal detection are implemented by integrating sensors.

A R Sheik, et.al (2018) [7], covers an overview of unmanned ground vehicles designed for surveillance in the war field. The sensors are integrated to the system for the detection of any object [14].

A K Singh, et.al (2017) [8], designed an unmanned aerial vehicle for military applications. Here mainly the tracking of the target is discussed.

J A G P. Ferreira, et.al (2020) [9], designed a robot that is useful in the war field surveillance. The different types of robots such as aerial and ground based. The sensors are deployed in the system.

A U Rashid, et.al (2017) [10], the mobile robots are designed for the war filed.

S M Mamun, et.al (2021) [11] the spy robots are specially designed for surveillance in the war field [13]. The robot can be controlled with the use of control system.

A Khan, et.al (2018) [12], covers the design and implementation of robot for the surveillance in the military area. Many different aspects are discussed like platforms of robot, integration of sensors and the protocols used for communication.

A N Hassan, et.al (2017) [15], designed an autonomous war field spy robot for surveillance in dangerous environments.

III. BLOCK DIAGRAM AND ITS DESCRIPTION

The fig.1 represents the block diagram of spy robot .

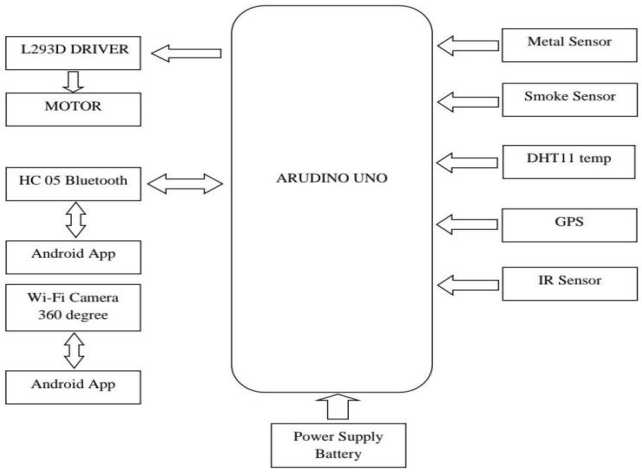

Fig 1 BLOCK DIAGRAM

This robotic device is capable of being controlled remotely and has the same operational controls as a typical automobile. It is also self-sufficient in terms of power supply. Additionally, it is equipped with a pair of sensors which can gather information about its surroundings. A temperature sensor has been installed to detect the intensity and presence of fires, if any exist within the room. Furthermore, a smoke sensor has been included to identify the presence of hazardous gases in the vicinity. This data will be transmitted continuously to a computer system in real-time, which will then relay the information to an Android phone via an HC 05 device. It has the ability to stealthily navigate into any area and relay information to us via its diminutive sensory capabilities. These robots can be deployed to areas where inspections are required.

IV WORKING PRINCIPLE

A. ARDUINO UNO

In this project, the Arduino Uno shown in the fig 2 serves as the main microcontroller that controls the movements of the robot and the wireless camera.

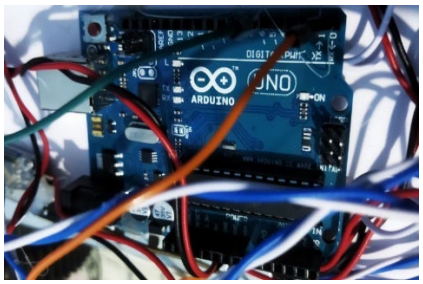

Fig 2 ARDUINO UNO

B. SMOKE SENSOR (MQ-02)

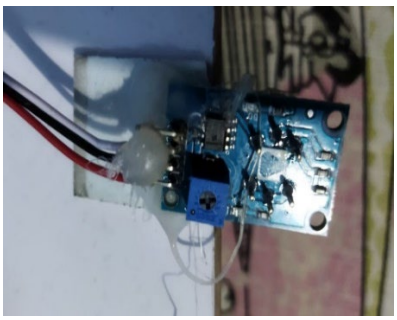

Fig 3 SMOKE SENSOR (MQ-02)

The fig 3 represents the smoke sensor is connected to the Arduino Uno board, which would then process the signals from the smoke sensor and activate the appropriate alert mechanism to notify the operator of the potential fire or smoke hazard. Overall, while a smoke sensor is not an essential component of this project, it can be a useful addition to enhance the safety of soldiers and protect against potential fire hazards in the war field.

C. GPS MODEL

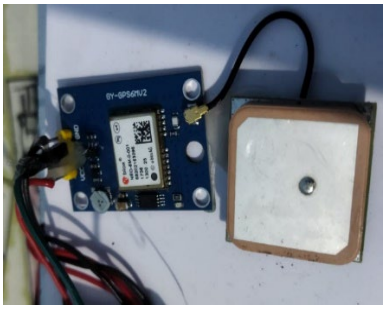

Fig 4 GPS MODEL

The GPS module shown in the fig 4 can help the operator to navigate and locate the spy robot's position in the field, especially in a harsh environment with limited visibility. By tracking the robot's position in real-time, the operator can ensure that the robot is moving in the right direction and avoid potential obstacles or hazards.

D. IR SENSOR

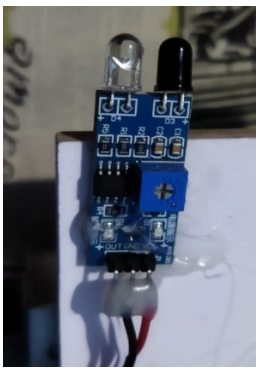

Fig 5 IR SENSOR

IR sensor shown in the fig 5 can detect obstacles and avoid collisions, which can be useful in navigating through rough terrains and harsh environmental conditions. The IR sensor can sense the objects between 0-5cm distance by emitting infrared rays and detecting the reflected radiation from the object.

E. METAL SENSOR (KY-036)

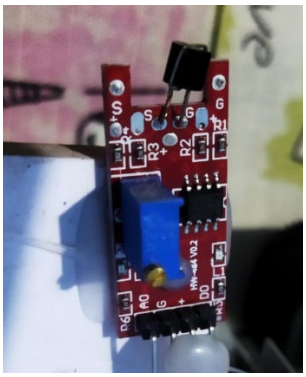

Fig 6 METAL SENSOR (KY-036)

The metal sensor shown in fig 6 can play a vital role in the project. By integrating metal sensors into the spy robot, it can

detect the presence of metal objects in the surrounding environment.

E. L293D DRIVER

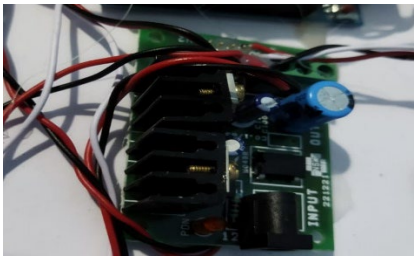

Fig 7 L293D DRIVER

The L293D is a motor driver IC shown in fig 7 that can play an important role in the Spy Robot using Wireless Camera and Android Application project. The motor driver IC can be used to control the movement of the robot's motors, allowing it to move in all directions.

F. HC 05 BLUETOOTH

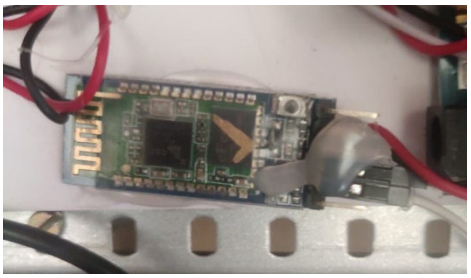

Fig 8 HC 05 BLUETOOTH

The fig 8 represents a HC-05 is a popular Bluetooth module that can be used to add wireless communication capabilities to various electronic projects. It is commonly used in robotics, home automation, and other embedded systems. The HC-05 module is based on the Bluetooth 2.0 specification and can support both the master and slave modes of operation. The HC-05 module has a range of up to 10 meters and can be configured using AT commands. It uses a serial UART interface.

G. TEMPERATURE SENSOR

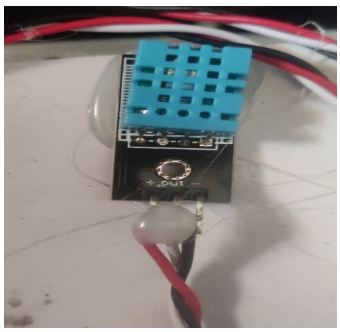

Fig 9 Temperature sensor

A temperature sensor shown in fig 9 is used to measure the temperature of an object or environment and converts the temperature information into an electrical signal that can be read by a microcontroller or other electronic device. Temperature sensors can be used in a variety of applications, such as in industrial processes, medical devices, and consumer electronics.

V. RESULTS

Spy robot model shown in fig 10 requires the integration of several hardware and software components (Arduino UNO board, Sensors, WIFI Camera, Battery, GPS, HC-05 Bluetooth, Arduino IDE, Android Application). As such, the results of the project can vary depending on the specific implementation and configuration.

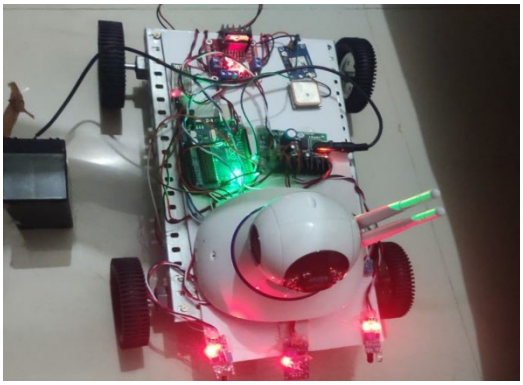

Fig 10 MODEL

The results of this project include:

1. Remote control: The user should be able to control the robot remotely using an Android application. The application should provide options for controlling the movement of the robot, as well as accessing the live video feed from the wireless camera.

2. Live video feed: The robot should be equipped with a wireless camera that provides a live video feed to the Android application. The video feed should be clear and stable, allowing the user to view the surroundings of the robot.

3. User interface: The Android application should have a user-friendly interface that allows for easy control of the robot and access to the live video feed. It should also provide feedback on the status of the robot, such as battery level and signal strength.

4. Security: The robot should be able to give a level of security and surveillance for the user, by allowing them to remotely view and monitor the surroundings of the robot. This can help to identify potential threats and hazards in the area.

Overall, the results of the proposed system can provide a powerful and flexible solution for remote surveillance and control in war fields and other hazardous environments. By allowing users to remotely monitor and control the robot, it can help to increase safety and security while reducing the risk to human life.

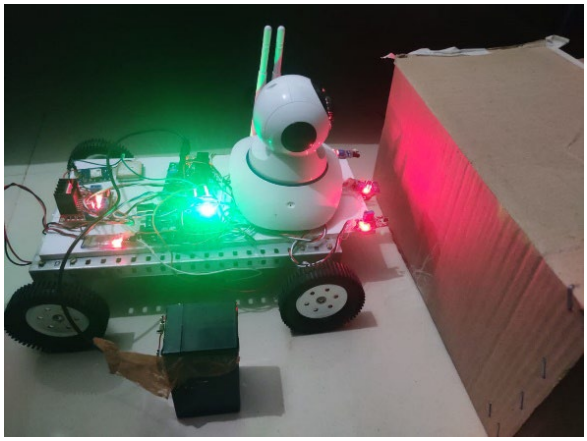

Fig 11 OBJECT DETECTION

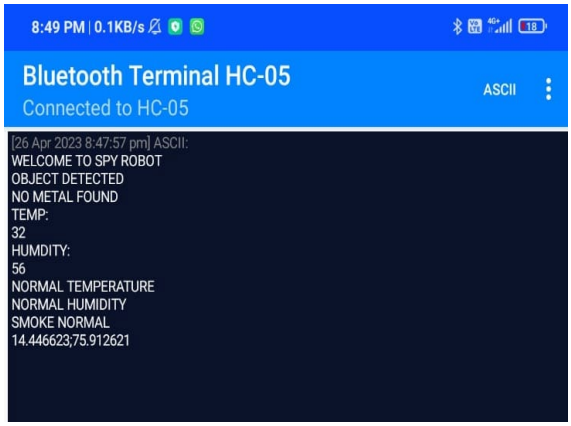

Fig 12 RESULT OF OBJECT DETECTION

The fig 11 shows that spy robot detected an object in front of it and sends the data through Bluetooth to android application and fig 12 shows the output of the object detected as "OBJECT DETECTED".

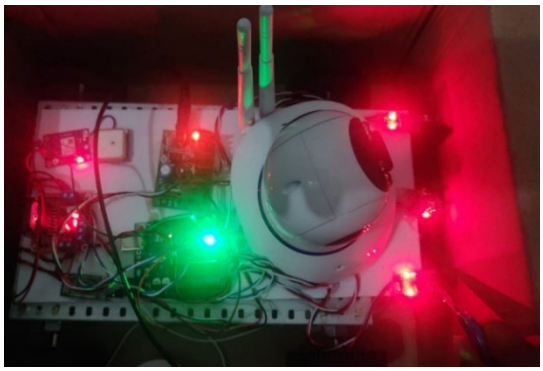

Fig 13 METAL DETECTION

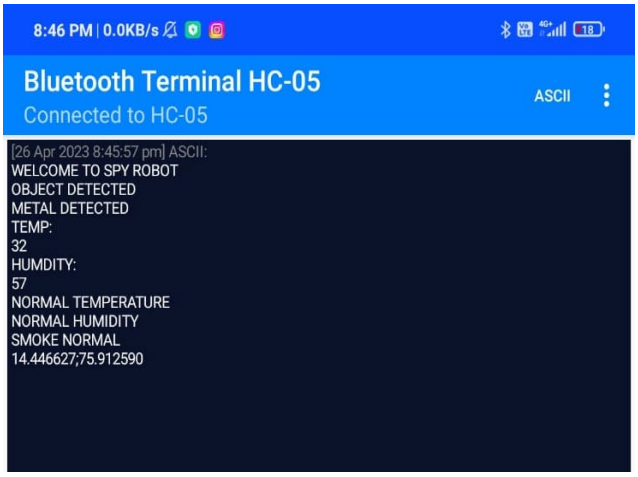

Fig 14 RESULT OF OBJECT AND METAL DETECTION

The fig 13 shows that spy robot detected metal and fig 14 shows the output of the metal detected as "METAL DETECTED".

VI. ADVANTAGES AND DISADVANTAGES

A. ADVANTAGES

- The spy robot's visual data can be saved and accessed by humans through a system.
- Robotic systems are more proficient than humans at performing various security and surveillance functions, providing intelligence that is unattainable to humans.
- The spy robot can complete tasks with greater speed and precision than humans.

B. DISADVANTAGES

- Covering a longer distance requires more power.
- It does not work beyond limit (distance>10m).

VII. CONCLUSION

This project involves building a robot model that utilizes a wireless camera controlled by an Android application. The project also aims to teach individuals how to develop Android applications and use the HC 05 Bluetooth and V380 app platforms to control the robot wirelessly. Additionally, the robot is equipped with metal and smoke detectors for added functionality. By utilizing this robot, human effort can be reduced significantly. The robot has been designed with a high degree of precision in its movement section, and all objectives of the project have been achieved with great accuracy. The camera's performance has been deemed satisfactory, though there is always room for improvement in any task.

A. FUTURE SCOPES

The future scope for spy robot includes:

1. Improved mobility: The future development of this project could involve the use of advanced motor drivers and sensors to improve the mobility of the robot. This could include the use of

multiple wheels, tracks or even legs to navigate over rough terrain and obstacles.

2. Advanced sensors: The use of advanced sensors such as temperature sensors, gas sensors, and radiation sensors could be incorporated into the robot to provide additional environmental data. This could help to identify potential hazards and provide more comprehensive surveillance of the war field.

3. Autonomous navigation: The development of autonomous navigation capabilities could enable the robot to navigate and operate without human intervention. This could include the use of advanced algorithms and machine learning techniques to identify and avoid obstacles and hazards.

overall, the future scopes of the Spy Robot are vast and diverse. With continued development and innovation, this project has the potential to become an essential tool for remote surveillance and control in war fields and other hazardous environments.

REFERENCES

[1]. J. Azeta, C.A. Bolu, D. Hinvi, A.A. Abioye, H. Boyo, P. Anakhu, P Onwordi, "An Android Based Mobile Robot for Monitoring and Surveillance", Procedia Manufacturing, vol. 35, pp. 1129, IEEE 2019.

2]. Mubarak Shah, Omar Javed, Khurram Shafique, “Automated Visual Surveillance in Realistic

Scenarios”, IEEE 2019.

[3]. Deepika R, Upendra Kumar, Chaitanya Nagpae, Chandrakant Ojha4 and V. K. Mitta, Capturing the Spied Image-Video Data Using a Flexi Controlled Spy-Robot, IEEE 2015.

[4]. K. Shantanu and S. Dhayagonde, “Design and Implementation of E-Surveillance Robot for Video Monitoring and Living Body Detection’’, International Journal of Scientific and Research Publications (IJSRP), Vol. 4, Issue. 4, pp. 1-3, April, 2014.

[5]. Harindravel, Letchumanan, “Mobile Robot Surveillance System with GPS tracking.”2013.

[6]. A. T. Chao, "Design and implementation of an autonomous war field spy robot," 2018 IEEE International Conference on Robotics and Automation (ICRA), Brisbane, QLD, 2018, pp. 1-6.

[7]. A. R. Sheikh and M. S. Pathan, "Survey of unmanned ground vehicles for military surveillance applications," 2018 15th International Bhurban Conference on Applied Sciences and Technology (IBCAST), Islamabad, Pakistan, 2018, pp. 395-400.

[8]. A. K. Singh, A. R. Singh, and S. Kumar, "Unmanned aerial vehicles (UAVs): A review on military applications," 2017 International Conference on Computing, Communication and Automation (ICCCA), Greater Noida, India, 2017, pp. 52-57.

[9]. J. A. G. P. Ferreira, A. C. R. da Silva, and P. M. C. G. Rodrigues, "Robotic systems for surveillance in military applications: A review," 2020 15th Iberian Conference on Information Systems and Technologies (CISTI), Seville, Spain, 2020, pp. 1-6.

[10]. A. U. Rashid, M. A. Baig, and K. Raza, "Mobile robot for surveillance in military applications: A review," 2017 14th International Bhurban Conference on Applied Sciences and Technology (IBCAST), Islamabad, Pakistan, 2017, pp. 313-318.

[11]. S. M. Mamun, M. A. Hasan, and M. S. Hossain, "A review on war field spy robot for surveillance applications," 2021 International Conference on Electrical, Computer and Communication Engineering (ECCE), Cox's Bazar, Bangladesh, 2021, pp. 1-6.

[12]. A. Khan, K. Rehman, and K. Alam, "War field spy robot: A comprehensive survey," 2018 2nd International Conference on Computer, Communication, and Control Technology (I4CT), Kota Kinabalu, Malaysia, 2018, pp. 1-6.

[13]. M. H. Alam, S. M. Islam, and M. T. Islam, "Design and development of a war field spy robot for surveillance applications," 2019 IEEE 2nd International Conference on Robotics, Automation and Intelligent System (ICRAIS), Dhaka, Bangladesh, 2019, pp. 1-5.

[14]. N. M. Iqbal, S. Al-Otaibi, and M. A. Sattar, "Intelligent war field spy robot for surveillance in hostile environments," 2019 2nd International Conference on Computer Applications & Information Security (ICCAIS), Riyadh, Saudi Arabia, 2019, pp. 1-5.

[15]. A. N. Hassan and K. H. M. Amin, "Design and implementation of an autonomous war field spy robot for surveillance in hazardous environments," 2017 IEEE 3rd International Conference on Engineering Technologies and Social Sciences (ICETSS), Bangkok, Thailand, 2017, pp. 1-6.