LoRa(HC-12) Survillance Robot Using Arduino.

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Abstract*— For more than 50 years, the concept of enhanced manufacturing has been embodied by robots. Robots and their accessories are increasingly being employed for military and criminal objectives as they become more advanced, dependable, and miniaturised. From surveillance to capability explosives, robots are a crucial part of military operations. Mobile robots are remotely controlled to gain popularity and equipped with the right sensors to do certain tasks. With the advancement of generation, including LoRa era, wireless information exchange via radio waves has become more feasible, manageable, and detectable. The project uses a robotic multi-motive robot that is principally based on LoRa to provide a cutting-edge perspective on remote and border areas A robotic system fitted with LoRa technology for wireless communication in surveillance applications is known as a LoRa (Long Range) surveillance robot. With the help of the low-power, long-range LoRa wireless communication technology, devices may connect with one another over great distances while using little power.

Keywords— LoRa (Long Range), Sensors, Esp32, Arduino.

I. INTRODUCTION

LoRa is found to be the best IoT solution because it operates in an unlicensed Industrial Scientific and Medical (ISM) band (sub-gigahertz) and provides long-distance connectivity to low-power devices. The spread spectrum modulation is an old modulation technique developed in 1940 which was originally used for military communication. Monitor real-time data collection and timely data transmission to operator data. The employment of Defense applications plays an important role in keeping an eye on its citizens and LoRa modulation is an improved version of the traditional method as it is based on the chirp spread spectrum, which allows the use of low-end oscillators for storage, and makes synchronization faster and more reliable. The idea of chirp to spread a spectrum modem converts one information into another bit series and spreads it across the spectrum. It thus makes it more powerful for channel sound because all the allocated bandwidth is used to broadcast the signal. LoRa aims to eliminate duplicates, reduce device costs, increase battery life on devices, improve network capacity, and support a larger number of devices. The disadvantage of this remote connection is the low data rate, which usually ranges from a few hundred to a few thousand bits per second (0.3 to 37.5 kbps) due to which helps us to achieve longer battery life due to lower power consumption. In fact, the whole electronic system is powered by batteries. Even a large number of items are connected with technologies such as LORA, and Bluetooth with high power consumption. Considering the energy needs and the issue of battery life, it is worthwhile to use LoRa technology to use a surveillance robot based cognitive statins in India. The natural environment is highly unstructured and often unknown; hence these robots must be able to process a large amount of information, and make planning and navigational decisions quickly.

II. EXISTING MODEL

Already existing systems use robots that have a limited range of communication as they are based on Bluetooth Technology. There are some existing projects that use short-range wireless camera also some existing robots can only be controlled with a manual mode which needs human Supervision throughout the whole surveillance process. are more power consuming compared to lora which can drain the batteries of the robot more quickly, reducing its operating time. Also the rate of transmission of data is less.

III. PROPOSED MODEL

The system we developed will allow us to monitor the scenario using esp32 Cam, WIFI module which will run only with specified SSID and password

over router or mobile hotspots. An LCD mounted on the robot that could be used to send messages. The robot is controlled using an application called XCTU with certain commands to make it move in a desired direction in case of any obstacle ultrasonic sensor helps the robot to stop. Arduino uno is used as microcontroller. We can live monitor from esp32 cam from any browser using a certain Ip address which redirects us to the webpage that displays live recording from robot camera module, also inbuilt flash can be turned on/turn off from the webserver itself.

IV. BLOCK DIAGRAM

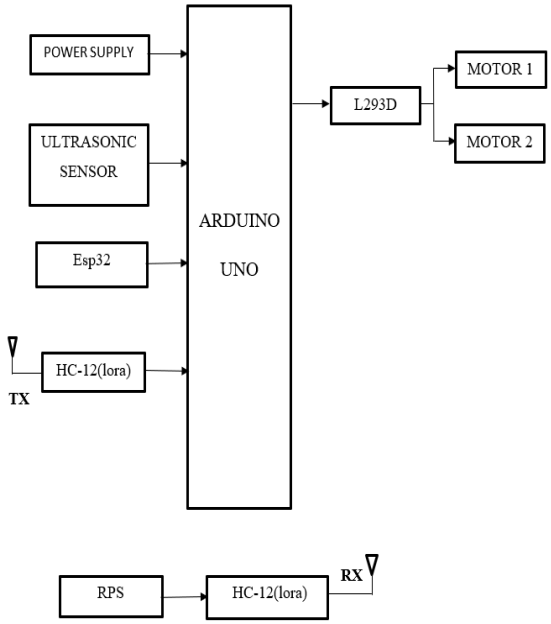


Fig.1. Block diagram

LoRa (Hc-12): It is a long-range Transmitter and receiver which has a 700mts range provided

Ultrasonic sensor: work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

ESP32 The ESP32-CAM is a development board with an ESP32-S chip, an OV2640 camera, microSD card slot and several GPIOs to connect peripherals

LCD: A 16X2 LCD is used to display the readings on it

L293d: L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction

V. FLOWCHART

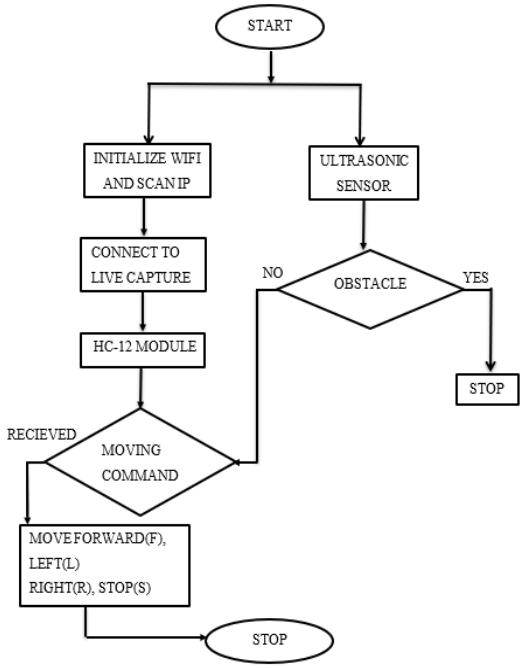


Fig.2. Flow chart

STEP-1: Start

STEP-2: Wait for Wi-Fi initialization

STEP-3: Read the IP address from advanced IP Scanner application and enter it in any device to display the live recording

STEP-4: Give the commands for the robot to make it move using XCTU application

STEP-5: In case of any obstacle Ultrasonic sensor will stop the robot

STEP-6: END

Command	Movement
f	Moves Forward
l	Rotate Left
r	Rotate Right
s	STOP
b	Moves Backward

VI. WORKING

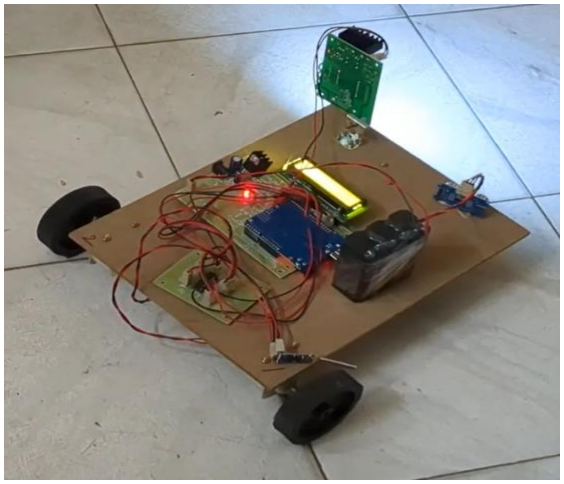


Fig.3.Working model

Initially ESP32 CAM, WI-FI module waits for WIFI initialization. Once the WIFI is connected through hotspot or router Arduino uno waits for the user to give commands for the motor driver(L293d) to move in desired direction, here the commands to make robot move are given from application/software called XCTU To see the live cam recording, we should connect to the IP address trough any browser, IP address generated can be known by using advanced IP scanner.

VII. ADVANTAGES

1. Remote monitoring
2. Low Power
3. Ease of access
4. Accuracy
5. Low cost

VIII. RESULTS

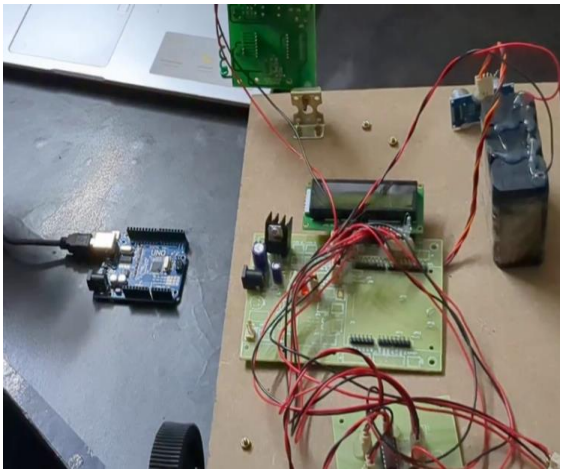
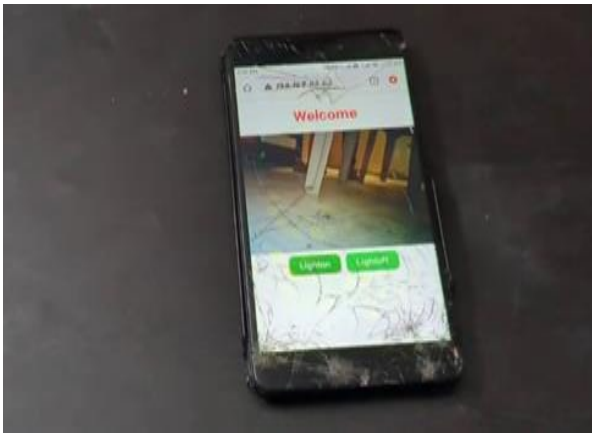
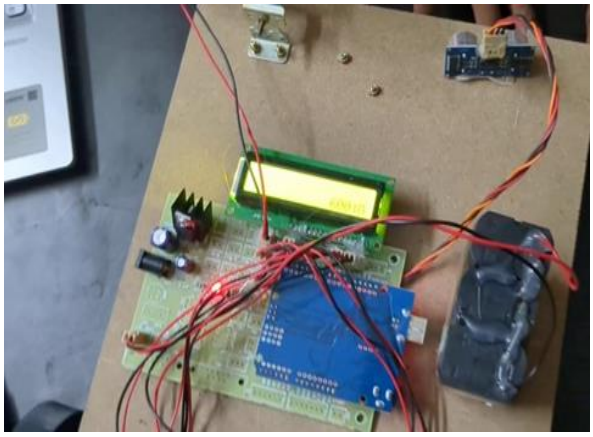
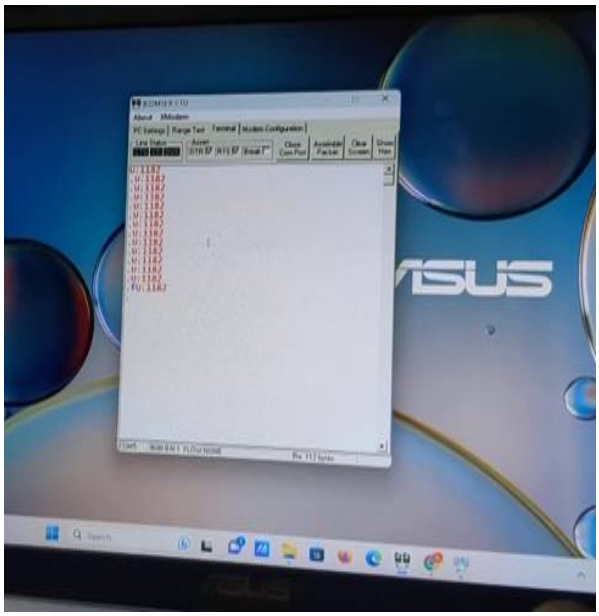


FIG.4.RESULTS







IX. CONCLUSION

The proposed project makes it easier for people, especially the law enforcing agencies, to monitor persons and places. It is found that we are able to receive data from about 700mts line of sight in urban areas by using LoRa(hc-12) module. The result found to be effective solution for military surveillance purpose because mostly Naxalites or terrorists' area is dense forest area and it can be used in rescue operations/disaster managements to save the people got struck in buildings where humans can't go. In fact, employing LoRa communication technique and using Internet of Things, we expanded the coverage and a cognitive robot setup is successfully implemented.

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