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IOT based Land Mine Detection Robot

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Abstract: ***Such equipment is usually automatically blasted through pressure when a target steps on it or drives on it. Demining or mine clearance is the process of removing land mines from an area, while minesweeping describes the task of locating mines. Landmines are generally easy to lay and difficult and dangerous. They are harmful due to their unknown positions and are often difficult to detect. Although dimming has been given the highest priority, currently my clearing operation is a labor-intensive, slow, very dangerous, expensive and low technology operation. The current rate of human quarry is about 100 thousand per year. The idea is to build and develop an automated robot capable of detecting buried landmines and taking them from their locations, enabling the operator to control the robot from afar. The buried quarry is detected using metal detectors as most land mines have metal components. The robot will travel in a straight line route. The system allows the operator to stay at a safe distance by enabling the robot to safely control. Wireless control is for the safety of the operator, designed robots must be able to operate remotely, and is equipped with wireless data transmission capabilities.***
Low cost and high reliability Robots can be constructed with high reliable structure in low cost and less complex. Millions of landmines are still buried in various countries around the world.

I. INTRODUCTION

There square measure several countries suffering from landmines that square measure a serious threat to life and cause economic issues. Landmines square measure harmful thanks to their unknown conditions and square measure usually tough to observe. the event of recent technology is tough thanks to the wide selection of landmines. Currently, over one hundred million anti-personal mines square measure beneath the bottom everywhere the globe. It injures or kills over 2000 folks a month, leading to the removal of landmines as a worldwide emergency. this methodology of manually removing mines is pricey and dangerous.

An automated automaton capable of sleuthing buried landmines and taking them from their locations, sanctionative the operator to remotely management the automaton. The buried quarry is detected exploitation metal detectors as most land mines have metal elements. The automaton can travel in a very line route. The system permits the operator to remain at a secure distance by sanctionative the automaton to soundly management. This project demonstrates the matter and impacts of landmines in defense areas. we tend to square measure proposing a automaton that has the aptitude to observe buried mines and permit the user to manage it wirelessly to avoid human causes. The automaton is provided with special wheels controlled by H-bridge modules, permitting it to maneuver all told attainable directions. during this project, we tend to target the protection of humans and automatons; The robot is provided with special vary sensors that facilitate to avoid obstacles within the space, particularly by sleuthing the position of obstacles. For the development of the project, a special form of model fabricated from light-weight temperature resistant metal is employed to hold all the things. during this project we tend to square measure employing a liquid with color that makes a spot on the position wherever the mines square measure being detected. A wireless camera are often more to the automaton, which is able to capture and transmit the robot's current location. The microcontroller commands the automaton. this method has the sensible advantage of reducing casualties, when the implementation of the technique, the automaton are often controlled expeditiously and it powerfully determines the position of the obstacle.

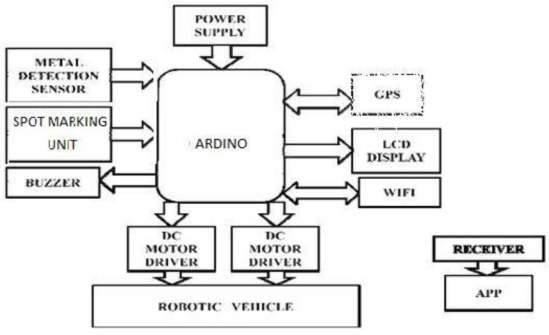

Figure 1. Steps in Land Mine Detection Robot

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II. THEORY

In it, we have explored land mines that demonstrate the problem and impacts of landmines in defense areas. We are proposing a robot that has the potential to detect buried mines and permit the user to regulate it wirelessly to avoid human causes. The robot is equipped with special wheels controlled by the driver module, allowing it to move in all possible directions. In this project, we focus on the protection of humans and robots; The robot is equipped with special range sensors that help to avoid obstacles in the area, especially by detecting the position of obstacles. For the construction of the project, a special type of prototype made of lightweight temperature resistant metal is used to carry all the items. In this, we are using a liquid with color that creates a spot at the position where the mines are being detected.

Fibre glass is employed to fabricate the robot that made it light weight. The robot has differential drive system that both wheels are including 12V DC geared servomotors. Motors have incremental encoders. The encoders have resolution of 504 pulses per revolution. This robot scheme with differential drive, two caster wheel and metal detector. One caster wheel can serve the aim of stability of robot but instead two caster wheels are used to reduce the load on wheels [11]. The weight of robot is about 10 kilograms and therefore the distribution of the load is over four wheels which help in making the robot to maneuver in landmine field without triggering the landmines. Antipersonnel landmines are usually tuned to trigger at a minimum weight of 25 to 40 kilograms. Metal Detector is connected within the front of robot to detect landmines.

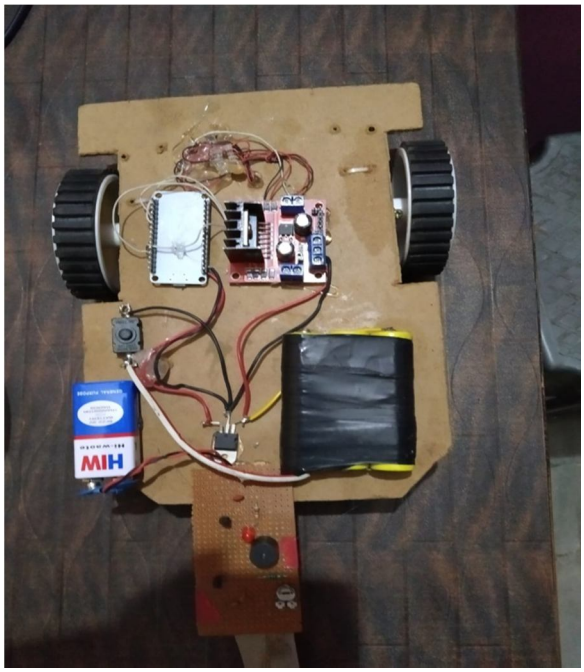

Figure 2. The Land Mine Detection Robot

In it, we have explored land mines that demonstrate the problem and impacts of landmines in defense areas. We are proposing a robot that has the potential to detect buried mines and permit the user to regulate it wirelessly to avoid human causes. The robot is equipped with special wheels controlled by the driver module, allowing it to move in all possible directions. In this project, we focus on the protection of humans and robots; The robot is equipped with special range sensors that help to avoid obstacles in the area, especially by detecting the position of obstacles. For the construction of the project, a special type of prototype made of lightweight temperature resistant metal is used to carry all the items. In this, we are using a liquid with color that creates a spot at the position where the mines are being detected.

The project includes numerous flow modulus and ways. meaning;

1) Wifi Module
2) Arduino Controller
3) Power provide Module
4) Motor Driver Module
5) Metal Detection technique

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The ESP8266 is low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer, Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and therefore the commands it accepted. The very low price and therefore the incontrovertible fact that there have been only a few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and therefore the software thereon , also on translate the Chinese documentation.
The ESP8285 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.
The successor to these microcontroller chips is the ESP32.

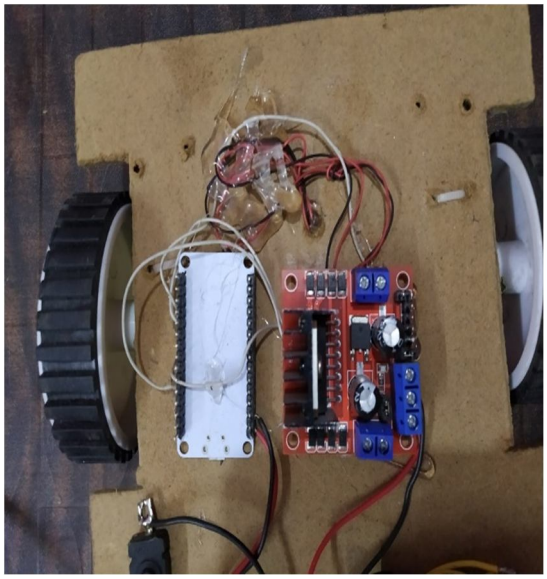

Figure3- The Wifi module Used in the Model

III. LITERATURE SURVEY

While many techniques have been developed for military use, the military problems is quite distinct from that of humanitarian demining. The military is concerned mainly with minefield breaching. Rapidly clearing a route thought a minefield, leaving most of the mines in place. To achieve these ends, military systems tend to rely on high – troubled operation. This is clearly insufficient for humanitarian use as even the fear of the presence of landmines will result in land remaining uninhibited.
Minefield surveys are typically classified into three levels. Level Ist surveys are designed to identify the general location of mined or suspected mines areas. A Level II surveys is designed to reduce the large areas identify in level 1st surveys. Level III surveys are conducted during the actual clearance of the areas identified in the level II to surveys and involves the accurate recording of the areas cleared.
Now, this project allows us to taking a brief literature surveys from the various journals, scholars, papers, thesis on automated metal detection robot. i.e.

1) According to paper added to IEEE xplore on 6 March 2017, Demining or mine clearing is the process of detecting and removing land mine from an area. Uncleared landmines represent a serious humanitarian and economic threat in over 70 countries. Its victims suffer from permanent disability if not killed and need horrific expensive care. Also, the value of the land, roads, and underground resources that is still useless. Clearing mines is very dangerous work. The majority of demining work remains administered manually using metal detectors and prodders. For every 5,000 mines that are removed, one person is killed and two people are injured. Over the years there has been considerable interest within the scientific and engineering communities within the application of advanced technologies to enhance the security and efficiency of this work. In this paper a motion-planning algorithm to enable landmine detection and clearing robots to systematically scan a minefield, detect landmines and clear it's presented. The algorithm works on two steps; (1) generate the driving tracks which will be wont to scan the minefield area, and (2) connect these tracks using Dubins' path in order to get a continues and complete trajectory which may be used for the robot's navigation.

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2) According to paper added to IJETTCS on July -August 2014 there are many Countries affected by landmines which present a major threat to lives and cause economic problems. Landmines are harmful due to their unknown positions and sometimes difficult to detect. The development of latest demining technologies is difficult due to the big variety of landmines. Currently, more than 100 million anti - personnel mines are under the bottom everywhere the planet . It also injures or kill more than 2000 people over a month as a result, the removal of landmines as become a global emergency. The current method of removal mines manually is costly and dangerous.

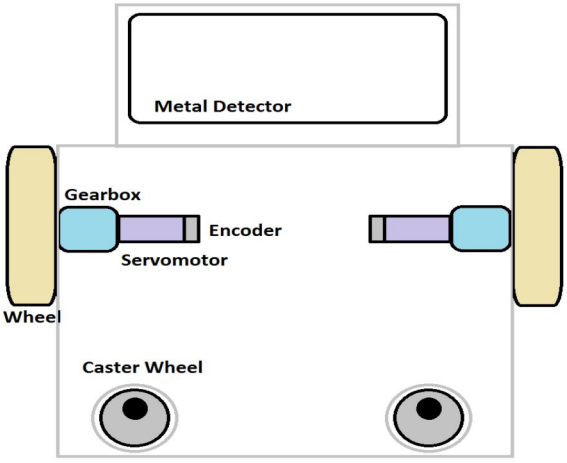

Figure 4: Drive Landmine Detecting Robot scheme

3) According to paper added InTech-Mine/ followed by IEEE 2014, the robot is equipped with special range sensors that help in avoiding the obstacles in the field by specifically detecting the position of obstacles. For the fabrication of the project, a special sort of prototype made from lightweight temperature resistant metal is employed to hold all objects. In this project we are using a liquid with colour which makes a spot on the position where the mines is being detected. A wireless camera is added to the robot, which captures and broadcasts this location of the robot. Microcontroller commands the robot. This technique has the sensible advantage of reducing the amount of casualties, after the implementation of the technique, the robot are often controlled efficiently and it robustly determines the position of the obstacle.

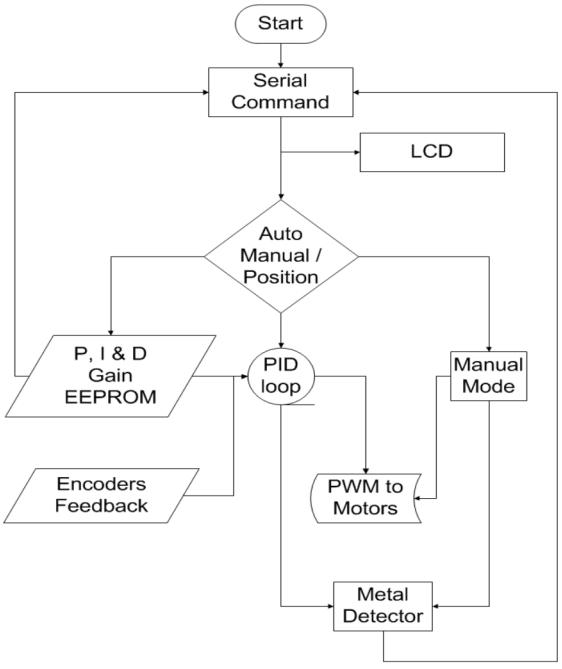

Figure 5: Microcontroller Program Scheme

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4) According to the book "Mine Detection Robot and Related Technologies for Humanitarian Demining" by Kenzo Nonami, (Chiba university of Japan), Currently, more than 100 million anti -personnel mines are under the bottom everywhere the planet . It also injures or kill more than 2000 people over a month as a result, the removal of landmines as become a global emergency. The current method of removal mines manually is costly and dangerous. This project demonstrates the problem and effects of landmines in defence fields.

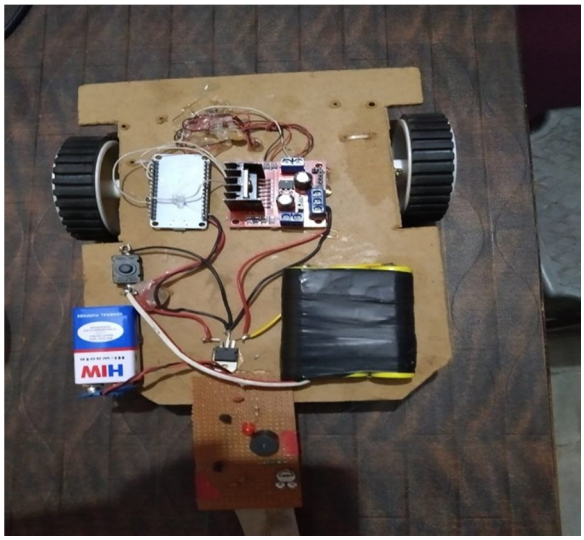

Figure 6: Land Mine Detection Robot

IV. PIN CONFIDURATION

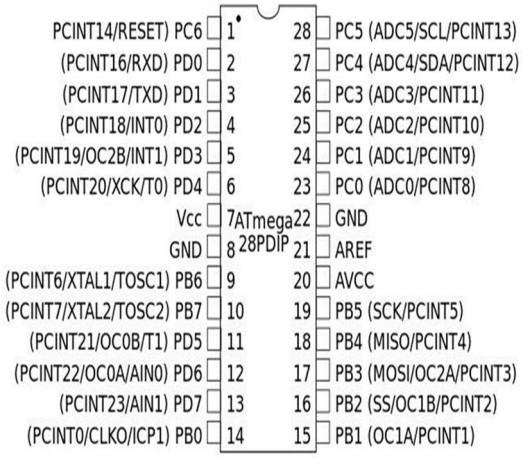

Figure 6: Pin Configuration of the Model

The Pinout is as follows for the 1st basic module,

1) VCC, Voltage (+ 3.3 V (upto 3.6 V it can handle))
2) GND, Ground (0 V)
3) RX, Receive data bit X
4) TX, Transmit data bit X
5) CH_PD, Chip Power Down
6) RST, Reset
7) GPIO 0, General Purpose Input-Output No. 0
8) GPIO 2, General Purpose Input-Output No. 2

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BRAND NAME	REES52
EAN	0781119459971
Part Weight	10.0 grams
Manufacturer Serias No.	ESP8266
Part No.	ESP8266
UPC	781119459969

V. DIODES

The diode might be a two-terminal electronic part that conducts primarily one direction (asymmetric conductivity) current; it's low (ideally zero) resistance in one direction and high (ideally infinite) resistance within the choice . Semiconductor diodes, the foremost common kind these days, ar the crystalline a part of a semiconductor material, the P – N junction connected to 2 electrical terminals. The thermionic vacuum tube diode consists of 2 electrodes, a plate (anode) and a hot cathode. The diode is that the 1st semiconductor device. The reforming capabilities of the crystals were discovered in 1874 by German man of science Ferdinand Braun. the primary diode, referred to as CAT's Vixer diode, was developed in 1906, product of mineral crystals like galina. Today, most diodes ar product of semiconductor, however alternative materials like antioxidant and chemical element ar generally used.

Figure 7:Diodes used

VI. MOTOR DRIVER

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. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*). The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more info. You can Buy L293D IC in any electronic shop very easily and it costs around 70 Rupees (INR) or around 1 $ Dollar (approx Cost) or even lesser cost. You can find the necessary pin diagram, working, a circuit diagram, Logic description and Project as you read through. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

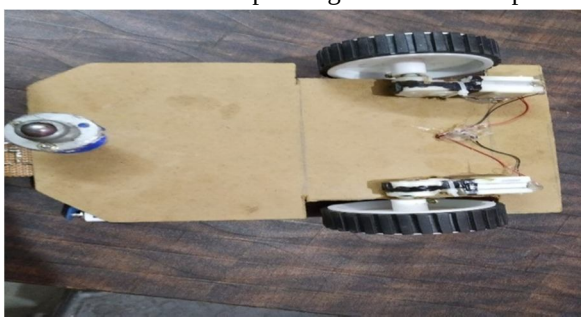

Figure 8: The L293D Motor Driver

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VII. REGULATOR IC

For ICs within the 78xx family, the xx is replaced with two digits, indicating the output voltage (for example, the 7805 features a 5-volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that's positive relative to a standard ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit.

78xx ICs have three terminals and are commonly found in theTO-220 form factor, although they are available in surface-mount, TO-92,and TO-3 packages. These devices support an input voltage anywhere from around 2.5 volts over the intended output voltage up to a maximum of 35 to 40 volts counting on the model, and typically provide 1 or 1.5amperes of current(though smaller or larger packages may have a lower or higher current rating 4.3.4.1 78xx.

Figure 9: Regulator IC Used

VIII. RESULT

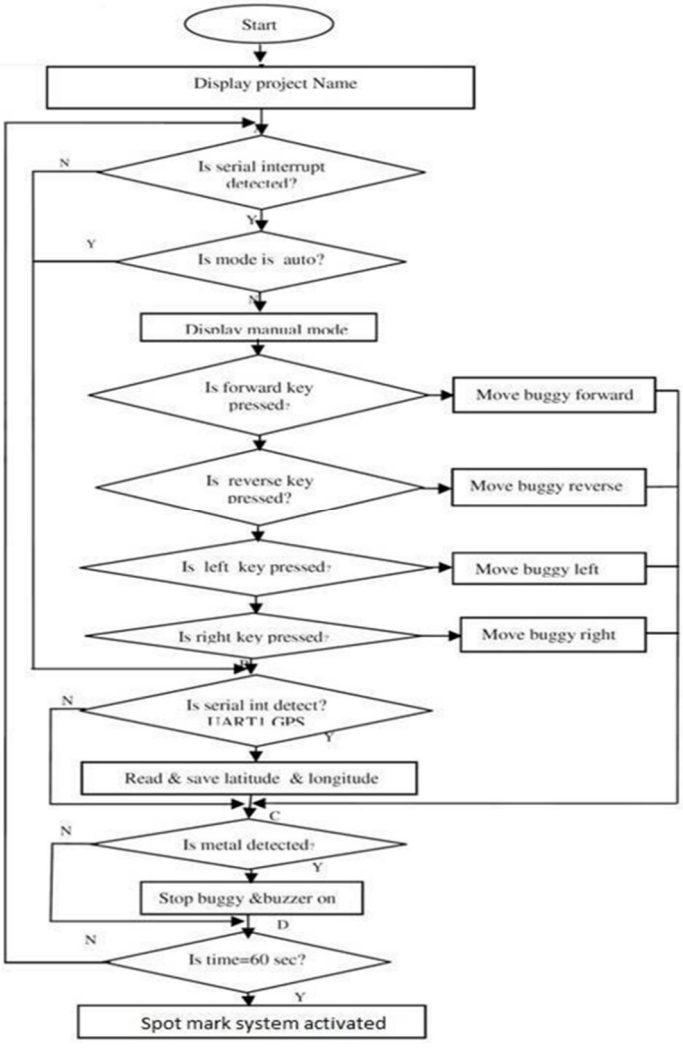

Figure 7. A DFD diagram of Land Mine Detection Robot

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As we know that landmines crisis, many countries affected by landmines which present a great threat to life and cause economic problems. Landmines are harmful due to their unknown conditions and are often difficult to detect. The development of new degradation technologies is difficult due to the wide variety of landmines. Currently, more than 100 million anti-mines are under the ground all over the world. It injures or kills more than 2000 people a month, resulting in the removal of landmines as a global emergency. The current method of manually removing mines is expensive and dangerous. Therefore, we create a fully "micro controller based automated landmines dotainment robot". We easily guarded the army officers and removed the potential possibility of casualties and detected landmines. In this project, we focus on the protection of humans and robots; The robot is equipped with special range sensors that help to avoid obstacles in the area, especially by detecting the position of obstacles. For the construction of the project, a special type of prototype made of lightweight temperature resistant metal is used to carry all the items. In this project we are using a liquid with color that creates a spot on the position where the mines are being detected.

A wireless camera is added to the robot, which captures and transmits the robot's current location. The microcontroller commands the robot. This technique has the practical advantage of reducing casualties, after the implementation of the technique, the robot can be controlled efficiently and it strongly determines the position of the obstacle. The current prototype of an automated landmine detection robot is currently presented in the current investigation and can be built using a few hundreds of low costs. Therefore, heavy investment on landmines can be reduced as countries are threatened by landmines. It detects uneven landmines under the ground and creates an alarm for the user and successfully changes the location of the landmine by moving it safely from one place to another without fear of explosion. The aim of this research was achieved by detecting and plotting the land mines and the area visited by the robot accurately in order that the demining crew can easily locate and remove the landmines. The success of this landmine detecting robot is to be invisible to the landmine which is merely possible by its low weight. This robot is low cost. This robot has very simple graphical user interface and mapping system. Novice users can operate the robot easily. The parts of robot are easily available in local market. Robot was successfully operated in all three, auto mode, semi auto mode, and manual mode. All three control modes present on one graphical user interface provide a very powerful system to the user.

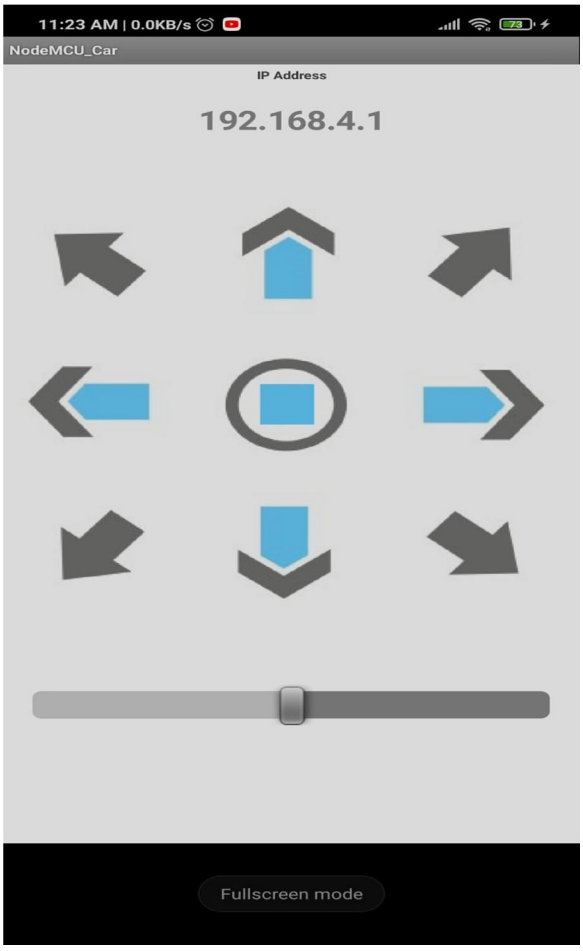

Figure 8: Mobile App By which Project is Moved

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IX. CONCLUSION

With such statistics, it's not stunning that mine isn't employed in locating eventualities any time before long. to lift awareness and advance concerning this technology, the IEEE artificial intelligence and Automation Society (RAS) can host the primary Humanitarian artificial intelligence and Automation Technology Challenge (HRATC) to be control at ICRA 2014 (May 31-June 1). The Challenge aims to market and develop new ways for autonomous landmine detection and can be operated nearly with physical robots based mostly in Coimbatore, Portugal, thus groups from round the world will participate. This application of artificial intelligence and automation is organized worldwide to lift awareness of human causes - it runs in partnership with the IEEE RAS-SITE (the initial and solely IEEE Society to Sight). RAS-SITE leverages existing and rising technologies for the good thing about humanity and aims to reinforce the standard of life in underserved, underdeveloped areas unitedly with existing international communities and organizations. it's simple to know why RAS-Sight is that the organizing partner in HRATC - this challenge can have interaction the international community for a humanitarian cause. Participants of the challenge were asked to submit a quick paper to explain their motivation, past experiences, analysis (if any), and key techniques that will be used throughout the challenge. groups accepted to participate can use a similar mechanism throughout the challenge. bear in mind that Hussaini-developed mine disposal mechanism of Coimbatore University? The team has partnered with RAS-Sight to be the official mechanism for HRATC. maybe the simplest feature of the challenge (aside from the very fact that technology is actually life-saving!) Is that each one participants are going to be ready to contend nearly. this can be right! they will log in from anyplace within the world to regulate a Husky-based mechanism and participate within the challenge.

The ways enforced for the technology are going to be evaluated consistent with the subsequent criteria:

A. Exploration time and environmental coverage
B. Quality of investigation and classification
C. Landmine rescue

In this project we used a different model, a unified model for object detection, compared to others this model is simple to construct and easy to understand. Yolo model is trained on loss function. It is extremely fast with good accuracy. The algorithm is much more efficient to use in real time.

REFRENCES

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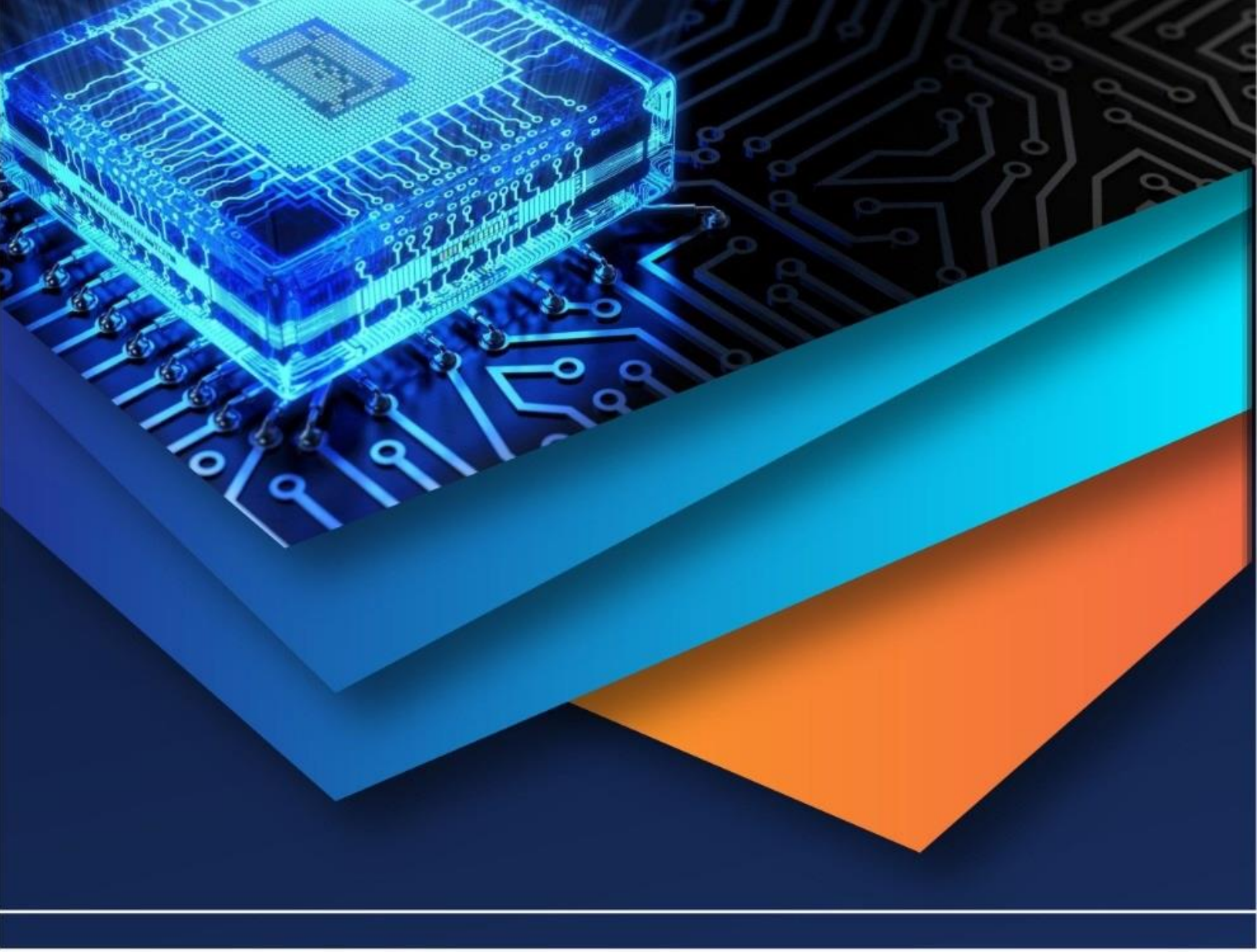

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