Design of robot assisted wireless sensor

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Abstract. This paper constraints on designing of a multi-purpose robot. A various sensor is used in this design, controls system, automatic arm, wireless communication system and remote controlling. The robot was success in test indoor and outdoor and. It can move easily in rough ground in order to find the destination avoiding any obstacles. The movement of the proposed robot could be wirelessly controlled by using control unit. The proposed robot can be used to protect human since it can allocate the position of gas leakage in home, office, industry or bank. And also, can be used for civil field as detecting metal area. By using modern technology for basic automatic robot with a wireless system so it does not cause any additional cost of wiring. This research success here discovered the metal and toxics gases by using sensors, the alarm will be operating when there is any material or toxics gas appear near the robot.

Keywords: Robot, Gas Detection, Metal Discovering, Wireless Controller System

1. Introduction
In the world of information technology information is the key. Similar can be said about any country’s military and law enforcement agencies. A lot of human lives are involved in this dangerous Robots are unmanned devices and can be controlled from remote location. Also, if they are spotted there is absolutely no risk or way of identifying to whom does the robot belong. In this way we can reduce the human interference and also save some lives [1].

With the robotic technology development researchers have many studies using unmanned and remote-controlled robots. These robots help human life becoming more easier particularly in dangerous situations.[2]. A robot job can be classified to two types specific purpose robot and a particular robot. Like computers, specific purpose robots could be linked with networks, and software that increase their useful. Dedicated robot is designed for a particular work [3].

Since the multi-purpose robots having many types of sensors and working unit that can be worked synchronously and separately, its advantages occurs in saving time and cost and at the same working time it will be done more efficiently [4].

In 2007 Seiji Masunaga et.al, designed a Robot controller for metal detector. In the present investigation the development of a Controlled Metal Detector (CMD) to control the crack and position of the sensor head has been presented.[11]. In 2008 Charles W. Gardnera et.al. Published a remote biological, chemical and explosive instrument discovery by using a robot-based Raman detector. Their study showed detector- UGV integration, the primary results with a biological agent (toxin) simulate and the results of an operator unsighted trial to detect explosive on car panels. [12]. In 2011 Joshua D Freeman represented a robot wireless sensor network for checking and discovering of explosions that happened
in indoor environment, they discussed the design of a hybrid wireless sensor network to supervise the parameters of the environment in an indoor region. A set of mobile robots are in service inside the wireless network act as mobile nodes and can be applicable when dealing with sensors at low range capability and where it is of the greatest importance that the sensors give accurate readings.[13].

In 2014 Kumar Reddy and Bala Siva Krishna Presented a gas detection savior robot in coal mines. The mobile robot for mine rescue, failure surveillance is designed and with a camera and other mechanism attached to it. By putting an arm on the robot, it will help the robot pick up samples or remove small trash from path inside the mine.[8]. In 2014 Manohar Raju and N.Sushma Rani implemented an automatic gas detection robot. This can be felt fulfil and self-dependent. The researchers believe that their novelty and results can be useful in chemical industries, offices, home function, and coal mine region.[9]. In 2015 Vibekananda Dutta and Teresa Zielinska Presented a networking technology for robotic functions. The authors addressed challenging issues in Internet of things -assisted robotic applications: communication networks, network interfacing and security policies.[5]. In 2015 Malaviya, Mihir Vyas, Ashish Vara Published an Autonomous Landmine Detecting and Mapping Robot. They have been successfully proven from their proposed assumption and concepts for a landmine searching platform works completely. It will able to clear the path with 1m width at one go. [7].

Also, in 2015 M. Taher et. al. designed a universal multi-purpose robot. The researchers proposed a robot that can be used in both civil and military field. [10] In 2017 M. Yuvaraju and Drishya.c, studies an autonomous protection robot in metal detection and chemical sensing using IoT. The main aim of their research is to design a robotic vehicle which can discover metals near to it on its path, also this robot is controlled by an android application [14].

As shown from the previous studies the researches are focus on design a robot for discover a metal only or to detect gas leakage only while this research is success in design a robot to discover the metal and toxics gases in the same design.

1. System Modelling

1.1. Structure of Robotic Car

The main components that will be used to design the proposed robotic car are explained with their function and properties in Table1

| System Component                  | Value/ Description                                                                 |
|-----------------------------------|------------------------------------------------------------------------------------|
| H-bridge                          | H-bridge used is L298N H-bridge Dual Motor Controller                              |
| DC Motor                          | Nine permanent magnet dc motor used for the construction.                           |
| FPV camera                        | It will be used to visualize location of metal and gas leakage.                     |
| 32CH TS835                       | It is transmitter Camera FPV sent imaging of camera FPV on a distance 1Km.          |
| Toxic Gas Sensor                  | This sensor used MQ-135 for sense toxic gases.                                     |
| Metal Sensor                      | This sensor used to sense metal.                                                   |
| Sensor for Humidity and Temperature| digital temperature and humidity sensor used of type DHT11                        |
| GPS NEO7-6M-0-001                 | Used to locate the robotic car in far places.                                      |
| The Arm                           | It is used to pick up and carry things.                                            |
1.2 Structure of The Remote Control

| System Component | Value/ Description |
|------------------|--------------------|
| RC832            | This component used to receiver of FPV camera. |
| HC-12            | It used for the wireless of remote control |
| Joystick         | It is a switch of three joystick to control of moving car, FPV camera and the arm |
| I2C              | It allows to continue the Arduino with LCD |
| LCD screen 4X20  | It is liquid crystal display contain 4 row and 20 columns |
| AV Screen        | It is used to display the imaging of FPV camera |

1.3. Arduino Mega
This microcontroller used in this research two Arduino of ATmega2560 had input voltage 12V and output voltage 5V one for robotic car structure(arduino1) and other for remote control structure(arduino2).

2. Design Implementation
2.1 The Connection of The Robot Components
The block diagram of the proposed robot shown in figure 2.
Figure 2. The proposed robot block diagram

The complete circuit of the robotic car proposed established by the following steps: First Step as shown in figure 3 connected dc motor to pin controller of H-bridge and connected pin 8,9,10,11 of H-bridge to arduino1 to digital pin 22,24,26,28 and connected output voltage 5V and ground of H-bridge to breadboard and connected output voltage 5V of arduino1 with output voltage 5V of H-bridge on breadboard and connected HC-12 to 5V and ground and pin 18 and 19 and connected lipo battery to arduino1 and h-bridge to supply 12V.

Figure 3. Connection of arduino1, H-bridge, four DC motor, lipo battery and HC-12
The figure below shows the first part of code for car.

```cpp
#include "TinyGPS++.h"

TinyGPSPlus gps;
#include<dht.h>
dht DHT;
define DHT11_PIN 2
#define M 13
#define G A0
#define m1 12
#define m2 11
#define m3 10
#define m4 9
#define m5 8
#define m6 7
#define m7 6
#define m8 5
#define m9 4
#define m10 3
#define m11 0
#define valm = 0;
#define valg = 0;
#define k = 0;
#define gas = 0;
#define met = 0;
#define state = 0;
defloat lati = 0;
defloat logi = 0;
String s;
void setup() {
  Serial.begin(9600);
}
```

Step two as shown in figure 4 connected GPS neo7 to 5V and ground of breadboard and Tx and Tr connected to pin 14 and 15 of arduino1 and connected DHT11 to 5V and ground of breadboard and pin 2 of arduino1 and connected toxic gases sensor to 5V and ground of breadboard and pin 13 of arduino1 and connected metal sensor to 5V, ground and pin A0 of arduino1.

![Connection of dht11, metal sensor, toxic sensor and GPS neo/0-001](image)

**Figure 4.** Connection of dht11, metal sensor, toxic sensor and GPS neo/0-001

Step three as shown in figure 5 connected three motor drive IC (Three motor drive IC L293D each one controlled of two DC motor which insulted on the arm and each one had 16 terminal 8 terminal was two
Vcc, two enable, two drive and two ground (other 8 terminals same) on breadboard and two drive connected five dc motor each two dc motor connected to one IC and two unable connected to pin 12, 11, 10, 9, 8, 7, 6, 5, 4, 3.

Step four as shown in figure 6 display the connection between 32CH TS835 and FVP camera.

2.2 The Connection of Remote Control

The first step connected three joystick for each one to 5V and ground of breadboard and VRx and Vry to analog input pin A0, A1, A2, A3, A6 of arduino2 and switch to pin 2, 3, 4 of arduino2 and connected HC-12 to 5V and ground and pin 12 and 13 of arduino2 this connection shown in figure 7.
Step two connected I2C to 5V and ground of breadboard and SDL and SCL to pin 20 and 21 of arduino2 and connected it to LDC screen and connected buzzer to pin 8 of arduino2 and to ground of breadboard the remote-control connection shown in figure 8.

The figure below shows the first part for code programming to control operation.
Step three as shown in figure 9, the connection of RC835 and AV screen.

![Connection diagram between RC835 and AV screen](image-url)

**Figure 9** Connection between RC835 and AV screen
3. Results and discussion

3.1. Operation of car that controlled by control box

After completing the process of connecting all parts of the research now the next step of the research that control the movement of the car through the box after the completion of the programming on the computer and upload to Arduino.

3.1.1. The control device

Figure 11 shows the control device that detects the temperature, location and Humidity. Temperature 25, humidity 15.

![Figure 11](image-url)
Figure 12 shows the control Device that detects the detect material. Temperature 21, humidity 13, robotic car M (means there is material which is discovered by the robot).

![Figure 12. The robotic car was detecting material](image1)

Figure 13 shows the control Device that detects the detect toxic gas. Temperature 21, humidity 13, robotic car G (means there is gas leakage discovered by the robot).

![Figure 13 The robotic car was detecting toxic gas](image2)
4. Conclusions
This paper developed a design for a robot with several applications and success in controlling its operating by using several types of sensors. The most important conclusions that obtained from this paper are by using IC-12 and programming it with the used of protocol, success in move the robotic car and control its arm to collect materials. Also, success in detecting gas leakage by using gas sensor.

The other function that this paper success in the robot modelling is by using of material sensor and Arduino, the robot can detect and discover the location of the material. Also, this design could be measured the humidity and temperature degree.

This paper was designed and succeed in detection the location of materials, toxic gases in order to protect the human by detect the toxic gases where the alarm will be operates when there is any material or toxics gas appear near the robot, and it could be improved to do other applications such as saving human lives, and in military location by using nuclear sensors.

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