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LANDMINE DETECTION ROBOTIC VEHICLE WITH GPS POSITIONING

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ABSTRACT:
In today's world Nation security is most important thing today and therefore there is a need to consider safety of the soldiers and army who fight for the nation's security.
One of the major concerns is the mine that is laid by the enemy on the way. So it becomes very important to detect this mine and diffuse them to save the lives of soldiers and armies.
This is now made possible with Landmine Detection Robotic Vehicle with GPS Positioning.

KEYWORDS *– ARM 7, GPS, Metal detector, IR Sensor, Wi-Fi, Android App*

I. INTRODUCTION

The aim of this project to design Landmine detection, if any on the position of land surface; it detects and alert the respective department using notification on android app. It also locates the mine position of land surface using GPS.
In this project system can scan a rectangular area efficiently and scan it for landmines. For this, the system makes use of metal detector for detecting these mines. Once the system detects the mine, it stops the robotic vehicle at the location where the mine is being hidden. After which system makes use of GPS to track the position of the mine and then sends message notification on android app indicating the position of the mine that is hidden in the land. Here the arm controller is used to process data sent by the metal detection system and stop whenever it is detected. Here we have ARM cortex board as controller that drives motorized vehicle accordingly so that robotic vehicle scan the entire rectangular area.

II. HARDWARE IMPLEMENTATION

The block diagram of the hardware implementation of the entire system is as shown in the Figure1. ARM 7 is a microcontroller capable of performing various functionalities. The various functionalities of the components are given below:
The various functionalities of ARM 7 (LPC 2148) are

- 16bit/32bit ARM7TDMI-S microcontroller in tiny LQFP64 package
- 8 kb to 40 kb of on chip SRAM and 32 Kb to 512KB of on chip flash memory
- It supports ISP and IAP.
- Two 10 bit ADCs provide a total 6/14 analog input with conversion time as 2.44microsecond per channel.
- Single 10 bit DAC provides variable analog output.
- Multiple serial interfaces including two UARTs ,two fast I2C bus (400kbits/s) SPI and SSP with buffering and variable data length capabilities
- Up to 45 of 5v tolerant fast general purpose I/o pins in a tiny LQFP64 package.
- Up to 21 external interrupt pins are available .
- On chip integrated oscillator operates with external crystal from 1MHZ to25Mhz.
- Processors wake up from power down mode via external interrupt or BOD.

IR obstacle sensor

Here we are connecting an IR based obstacle sensor. The 50 ohm resister is used for current limiting. The current through the LED is 5v / 50 ohm = 100m amp, which is high for an LED. But to increase the range of the obstacle sensor we are using a lower range resistor (50 ohm).
On the receiver side we have connected the IR receiver in reverse bias. So as soon as the light falls in the IR receiver, the anode voltage increases and when the anode voltage is more than the cathode voltage then the LED is in forward bias mode and start conducting.

Metal detector sensor

The operation of metal detectors is based upon the principles of electromagnetic induction. The single-coil detector is the one used in a real metal detector. A pulsing current is applied to the coil, which then induces a magnetic field. When the magnetic field of the coil moves across metal, such as the coil, the field induces eddy currents in the coil. The eddy currents induce their own magnetic field, which generates an opposite current in the coil, which induces a signal indicating the presence of metal.

GPS modem

The GPS smart receiver features the 16 channels .Ultra low power GPS architecture. This complete enabled GPS receiver provides high position, velocity and time accuracy performances as well as high sensitivity and tracking capabilities.
A GPS tracker essentially contains GPS module to receive the GPS signal and calculate the coordinates. For data loggers it contains large memory to store the coordinates, data pushers additionally contains the GSM/GPRS modem to transmit this information to a central computer either via SMS or via GPRS in form of IP packets. The diagram depicts hardware architecture of an advanced GPS tracker.
A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS or SMS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real time or when analyzing the track later, using GPS tracking software (e,g, Telematics 2.0).

DC motor

DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v.
To drive a dc motor, we need a dc motor driver called L293D. This dc motor driver is capable of driving 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor while changing the direction of rotation, the dc motor driver have an internal protection suit. We can also provide the back EMF protection suit by connecting 4 diode configurations across each dc motor.

Liquid crystal display

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD.
LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

Wi-Fi modem

The ESP82XX Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP82XX is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. This module comes with AT commands firmware which allows you to get functionality like arduino Wi-Fi shield, however you can load different firmware's to make your own application on the modules' memory and processor. It's a very economic module and has a huge and growing community support.
This module has onboard 80Mhz low power 32 bit processor which can be used for custom firmware's. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts. ESP8266 is transforming the world with its low cost and high features which makes it an ideal module for Internet Of Things (IOT). It can be used in any application where you need to connect a device to your local network or internet

Android app

Here we are developing an Android APP through which the user can set the Automatic mode or the Manual mode. In manual mode the App GUI will display 4 buttons through which the user can control the vehicle.
In Auto mode the App will display an GOOGLE MAP on which we can see the current position of robot LIVE. For this the µC will send the coordinates to APP wirelessly via WIFI.

III.BLOCK DIAGRAM

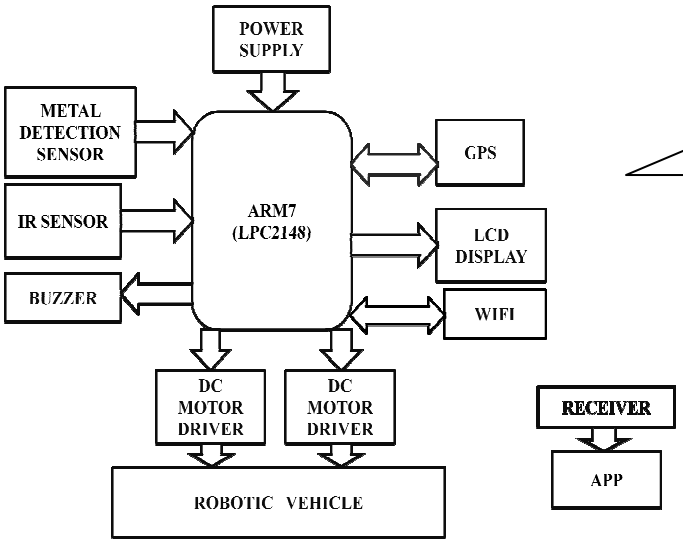

Fig.1. Block diagram of Landmine detection robotic vehicle with GPS positioning

IV.BLOCK DIAGRAM DESCRIPTION

Here in our system we are going to control the robot from remote location in addition to remote monitoring. Our system also has two modes in which the robot gets controlled. We place the IR sensor in the robot which detects any obstacles in the path of robot as it moves to different places. For controlling the robot we have developed and Android APP through which the user can select 2 modes "**Auto mode**" & "**Manual mode**".

In the **manual mode** the user can move the Robot Forward, Reverse left and right using the android APP GUI buttons. The microcontroller is interfaced to the android APP via WIFI modem and gets all the input and controls the robot according to it. In manual mode the user has the full control of the robot. The user can control the robot from the remote location by using the Android APP

In **Auto mode** the robot will find its own path. The µC continuously receives the GPS co-ordinates which are displayed on LCD. The µC will continuously compare the live GPS co-ordinates with ones stored in database. If they match that means that the robot is about to cross the designated borders. As soon as this the µC will turn on the buzzer to indicate this. If any abnormal conditions occur while sensing means, it's intimated through LCD and Buzzer unit in the control section.

V.FLOW CHART

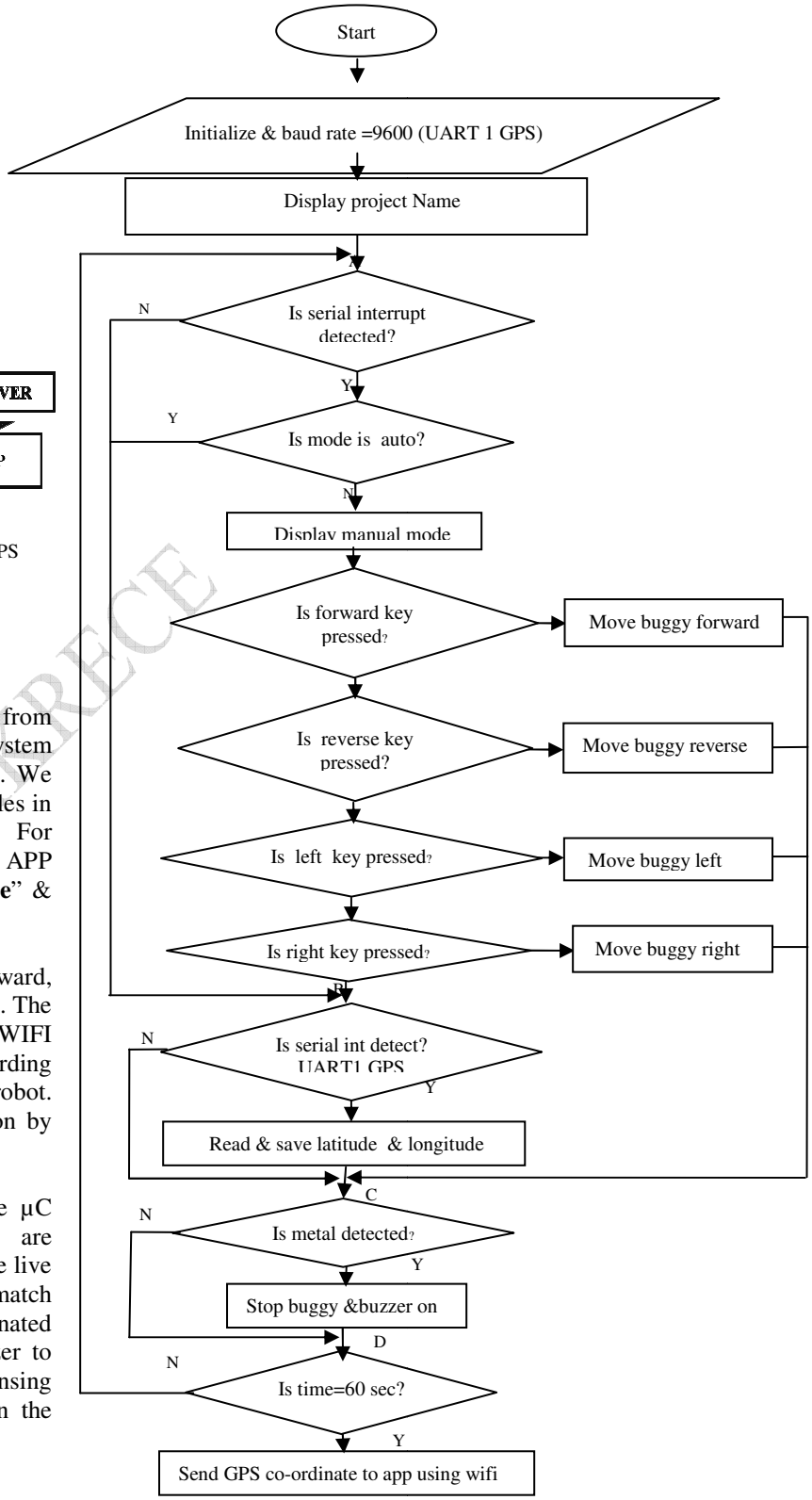

Fig 2.flowchart of Landmine detection robotic vehicle using GPS

VI. APPLICATION

- Can be use in military application

VII. ADVANTAGES

- The Robot can operate automatic as well as in manual mode
- The mode switching is done very fast without any delay.
- Robust system.
- Low power requirement.

VIII. FUTURE SCOPE

- In the future the landmine detection robotic vehicle with GPS positioning can play wide role in different application such as soldier tracking using PIR sensor and voice recognition in like siachin region were soldiers need any kind of help.
- Also it may be used for soldiers health monitoring.

IX. CONCLUSION

The Landmine Detection Robotic Vehicle with GPS Positioning is very beneficial due its more advance features.
Landmine detection detects the mine and locates position of mine on land surface and alert the respective department using notification. So it becomes very important to detect the mine and diffuse them.
Thus by making use of Landmine Detection Robotic Vehicle with GPS Positioning, this project helps to save the life of our soldiers and armies in the areas where landmines are hidden by the enemies.

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