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AN OVERVIEW OF SMALL UNMANNED AERIAL VEHICLES FOR AIR QUALITY MEASUREMENTS

SALIBINDLA ANUSHA[1], S. UMA RANI[2]

[1] Salibindla Anusha, Dept of ECE, Marri Laxman Reddy Institute of Technology & Management Dundigal(v), Qutubullapur(mn), Rangareddy(dst), Telangana, India.

[2] S. Uma Rani, M Tech, Assistant professor , Marri Laxman Reddy Institute of Technology & Management Dundigal(v), Qutubullapur(mn), Rangareddy(dst), Telangana, India.

Abstract: The main pollutants from vehicles are the oxides of carbon and nitrogen, which can be easily detected these days with the help of semiconductor gas sensors. The existing system has data collection and remote sensing using GPS. A mobile robot equipped with embedded systems can collect environmental samples with a much denser spatiotemporal resolution than a human operator also resulting in a safer working condition. Pollution and urban air quality are the major environmental risks to public health. Gas emissions are responsible for a variety of respiratory illnesses and environmental problems, such as acid rain and the depletion of the ozone layer. Pollutants may be released as exhaust gases from traffic or industry and fires or as a consequence of accidents with chemicals. The process of working of this project is explained as follows. The total equipment of this project is placed inside a vehicle. Here we have GPS (Global Positioning System) module by which we can get the location of the vehicle, the location values are displayed on the LCD (Liquid Crystal Display). In this project we have sensors which are interfaced to the micro controller. Those are gas sensor through which we can detect the gas from the vehicle. These values are also displayed on LCD. Here ADC (Analog to Digital Converter) is used to convert the analog data from the sensors to digital form. Whenever these values exceed the threshold then intimation is given to the RTA including vehicle's exact position. The motor getting stopped if it exceeds the threshold value and posted on webpage through GPRS.

KEYWORDS: *Unmanned vehicle, Gas Sensor, location detection.*

INTRODUCTION

The main pollutants from vehicles are the oxides of carbon and nitrogen, which can be easily detected these days with the help of semiconductor gas sensors. The existing system has data collection and remote sensing using GPS. A mobile robot equipped with embedded systems can collect environmental samples with a much denser spatiotemporal resolution than a human operator also resulting in a safer working condition. Contamination and urban air quality are the major natural dangers to general wellbeing. Gas emanations are in charge of an assortment of respiratory ailments and natural issues, for example, corrosive rain and the consumption of the ozone layer. Pollutants may be released as

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exhaust gases from traffic or industry and fires or as a consequence of accidents with chemicals. Most of the volatile compounds are colorless, tasteless, and odorless, and hence, human beings are not able to recognize these leakages early enough to activate appropriate counter measures without auxiliary tools. Moreover, looking for shelter into territories thought to be non dangerous in light of the missing odor is clearly inclined to deadly accidents. The progressively strict control in such manner requires innovative upgrades to maintain a strategic distance from high focus noticeable all around to keep a perfect domain, avoid any risks for people and goods, and ensure safety in industrial and public environments. [5] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer.

LITERATURE SURVEY

M. Rossi, D. Brunelli, A. Adami, L. Lorenzelli, F. Menna, and F. Remondino

Unpredictable concoction focus and gas spillage acknowledgment can be significant in ecological checking for chance appraisal. The utilization of Unmanned Aerial Vehicles (UAVs) to gauge spatially circulated gas fixation is of awesome intrigue since it permits a Simultaneous Localization And Mapping (SLAM) of the volatiles. This field is very later and, up until this point, couple of endeavors have been committed to the plan of incorporated detecting instruments that attention on the streamlining of urgent highlights as weight, measurement and vitality self-sufficiency, as essential as selectivity and affectability of sensors on board UAVs. The proposed Gas Sensing System (GSS) is a completely self sufficient load up in light of a 32bit MCU with 30min independence (all alone battery), information putting away, remote network for constant criticism and installs a custom small scale machined MOX (Metal Oxide) sensor. This framework can be mounted on any UAV on account of its little measurements and light weight. Investigations exhibit that the detecting execution is not debilitated by the wind current amid the flight and we can spatially depict the unpredictable fixation.

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E. Santamaria, F. Segor, and I. Tchouchenkov

One concentration of research at Frauhofer IOSB is the use of unmanned aeronautical vehicles for information procurement. Past endeavors have prompt the advancement of an equipment and programming framework ready to quickly produce a total and up-todate aeronautical picture by joining a few single high determination pictures taken by different unmanned flying vehicles. Be that as it may, the way arranging segment of the framework was not intended to help no-fly zones inside the territory of intrigue. Plus, the framework accepted that all vehicles would have parallel flight extend and a similar sensor impression. In this paper, we address these impediments and present another total scope way arranging calculation with help for no-fly zones inside the region of intrigue. The proposed technique is reasonable for non-curved zones, potentially with gaps, to be secured by at least one flexibility frameworks, for example, multi-rotor air ship. Range and sensor impression of the air ship may vary.

PROPOSED SYSTEM

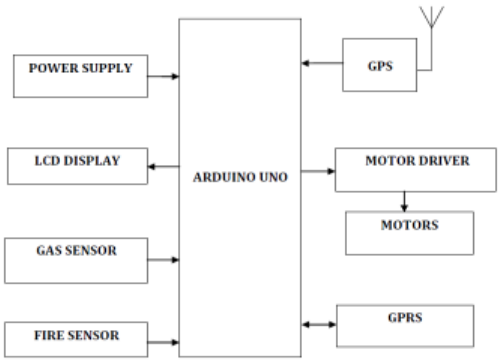

Fig 1: Block Diagram

The process of working of this project is explained as follows. The total equipment of this project is placed inside a vehicle. Here we have GPS (Global Positioning System) module by which we can get the location of the vehicle, the location values are displayed on the LCD (Liquid Crystal Display). In this project we have sensors which are interfaced to the micro controller. Those are gas sensor through which we can detect the gas from the vehicle. These values are also displayed on LCD. Here ADC (Analog to Digital Converter) is used to convert the analog data from the sensors to digital form. Whenever these values exceed the threshold then intimation is given to the RTA including vehicle's exact position. The motor gets stopped if it exceeds the threshold value and posted on webpage through GPRS.

HARDWARE FEATURES

Micro controller:

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARDUINO:

It is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs. Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

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Liquid-crystal display (LCD)

It is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

Co2 sensor:

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, i-butane, propane, methane, alcohol, Hydrogen, smoke. The surface resistance of the sensor Rs is obtained through effected voltage signal output of the load resistance RL which series-wound. The relationship between them is described:

Rs\RL = (Vc-VRL) / VRL

Fig 2: Co2 sensor

GPS:

Global Positioning System (GPS) technology is changing the way we work and play. You can use GPS technology when you are driving, flying, fishing, sailing, hiking, running, biking, working, or exploring. With a GPS receiver, you have an amazing amount of information at your fingertips. Here are just a few examples of how you can use GPS technology. GPS technology requires the following three segments.

- Space segment.
- Control segment.
- User segment

Space Segment

At least 24 GPS satellites orbit the earth twice a day in a specific pattern. They travel at approximately 7,000 miles per hour about 12,000 miles above the earth's surface. These satellites are spaced so that a GPS receiver anywhere in the world can receive signals from at least four of them.

Control Segment

The control segment is responsible for constantly monitoring satellite health, signal integrity, and orbital configuration from the ground control segment includes the following sections: Master control station, Monitor stations, and Ground antennas.

User Segment

The GPS user segment consists of your GPS receiver. Your receiver collects and processes signals from the GPS satellites that are in view and then uses that information to determine and display your location, speed, time, and so forth. Your GPS receiver does not transmit any information back to the satellites.

The following points provide a summary of the technology at work:

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- The control segment constantly monitors the GPS constellation and uploads information to satellites to provide maximum user accuracy
- Your GPS receiver collects information from the GPS satellites that are in view.
- Your GPS receiver accounts for errors. For more information, refer to the Sources of Errors.
- Your GPS receiver determines your current location, velocity, and time.
- Your GPS receiver can calculate other information, such as bearing, track, trip distance, and distance to destination, sunrise and sunset time so forth.
- Your GPS receiver displays the applicable information on the screen.

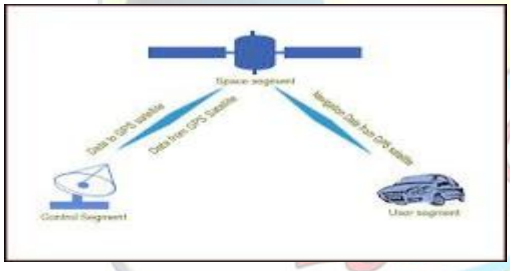

Fig 3: GPS Working

GPRS:

GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks.

Fig 4: GPRS module

DC Motor:

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

Fig 5: DC Motor

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RESULT:

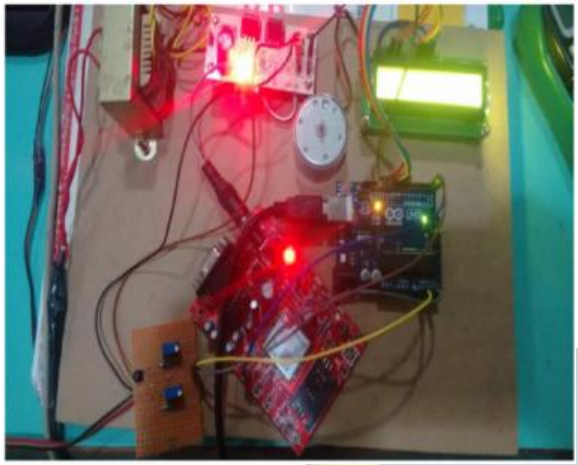

Fig 6: Overview of kit

Fig7: GPRS Web page

CONCLUSION

In this paper, we present the design and characterization of an embedded platform meant for gas distribution mapping and leakage localization applications using UAVs as mobile carrier. The main features of the measurement instrument are the low power consumption and the small form factor, achieving long autonomy on its own rechargeable battery. Field experiments demonstrate the sensitivity of the measurement instrument equipped with VOC-targeted MOX sensors both in stand-alone and mounted as a payload of an UAV.

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AUTHOR DETAILS:

NAME: Salibindla Anusha
Qualification: M.Tech (Embedded Systems)
Mail Id: s.anushareddy17@gmail.com
Phone: 8179972706

NAME: S. Uma Rani
Qualification: M.Tech
Designation: Assistant Professor
Mail Id: umadeepu17@gmail.com
Ph No: 8142335401