

## Implementation of Electronic Nose System By Using Quadcopter

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### **Abstract:**

*The electronic nose system is nowadays mainly employed in much-industrialized applications. One of the majorities that shows potential applications is the chemical explosive gas quality monitoring system to identify and classify the dangerous gas environmental region. The container is there effortlessly monitored and detected by the array of chemical gas sensors (CNQ4) embedded with the quad copter. A remotely controlled quad copter use in the projected method with the assist of the camera and sensors close to this region, where explosive chemical gas preserve be predictable. Also, expand the imperfect flight independence of the occupation. To develop the best environmental monitor apparatus for explosive gas outflow localization and simulate structure to estimate its presentation. Generally present a design space investigation for a battery-powered quad copter.*

### **I. INTRODUCTION**

The quad copter that with widely used for data gathering and investigation. Information collects by this will be further precise than a person worker. Sensors and cameras can regularly observe the surrounding air quality, anywhere it gives right particulars. It resolves to provide a secure location since it is not possible to use for a being operative to observe the region anywhere gas break out has to happen. It creates unsafe surroundings for social and the surroundings as well. Gas emission makes respiratory infection and environmental troubles such as acid deposit reduction, etc. gas is an unstable compound that is monotonous and flavorless. So after these compound increases in the air, it will be hard to recognize with the exposed individual judgment [1].

By designing more than a few methods are obtainable, which detects the gas outflow. The disadvantage of this system is the constant operation association of sensors. By using stagnant system, the fundamental basis of discharge cannot be is documented. As quickly as the gas leak, it spreads, especially rapidly in the air [2]. Thus an appropriate machine must be necessary to sense the gas.

Within this investigation, an implanted electronic nose system can be used to mechanism a quad copter with a compound sense method for gas leak recognition and surroundings. This classification consists of a controller (ATMEGA 328P), which is 32 bit. An array of gas sensor collects the data. Four CNQ4 sensors are attached to the system to detect the explosive gases such as ammonia, methane, humidity, and carbon monoxide [3]. A camera is attached to this arrangement to observe the region and the opportunity for gas leakage.

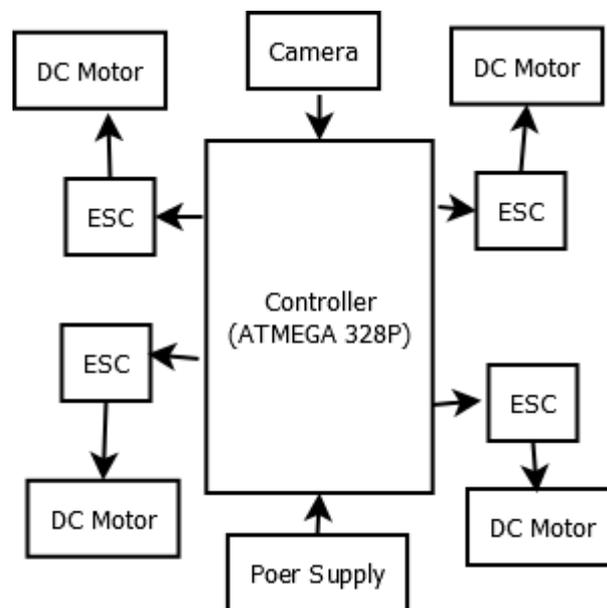
In recent times Quad copters are essential and extensively utilized in unique scientific research for unfocused information series and remote sensing. An E-nose device equipped with an embedded mechanism can accumulate the gas samples through a sensor with a miles solution and follows with more secure working situations [4].

Increasing the chemical gasoline to be hit via the quad copter E-nose machine and also locating the hard region through the camera and discovering the area that is additionally controlled by the E-nose gadget digi-com and SD card that is built-in with the device [5]. A controller with the technological battery used to avoid the leakage of chemical substances fuel within the environment also keeps away from the hazard to make sure safety for commercial and public settings.

In this paper, individually present an E-nose device display place and capacity of device quad copter with chemical sensing implementation and digital camera and SD card. The application for surroundings tracks system [6], chemical gas leakage detection, and different mapping packages. Without help amplify and easygoing weight (300g) quad copter E-nose machine based on a 32-bit controller unit is managed and communicating modem also digitally managed the analog interface. Explosive gas sensor and wireless communication range are up to 2.4 GHz to manage the application for Lion battery, the maximum fundamental layout parameter, and the surroundings parameter analysis device.

UAVs or quad captor are nowadays incredibly accepted and commonly used in technical do research for circulated data gathering and isolated sense. A cell phone android prepared with implanted systems can gather soil samples with a greatly denser spatiotemporal motion than a being operative as well resultant in a safer operational situation. Contaminations are the essential soil sample's risk to society. Gas emission is dependable for a selection of agricultural problems, such as acid depletion of the ozone level exhales. They are too heavy to float in the air and hence immediately fall on the surface of floors. Therefore cleaning such cover is a challenging task for the smart robot.

## II. BLOCK DIAGRAM



**Fig.1. Block diagram**

**A. Battery:** Lithium Polymer (Li-Po) cells are the prominent strength majority provide for scheming (or 'drones') nowadays. Exclusive of going loads into detail, the principle rationalization in the back of that is since they are rechargeable and usually have expansive limits fig. 2.



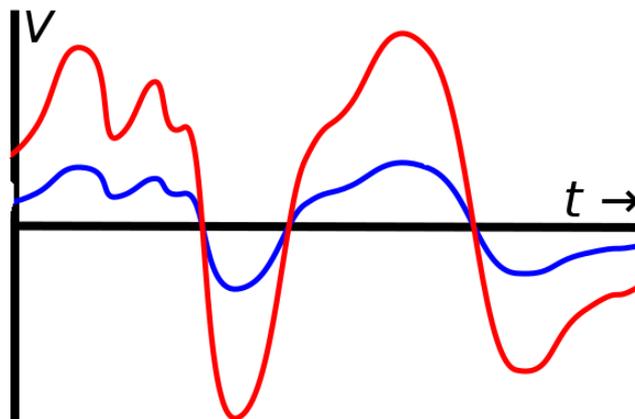
**Fig. 2 Lithium battery**

**B. Chemical sensor:** fig. 3, which makes use of the experience and surroundings evaluation? The chemical sensor delivers current between 100 micro Amps to 50 milli Amps.



**Fig. 3 Chemical sensor**

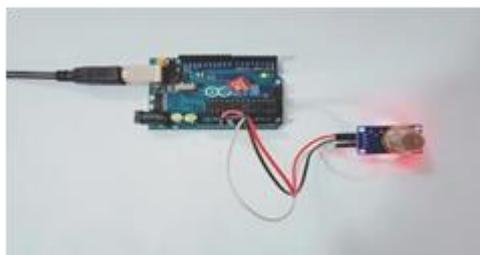
**C. Amplifier:** this could make more prominent the input sign and ship it to the chemical gasoline sensor. If the chemical gas is going back at a specific degree of less than zero.5 ranges the lead will glow robotically; in any other case, the chemical fuel will decrease in fig 4.



**Fig.4. Amplifier**

**D. Zigbee:** This communication is constructed explicitly for manage and sensor 802.15. Four accessible for wireless, private region networks, and it operates at the two.4GHZ frequency is also low value, and clean get right of entry also takes much less strength broadly deployed for controlling and tracking software at the same time as it covers 10-100meters within the range. It helps one-of-a-kind community configurations for the master to master and grasp to slave communications and, additionally strength fed.

**E. Controller:** this is the maximum essential. It will control all peripheral. It presents the communication at the LCD base at the warmth and moisture sensors fig 5. It is far reduced instruction set computing arrangement and as well 1024B 24KB SRAM, EE-PROM, 23 ideal cause input-output lines.



**Fig. 5 Controller by sensor**

**F. Quad copter:** it is a 300mm quad frame constructed from excellent substances. The mainframe is glass fiber, even as the palms from ultra-sturdy polyamide nylon. This edition of the gas look covered PCB associations supposed for the shortest soldering of your ESCs. All removes the want for an energy distribution board or messy multi-connectors retaining your electronics layout very tidy. With a more muscular mold arm, no more arm fracture at the growth rate on an unbreakable land fig. 6.

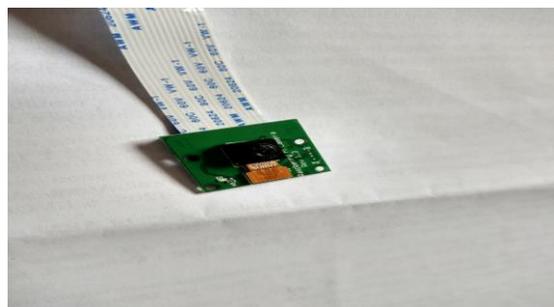


**Fig. 6. Quadcopter**

**G. ESCs:** motors spin, however, with a purpose to completely understand how quad copters paintings, need to recognize how the motor with managed. The electronic fee regulator or (ESC) is come again? Inform the velocity of how to rotate. It is reliable for calculating the velocity at which the rate its miles related to spin. Because the vehicles are made-up to rotate at variable speed, depending on power enter, ESCs are vital. Each motor could have a linked ESC attached to it.

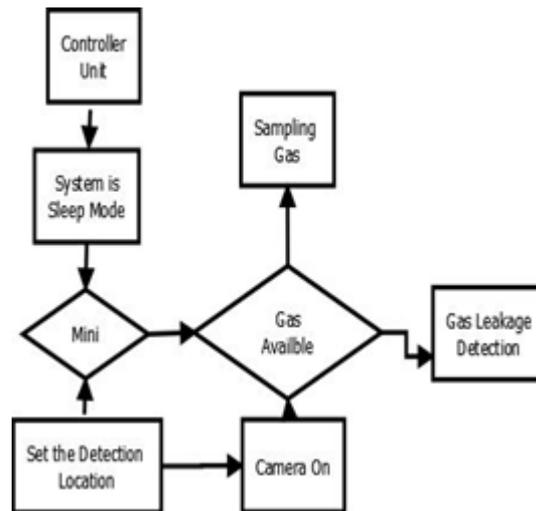
**H. Motor:** The impulse following with cars is to rotate the propellers that are reliable as long as pressure for counter magnitude and draw. Every rotor should be constrained for my part by a rapidity checker. Vehicles are the most critical energy following how quad copters take off. They are genuinely like ordinary DC motors within the experience that coils and magnets are applied to power the shaft. The brushless motors do not have a broom on the cylinder that offers with iterating the energy within the loops, for this reason, the 'brushless' reference.

**I. camera:** in all likelihood, the most crucial attribute is digital camera needs to have a report as an analog indication that can receive signal. Various capable cameras can do the similar, but no longer particularly well – needs the video signal to knowledge encoders and decoders and DACs to construct it add the considerable latency fig subsequently. 7. A digital, however, is reason built for analog.



**Fig. 7 Camera**

#### **Flow Chart:**



### ALGORITHM

Right here gives the message that it provides the gas support role, and quickness of the quad copter reduce machines. Everybody can employ the detection and type of E-nose system with MAT Lab. The basis of the algorithm operates through the activity of the colorless and follows the gas sensor description where it discovers every location up to date at the same time as the gas exploring is similarly up to date keep on detecting the gas here and above explosive gas leakage detection table 1, 2.

### III. IMPLEMENTATION

#### A. The Chemical gas Sensor algorithm



- Step 1 Assign analog pin A0 to MQ GAS Sensor
- Step 2 Define and initialize Setup Function for GAS sensor
- Step 3 Read GAS Sensor Value
- Step 4 If GAS sensor data is better than entrance data than Print High
- Step 5 If GAS sensor data is less than entrance data than Print Low

#### B. Hardware

1. Connect GND pin of the Gas sensor to GND on the board
2. Connect Out pin of Gas Moisture sensor to A0 on the board
3. Connect VCC pin of Gas Moisture sensor to 5V on the board
4. Connect the power supply to the board and USB to USB Client Port
5. Open Arduino IDE under Tools → Board select
6. Under Tools → Serial Port select the Com # where the connection to
7. Write the above code on Arduino IDE
8. Upload to the by clicking the upload button
9. Monitor the value of the gas sensor in the Serial Monitor

The selection of this effect is the detection of chemicals, to detect and optimize typically a smaller amount much less electrical energy for the sensing the chemical gas used for E-nose the optimum depends on the

distance. The difference between low, mid, and high speed, which varies, tracking E-nose implement its beneficial and also modern-day consumer resources and area by way of using the E-nose system.

#### IV. HARDWARE DESIGN

##### A. Brushless DC Motor

A brushless DC motor, corresponding DC motor, is immediate motor fueled by straight current control through an exchange power gracefully, which produces power through substitute current to force every phase of the motor employing of a controller. The regulator gives the beat of flow to the motor windings that control the speed and torque of the motor fig. 8.



Fig.8. Brushless Motor

Table- I: Brushless Motor specifications

|                     |                                |
|---------------------|--------------------------------|
| Operating Voltage   | 3.2V.                          |
| Dimension:          | 8mm (Diameter) x 23mm (Length) |
| Resistance          | 0.63ohm                        |
| No weight RPM       | 37850                          |
| No weight Current   | 130mA                          |
| R<br>Regular Torque | 0.79mNm/A                      |
| Load of motor       | 6.2g                           |

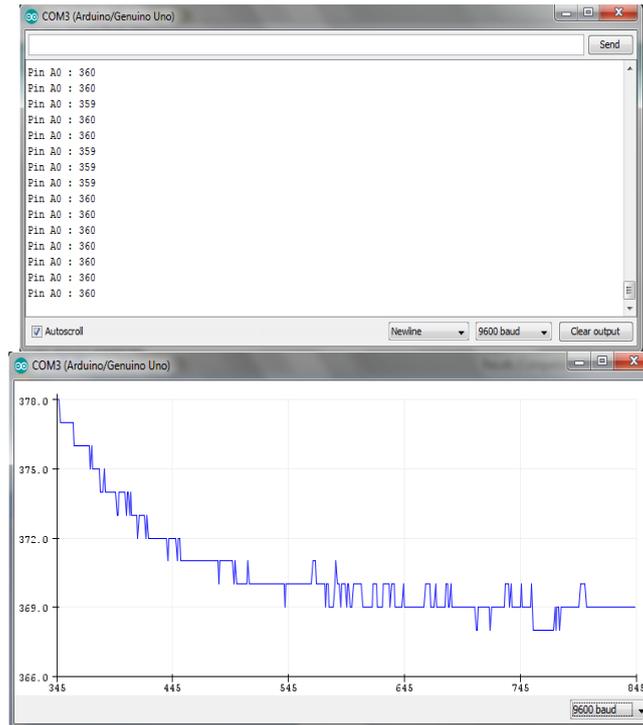
##### B. Camera Specification

A digital camera is a capture area in digital memory. Digital cameras, many more cameras are now included in the mobile procedure, which can, among lots of other purposes, use their cameras to initiate live video-telephony and directly edit and upload imagery to others.

|                  |                |
|------------------|----------------|
| PS               | 23.6 x 15.6 mm |
| WP               | 16.9 million   |
| RS               | Image sensor   |
| Efficient pixels | 16.2 million   |

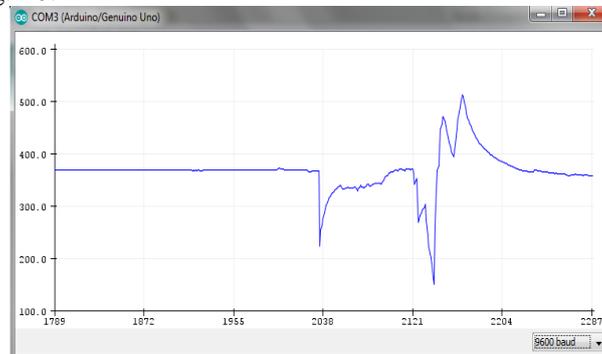
#### V. RESULTS AND DISCUSSION

The quad copter has an extensive collection of relevance used for information compilation and sensing. The quad copter is typically to collect data in numerous forms. The present is a drawback with the employ of the quad captor used for gas sense fig. 9 due to higher energy and the four wings of the drone, difficult to control the chemical substances.



**Fig.9 Explosive Gas Sensor Analysis**

They have utilized in drone technology and gathered the information specific with explosive gas sensing; moreover, it will provide the excellent [7] the different E-nose device information, the environmental problems are critical [8] as well as separate area and processing. They implemented furthermore, and tested, [9] it includes the extraordinary application of explosive gas detection and monitoring gas emissions through a UAVs [10] they also get and evaluate the emergency manager within indoor/outdoor environment problems fig. 10.



**Fig. 10 Characteristic Response of Powered CNQ4 Gas Sensor**

nowadays a few kinds of research are confirmed and extensive locality monitoring device to resolve the trouble of the confined electrical energy for chemical sensing E-nose device [11, 12] suitable for allotted tracking system the usage of one of a kind additives low energy and low weight [13, 14].



**Fig.11. Quadcopter system**

**Table- II: Specifications of wiping system**

| DJI |            |
|-----|------------|
| BS  | 4 * HP     |
| S   | 30amps     |
| VC  | 1 * APM2   |
| FC  | 1 * NEO-7M |

**Table III: Performance Comparison**

| Existing system                                      | Platform / Technology                | Methodology                                  | Comment                        |
|--|--------------------------------------|--|--------------------------------|
| GPS/GSM E-nose system                                | Drone                                | Easy to find leakage gas                     | Easy to design                 |
| The embedded gas sensing system                      | GSM/GPS Based system                 | Easy to find gas leakage detection           | Easy to design                 |
| E-nose for detection of Bacteria                     | PC based system                      | Infection monitoring system                  | A little bit complex to design |
| E-nose for detection Liquor Flavors                  | QCM based system                     | Easy to the identification of Liquor Flavors | Little Bit Complex to design   |
| Wireless Sensing addressing power consumption Limits | Wireless Sensor Network based system | Easy to identify the chemicals               | User-friendly                  |

**Table IV: Comparison of quad copter**

| Name | Weight (g) | Max. Payload | Volt age | Capacity (mAh) |
|------|------------|--------------|----------|----------------|
|      |            |              |          |                |

|                   |        |       |     |       |
|-------------------|--------|-------|-----|-------|
| Motor X4          | 4-6    | 200   | 3.3 | 1000  |
| ESCX4             | 8      | 300   | 3.7 | 1200  |
| Flight Controller | 15     | 200   | 3.4 | 1300  |
| Propeller         | 13.6Kg | 20lbs | 14  | 10000 |

## VI. CONCLUSION

In this research present, the design and develop of quad copter of an embedded platform meant for chemical sensors can recognize the leak of gas. The mean features of the measurement device are low power consumption and cost. They are achieving long autonomy on its rechargeable battery. This system will continuously observe the volcanic gas region—the absorption of gas concentration 360 exceeding the entrance stage determination measured as exhaust. The appearance haze is a severe subject to our surroundings, so this system helps to recognize the explosive gas in the air. The quad copter cannot complete the path it remotely in a predefined way of the projected method. Thus a means to overcome this under consideration gas measurement unit and evaluated the performance that can be achieved 85% by introducing quad captor.

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