Hybrid System for Measuring Indoor Oxygen Content Using Arduino

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Abstract – IOT(Internet of Things) is the popular technology which consists of embedded system with sensors, actuators and network connectivity. IOT is helpful in sensing and controlling the existing infrastructure, creating opportunities for enhancement of upgrading future. With the help of sensors and actuators, the IoT plays an important role in various fields like education, medical, agriculture, military, etc. It can easily integrated into systems developed to facilitate everyday life. In this study; the system is developed to calculate indoor oxygen content. With the help of these measures of oxygen the system is able to rescue the person who trapped in closed area. Moreover, this system reads the amount of oxygen in surrounding environment with the help of sensors and able to calculate average life span of people until he/she gets free, as well as system can check the threshold values of levels of oxygen to predict the life span of the people. To implement this, system uses various sensors such as humidity, temperature and oxygen sensors to measures the corresponding values with respect to surrounding environment.

***Key Words*:** IoT, embedded system, sensors, temperature, agriculture, life span, humidity.

I. Introduction

IoT is a giant network which is connected devices. These devices gather and share about how they are used and the environment in which they are operated. It's all done using sensors. sensors are embedded in every physical device. It can be your mobile phone, electrical appliances, Pecos barcode sensors, traffic lights and almost everything that you come across in day to day life. These sensors continuously emit data about working state of the devices. Even though these hardware and software, which are often used to facilitate human life and to make the work done by human power machine, are systems that can stimulate and interfere with human life to save and to perceive possible harm . In this project, the remaining life expectancy of people who are left behind in an environment without oxygen entry can be calculated and informed to both the screen and outside accessible environments. A person who is left behind does not know the remaining life span and thinks that the air will be consumed immediately, especially for those who are claustrophobia, this effect is much more and affects the amount of oxygen in the environment negatively. As a result, people are affected psychologically or physically such as rapid breathing or self-harm by panic, and even those who can survive as a result of these effects die prematurely. With this improved system, it is ensured that the person staying indoors is able to see the time remaining momentarily, to live for the period of time under control, to avoid unnecessary panic awareness and to avoid movements that will adversely affect the amount of oxygen in the environment. At the same time, in sudden oxygen drops, both the person staying in the closed area and the user outside are warned; it is necessary to stay stable and thus the survival time can be extended.

A. *Problem Statement*

In India for past few days, there have been several accidents of children falling into abandoned borewells which is left uncovered and get trapped. There need to solve these types of issues with the help of IoT.

B. *Literature Survey*

The internet of Things (IoT) is a computing concept that describes the idea of everyday physical objects being connected to the internet and being able to identify themselves to other devices. The team is closely identified with RFID as the method of communication, although it also may include other sensor technologies, wireless technologies or QR codes. The IoT is significant because an object that can represent itself digitally becomes something greater than the object by itself. No longer does the object relate just to its user, but it is now connected to surrounding objects and database data. When many objects act in unison, they are known as having "ambient intelligence".

The definition of the internet og things has evolved due to the convergence of multiple technologies, real-time analysis, machine learning, commodity sensors and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems, automation(including home and building automation) and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras and other home appliances) that support one or more common ecosystems and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. There are number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security; and consequently industry and governmental moves to begin to address these.

There are various real time applications of IoT which is used in different fields such as education, industry, agriculture, military,ect. IoT can also use in smart home automation, vehicle detection which plays an important role in day to day life. ioT devices are a part of the larger concepts of home automation, which can include lighting, heating and air conditioning, media and security systems. Long-term benefits could include energy savings by automatically ensuring lights and electronics are turned off.

A smart home or automated home could be based on a platform or hubs that control smart devices and appliances. For instance, using Apple's HomeKit, manufactures can have their home products and accessories controlled by an application in iOS devices such as the iPhone and the Apple Watch. This could be a dedicated app or iOS native applications such as Siri. This can be demonstrated in the case of Lenovo's Smart Home Essentials, which is a line of smart home devices that are controlled through Apple's Home app or Siri without the need for a Wi-Fi bridge. There are also dedicated smart home hubs that are offered as standalone platforms to connect different smart home products and these include the Amazon Echo, Google Home, Apple's HomePod, and Samsung's SmartThings Hub. In addition to the commercial systems, there are many non-proprietary, open source ecosystems; including Home Asistant, OpenHAB and Domoticz.

There are numerous IoT applications in farming such as collecting data on temperature, rainfall, humidity, wind speed, pest infestation, and soil content. This data can be used to automate farming techniques, take informed decisions to improve quality and quantity, minimize risk and waste, and reduce effort required to manage crops. For example, farmers can now monitor soil temperature and moisture from afar and even apply IoT-aquired data to precision fertilization programs.

In August 2018, Toyota Tsusho began a partnership with Microsoft to create fish farming tools using the Microsoft Azure application suite for IoT technologies related to water management. Developed in part by researchers from Kindai University, the water pump mechanisms use artificial intelligence to count the number of fish on a conveyor belt, analyze the number of fish, and deduce the effectiveness of water flow from the data the fish provide. The specific computer programs used in the process fall under the Azure Machine Learning and the Azure IoT Hub platforms.

C. *Methodology*

Temperature and Humidy Sensor DH22: Humidity sensors detect the relative humidity of immediate environments in which they are placed. They measure both moisture and temperature in the air and express relative humidity as percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes the temperature. Most humidity sensors use capacitive measurements to determine the amount of moisture in the air this type of measurements relies on to electrical conductors with a non-conductive polymer film laying between them to create an electrical field between them.

Figure 1: DHT22

***Arduino Uno R3 microcontroller*:** The Arduino Uno is the most common version of Arduino family. The Arduino Uno is the microcontroller board based on the ATmega328. It has 14 digital inputs/outputs pins (of which 6 can be a PWM outputs) 6 analog inputs, 16 MHz ceramic resonator, a USB connection , a power jack, an ICSP header, and a reset button. The Arduino Uno is the great choice for the beginners. It contains everything needed to support the microcontroller-supply connect it to a computer with a USB cable or powering with a

AC-to-DC adapter or battery to get started. The Arduino is a good choice for beginners since it is easy to start with.

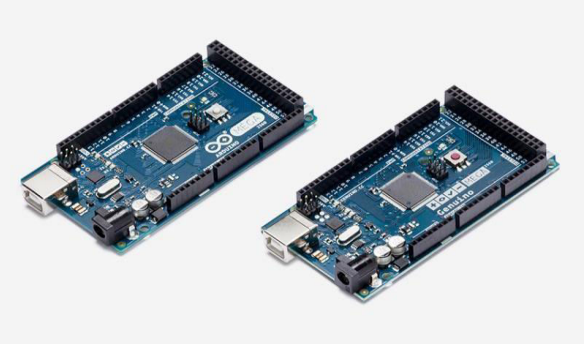

Figure 2. Arduino Microcontroller

***ESP8266 Wi-Fi Sensor*:** ESP8266 is a Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT embedded applications. It employees a 32 bit RISC CPU based on the Tensilica Xtensa L106 running at 18 MHz it has a 64KB boot ROM, 64 KB instruction RAM and 96 KB data RAM. External flash memory can be access through SPI. Esp8266 module microcontroller need to use set of AT commands.

Oxygen sensor: An oxygen sensor is one type of sensor and it is available in the exhaust system of an automobiles. The size and shape of this sensor look like a spark plug. Based on its arrangement in regard to the catalytic converter, this sensor can be arranged before (upstream) or (downstream) the converter. Most of the automobiles which are assigned after 1990 include upstream and downstream O2 sensors. The oxygen sensors used in automobiles are one sensor is arranged in front of the catalytic converter and one is arranged in every exhaust manifold of the automobile, but the maximum number of these sensor in a car mainly depends on the engine, model, year of manufacture.

II. PROPOSED SYSTEM

The system consists of three main parts:

a) A measuring unit to be placed in a closed area for oxygen, temperature, humidity and gas measurement.
b) The desktop and web tracking unit for which the measuring unit will transmit the measured values.
c) Mobile tracking unit with wireless communication capability with measuring unit.

Path followed by the system is as follows:

- Activate the sensor like oxygen sensor, temperature sensor to get data.
- Show the statistics using data getting from sensors.
- In case of boring, system will put the data to server.
- In case of forest, system will store same data to database.
- To get the output of each cases, perform operations using data mining and artificial intelligence.
- Show corresponding results on the screen.

III. CONCLUSION

This studied that the device which developed in this project will measure the amount of oxygen, temperature, humidity and gas in the environment to rescue the persons trapped in bore well as it is use in forest system for shifting the animals from danger zone to safe zone. These operations are read with the help of O2, DHT22 and MQ4 sensors connected to Arduino and transfer these readings to desktop and web applications via serial port and to mobile application via Wi-Fi module; and a device with an LCD screen on which users can instantly view the amount of oxygen and remaining life span in the environment.

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