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DESIGN OF A GAS SENSOR BASED ON THE CONCEPT OF DIGITAL INTERCONNECTION IOT FOR THE EMERGENCY BROADCAST SYSTEM

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ABSTRACT

It is important to highlight the use of the technologies and highlight the work of IoT, since it is not allowed to send the machine-to-machine. For communication in an emergency environment, IoT stands out for being considered as a strong technology. The emergency alert service offered by Terrestrial Digital Multimedia Broadcasting (TDMB) is known as the Alarm Service, but it is automatic emergency alert services (AEAS). This document a methane sensor circuit with Wi-Fi connection is designed with an ATMega microcontroller for the implementation of the IoT. It's intended to illustrate a consumer transceiver for IoT's long-range communications in emergency environments. In order to overcome the drawbacks of AEAS, the signaling method can be used for the system which is proposed an embodiment. This IEEE802.11ah Wi-Fi protocol works as a transceiver, and is under standardization at a very low cost and not only that, also with low power services.

Keywords: TDMB, AEAS, IEEE802.11ah, gas sensor, ATMega.

1. INTRODUCTION

In the last decade, various advances have been made in the area of control and industrial automation [1], [2], [3], which have allowed a significant improvement in processes and systems [4], [5], [6].From this emerges the Internet of Things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software and network connectivity that enable these objects to collect and exchange data [7], [8].

Several communication systems are used for fast, efficient and efficient delivery of alerts. Especially for delivering emergency alerts using the broadcasting system, as they are robust to the destruction of the network infrastructure. However, for the flexible broadcasting system, mobility has also been added to the digital broadcasting system. In the AEAS standard, this TDMB control channel is like an alert service channel. A TDMB control information limits the use of AEAS [9]. When the AEAS is used, while the TDMB channel is very busy with the other TDMB control data. If the receiver is deactivated in the mobile station (MS), the TDMB receiver does not have the functionality to receive the AEAS message [10]. In addition, an activation method for the TDMB receiver disabled in emergencies is required in each system, but in this system, AEAS messages are also delivered to all MS users.

The Emergency Signaling Warning System (ESWS), the conventional AEAS system, is described. Deficiencies are compensated [11]. Even if the conventional TDMB channel is very congested, the SEAS allow the effective and fast delivery of emergency alert messages. The performance of the receiver is improved because the periodic feature allows for a more sophisticated channel estimation method. However, to avoid the involvement of channel repeaters used in TDMB systems, SEAS is implemented in the repeater. Users of the repeater service area, such implementation, are inherently efficient LBS [11], [12]. This allowed the system to avoid consumption of LBS in the mobile system.

2. CONFIGURATION OF TDMB

Emergency broadcasting system

The TDMB EBS can transmit too many emergency alert contents to the environment without relying on any additional receiver operation [14]. The Emergency Broadcast System (EBS), sometimes called the Emergency Action Notification System (EANS), is a former emergency warning system used in the United States (See Figure-1).

In the general environment, the system can provide a system repeat service in which the TDMB for the system made in a part of the repeater channel and part of EBS. The radio frequency (RF) signal is converted to intermediate frequency (IF) signal after filtering and the low noise amplifier (LNA). This bandwidth is converted into an IF signal by an IF digital converter and an analog converter is implemented after cancellation and interference equalization.

A general repeated TDMB signal and an emergency broadcast signal and the selected signal signal executed by the "Switch" block operates. The switch selects the general IF TDMB sign and transmits the signal to the RF converter in a common environment [15].

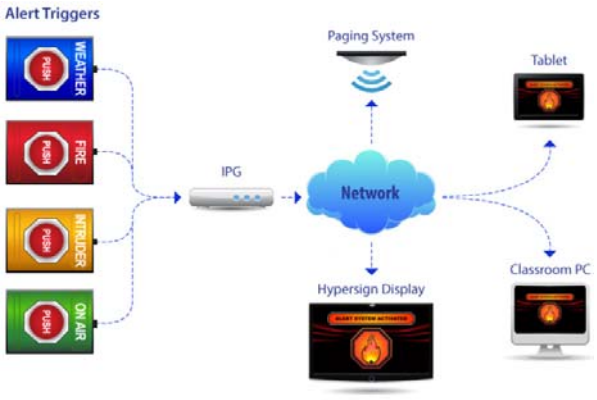

Figure-1. Diagram of the emergency broadcasting system.

3. IEEE802.11AH PROTOCOL

The service related to IoT has an intelligent network scenario based on IEEE802.11AH and backhaul network. The device serves to improve the efficiency, reliability and sustainability of the Smart grid system services. The wireless smart metering service network (Wi-SUN) belongs to the WPAN system. To manage and control the boot data, the Wi-SUN home is attached via the IEEE802.15.4g protocol [16]. To support short-range communication, the IEEE802.15.4g is a class of WPAN is used. The difference between the smart meter and WPAN is 15.4g / 11ah GW is relatively short. The IEEE802.11ah AP is data converted by GW retransmissions over the Wi-Fi protocol IEEE802.11ah [17]. The distance between the GW household smart meters is comparatively shorter than the distance between AP and GW.

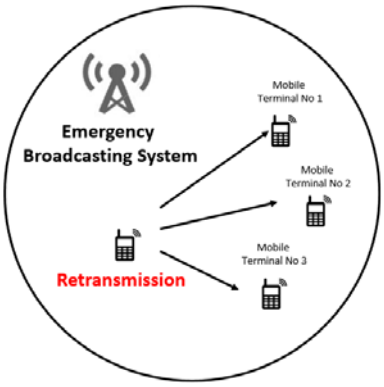

Figure-2. Retransmission of the emergency broadcasting system.

According to the utility database, a decision for the optimal use of utility data is determined by the control and the database, and transmits the domestic intelligent decision command meter through the network of Backhaul and the IEEE802.11a protocol. The conventional transceiver architecture for IEEE802.1ah under modulation and coding scheme1, BCC and 2 MHz of bandwidth. The transmitter of the BCC Interleave coding system between RF.

This data format in the OFDM file for the Wi-Fi protocol at 2 MHz bandwidth. Null data exist in the remaining 12 subcarriers; Only 52 subcarriers are used for data transmission in an OFDM file. IoT service coverage must be equivalent to that of repeater. With the aim of fully supporting the mobile terminals with the range of repeater service. Wi-Fi is a trademark of the Wi-Fi Alliance, the commercial organization that adopts, tests, and certifies that the devices meet 802.11 standards related to wireless local area networks.

The IEEE 802.11b, IEEE 802.11g and IEEE 802.11n standards enjoy international acceptance because the 2.4 GHz band is almost universally available, with a speed of up to 11 Mbit / s, 54 Mbit / s and 300 Mbit /s, respectively.

The IEEE 802.11ac standard known as WIFI 5, which operates in the 5 GHz band, is now also being handled and operates with relatively clean channels. The 5GHz band has recently been enabled and there are no other technologies (Bluetooth, microwave, ZigBee) that are using it, so there is very little interference. Its range is somewhat lower than that of standards working at 2.4 GHz (approximately 10%), because the frequency is higher (the higher the frequency, the lower the range).

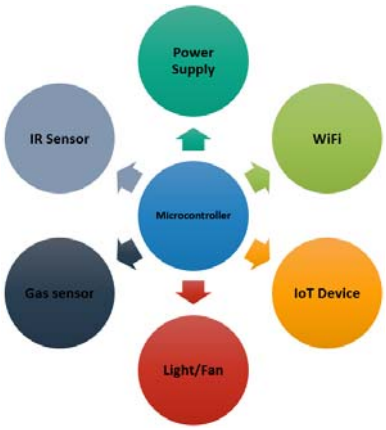

Figure-3. Diagram of the gas sensor to be implemented with IoT.

SENSOR MQ4

This is a sensor to detect methane gas (gas) in the air; the MQ-4 can detect concentrations of 300 to 10000 ppm. This transducer contains high sensitivity and fast response time [18]. The output has an analogy resistance, it is the sign that allows us to analyse the behaviour. The sensor output is an analogy resistor. The interface circuit is very simple, everything to do with 5V power supply, add a load resistor and connect the output to the analog - digital converter.

ADJUSTMENT OF SENSITIVITY

The resistance value of MQ-4 is different from several gas concentrations (See Figure-4). Therefore, sensitivity adjustment is very necessary. We recommend calibrating the detector for 5000ppm of CH_4 concentration

in air and using the load resistance (RL) value of approximately 20KΩ (10KΩ to 47KΩ). When measured with accuracy, the convenient alarm point for the gas detector must be determined after consideration of temperature and humidity (See Figure-5).

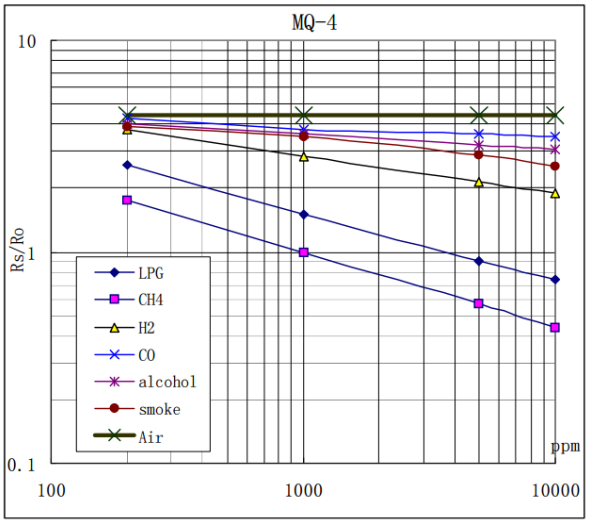

Figure-4. Shows the typical sensitivity characteristics of the MQ-4 for several gases.

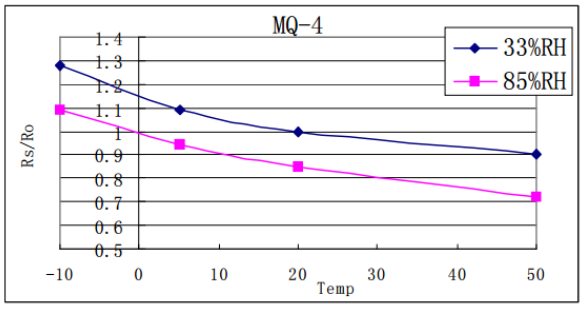

Figure-5. Is shows the typical dependence of the MQ-4 on temperature and humidity.

4. PROPOSED SYSTEM

In order to overcome the disadvantage of the existing system, sensors are used in this system. For this system, there are three modules; The first module is the design of a web page using the software Dream Viewer and Xampp. Developer to create a web server for testing purposes is a simple and light distribution of Apache (A), My SQL (M), Php (P) and PERL. The microprocessor ATMega328p, together with the ESP8266 wifi model and the MQ4 sensor were used to implement the gas sensor (see Figure-6). We can observe the programming developed to be able to carry out the acquisition of the data through the sensor using the proposed microcontroller (see figure 7).A program was developed in Labview to observe the measurements made by the MQ-4 sensor (see figure 8 and 9).

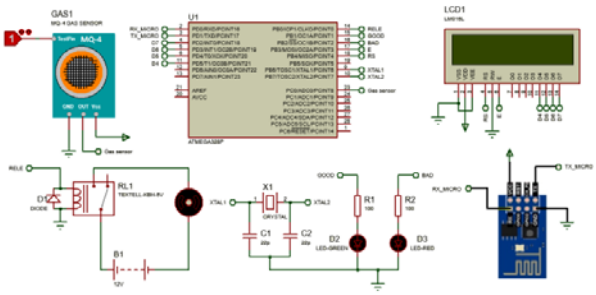

Figure-6. Circuit implemented for the MQ-4 gas sensor of the proposed system.

Free and open source it consists of Apache Http and severe interpreters for scripts written in PHP and PERL Web programming languages and applications using the web page only the user can access the system, to turn on/off the light, the fan and the Gas leak the second module will be the piece of hardware, sensors such as MQ4 gas sensor, IR sensor and MP Proteus software lab to install the third module will be the combination of hardware and software using built-in PHP and C. The Wi-Fi protocolIEEE802.11ah, for long range communication.

Sensor_MQ-4 §

```
void loop() {
  // put your main code here, to run repeatedly:

void setup() {
  Serial.begin(9600);
}

void loop() {

  int adc_MQ4 = analogRead(A0); //We read the analogue output of the MQ-4
  float voltage = adc_MQ4 * (5.0 / 1023.0); //We convert the reading to a
  float Rs=1000*((5-voltage)/voltage);  //We calculate Rs with a RL of 1k
  double Gas=0.4091*pow(Rs/5463, -1.497); // We calculate the concentratio
  //-------We send the values for the WiFi of the device------------
  Serial.print("adc:");
  Serial.print(adc_MQ4);
  Serial.print("    voltage:");
  Serial.print(voltaje);
  Serial.print("    Rs:");
  Serial.print(Rs);
  Serial.print("    Gas:");
  Serial.print(Gas);
  Serial.println("mg/L");
  delay(100);
}
```

Figure-7. Arduino programming for the implementation of the MQ-4 system sensor.

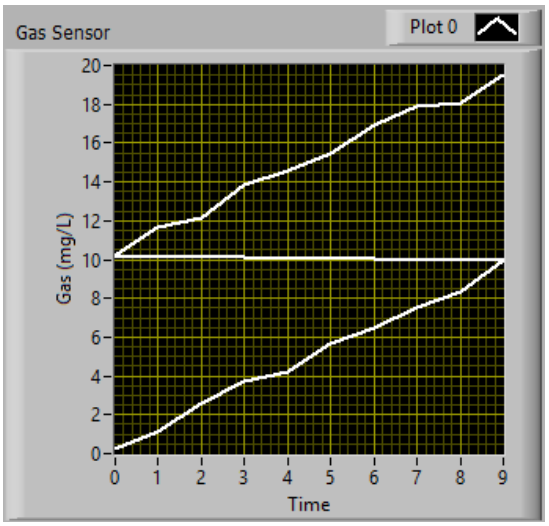

Figure-8. Front panel developed in Labview for gas sensor.

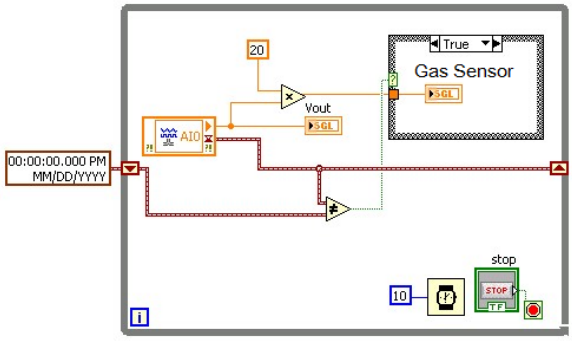

Figure-9. Code block diagram developed in Labview for the gas sensor.

5. CONCLUSIONS

This document includes security sensor and infrared, Wi-Fi module, gas sensor for the emergency environment. This document describes the long-range IoT communications based on the IEEE802.11ah Wi-Fi protocol. In which it uses Wi-Fi to send data over the Internet. In the IoT device all the data has been stored and the monitoring has been done through the server. When the device is turned on, the Wi-Fi is automatically connected through the Internet and the data has been shared. This project is designed with the hope that the sea is very economical and useful for the purpose of safety and offering flexibility in operation.

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