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Fog Density Detection Based Automotive Vehicle

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Abstract:

Accident count is increasing day by day. Fog is one of the main causes of accidents, especially in hilly regions. As fog density increases, visibility of the road gets decreased. The drivers will not be able to see the road or any obstacle that is present. Unfortunately, few people do not slow down their vehicle even in the worst fog environment. So we are proposing a system that detects a foggy environment and reduces the acceleration of the vehicle, to avoid accidents. In the proposed system, a sensor that is directly connected to Arduino Uno is used to automatically calculate the values of temperature and relative humidity from the atmosphere. Based upon the values of dew point, the speed of the vehicle is controlled. If the Dew value is less than 2.5°C it indicates the presence of fog. Depending upon the Dew Value the complete control takes place. Also, from Arduino the data is sent to cloud through IOT module and from there we can access in App.

Keywords : DHT22 sensor , IOT, Arduino UNO

1. INTRODUCTION

With the increasing count of accidents day by day, the fog is one the reason in hilly regions. We are already aware that traffic police suggest just to go slow and do not accelerate. Even though people do not take it serious. To avoid this, we are implementing such system which Controls the acceleration speed of the vehicles. We have used a DHT22 sensor which will collect information regarding temperature(C), and Relative Humidity(RH) and give it to the Arduino Uno. According to the formula given in the Arduino it calculates a Dew point Value. If the value is 2.5C it indicates presence of fog. Based upon it motor shield controls the acceleration of the wheels of the vehicle. An App is also created it gives the values noted. IOT is used to send the reading to cloud and it sends to App. According to the values updated in the Arduino the acceleration of the Vehicle is based.

I. RELATED WORKS

Several conditions during real world driving exist that can reduce visibility of the driving scene. For example, nighttime or fog conditions can cause reduced visibility. In the present study, one particular condition is examined—the presence of fog. The presence of fog in a driving scene results in a reduction of contrast that varies exponentially as a function of distance. Consequently, reduced contrast due to fog can decrease distance information, such as the visible horizon (1) or texture gradients (e.g., roadway texture) in the scene (2). Several studies have found evidence suggesting that the presence of fog can have an impact on driver performance. Some studies have found decreased headway during car following under simulated fog conditions (3–5). Other studies have found that fog can reduce the perceived speed of the driver's vehicle (6). Finally, Yonas and Zimmerman found a reduced ability of subjects to detect an approaching or

receding object under reduced contrast conditions (7).

However, there are several limitations to previously published research concerning fog and driving performance. For example, the Broughton et al. study examined the effects of fog and the change in distance headway (relative to a LV) following a right-hand turn (3). A limitation of that research is that it does not assess continuous car following performance. In addition, drivers adopted different driving strategies under simulated fog conditions. Indeed, under the highest fog conditions, some drivers adopted headway distances that were so great the LV was not visible, whereas other drivers adopted a driving distance that was well within the range of visibility. The Snowden et al. study examined the effects of reduced contrast of the driving scene (associated with increase fog) on speed perception (*6*). The visual displays, however, did not include variation in contrast as a function of distance that is present under real world fog conditions. Studies that examined speed perception and fog (*8*) and included the correct simulation of fog (i.e., where contrast varied as a function of distance) failed to replicate the results of Snowden and colleagues(*6*). Finally, the Yonas and Zimmerman study also failed to vary contrast as a function of distance when simulating fog (*7*).

2. PROPOSED MODEL

In this paper we are using Arduino Uno. Here, we are using DHT22 sensor by which we can easily get the data like temperature and relative humidity. This sensor is directly connected to the Arduino Uno and it calculates a Dew Point value based upon the give in built formula. This is connected to a motor Shield. Based upon the dew value the motor is controlled in decreasing the acceleration speed. And finally takes control regarding the wheels. Mainly, when the Dew value is 2.5 C it indicates presence of fog. It this value goes on decreasing it indicates more the fog density. Which gradually decreases the vision of the road. And through the help of the IOT we can send the data to cloud and also can be accessed through app. Through this method we can reduce accidents .An app is developed which gets its data from the cloud based upon the reading taken place. In this app it gives data like temperature, relative humidity, Dew value, moisture, and if needed any other specifications can also be added.

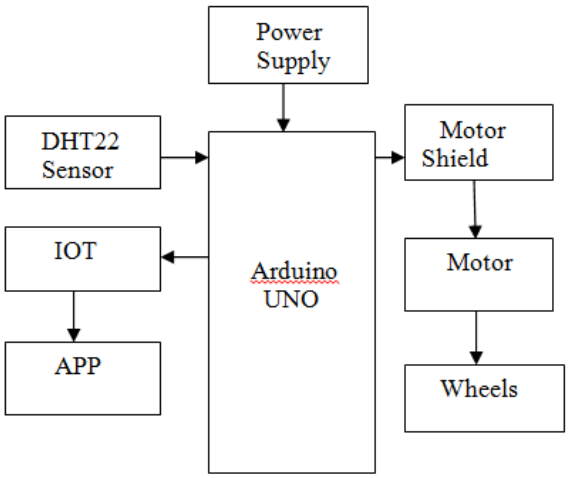


Fig 1: Block Diagram

The hardware components used in the system are as follows:

A. POWER SUPPLY

The potential transformer will step down the power supply voltage (0-203V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op-amp. The advantage of using precision rectifier is it will give peak voltage output as DC, rest of the circuits will give only RMS output.

B. ARDUINO MEGA

The Arduino Uno is a microcontroller board based on the ATmega328 . It has 14 digital input, output pins

(of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, reset button and ICSP header .it contains everything which are used to support microcontroller.It contains ATmega 328 datasheet. It is used to send the temperature ,humidity and dew temperature to motor driver. The adaptor can be connected by plugging a 2.1mm center positive plug into the board's power jack. The power supply of this board can be done with the help of an AC to DC adapter, a USB cable, otherwise a battery.

Fig 2: ARDUINO UNO

B.DHT22 SENSOR

It has high precision and low error with over 20 m measured distance. And is a very small sensor. From the this sensor, the value of temperature and Relative Humidity very taken. Which is imported to the Arduino and to calculate the Dew Point Value.

C. IOT MODULE

In internet of things objects are equipped with microcontroller/microprocessor and sensor devices and various software applications. Basically, a little network computer is attached to a thing, allowing information exchange to and from that thing. In this we have used an Mode Mcu.

D. MOTOR SHIELD L293D

It is a driver board based on L293 IC, which can drive 4 DC motors and 2 stepper and Servo motors at the same time. It gets the data from Arduino and controls the the wheels.

F.DC MOTOR

It uses flatness control principle. The output device which is varied by switches which is used to control the vehicle speed by controlling the accelerator.

G.WHEELS

The wheels plays the important role in this project. These, are controlled by the DC Motor and in turn it controls the vehicle speed and helps to reduce the acceleration speed.

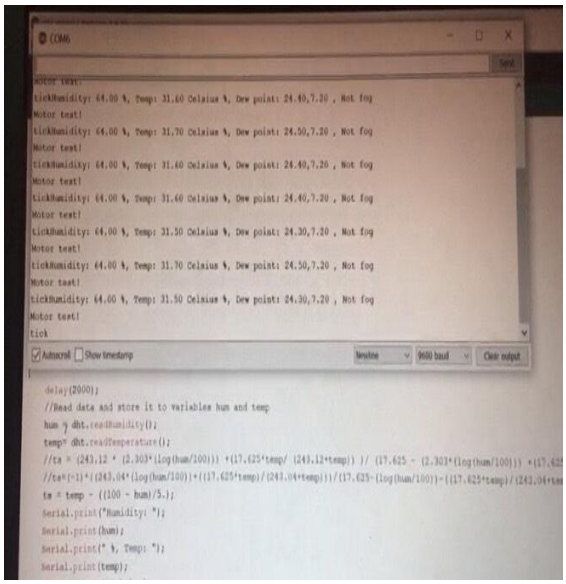
The software parts used in the systems are:

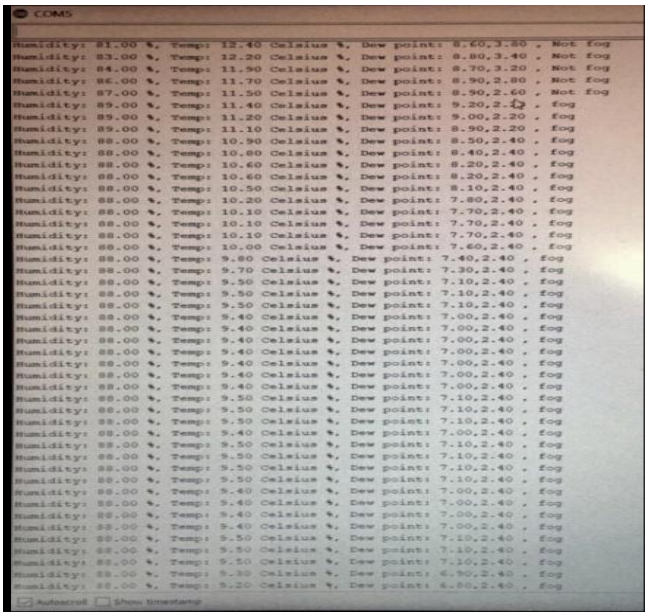
A. EMBEDDED C

Embedded C Programming Language, which is widely used in the development of Embedded Systems, is an extension of C Program Language. The Embedded C Programming Language uses the same syntax and semantics of the C Programming Language like main function, declaration of data types, defining variables, loops, functions, statements, etc. Embedded C based on DSP-C allows the design of fixed point data types and named address spaces.

B. ARDUINO MEGA SOFTWARE

Extract the necessary files to program Arduino IDE Software. To program Arduino we need to download the Arduino software in the system (PC), and the programming language used is the Embedded C





3. RESULTS

When the arduino detects foggy it automatically slows down the vehicle acceleration speed. And its data can also be checked using the app. In which it gives details including humidity, temperature, and moisture. And in case other details can also be added if needed.

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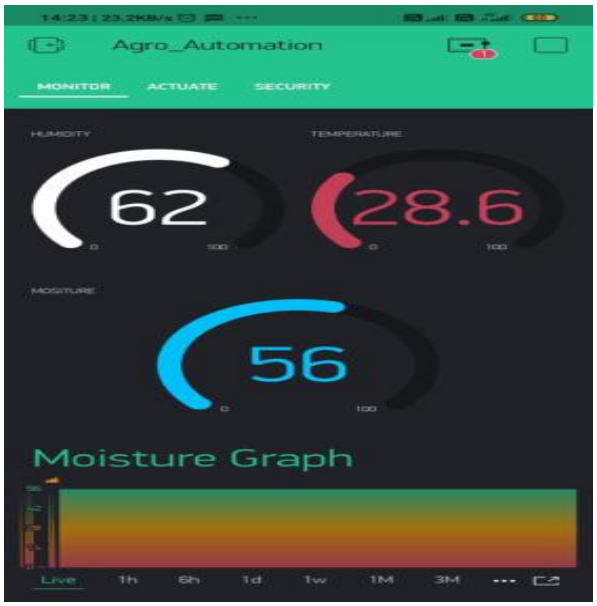
Fig 4: APP Display



4. CONCLUSION

The final result of the paper is to reduce the acceleration of the vehicle when it detects fog. In this way accidents can be reduced to an extent. The best advantage of this paper is it automatically decreases speed and controls the vehicle. And the data can also be used further.

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