

Arduino Sensor based on Traffic Safety System using Intelligence

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Abstract

In 2015, 100-car pileup was happened because the safe distance from the car in front did not be kept due to much fog at YoungJong Bridge in South Korea. This is why the road would be benumbed with cold weather in winter. For this weather condition, if the driver of the car in front changed the lane suddenly or suddenly slammed on the brake in fog or freezing area, the braking distance of the real car has to be 2 or 3 times longer than usual. In this paper, we have simulated the function that warns and notice about the fog area or the freezing one in the road using Arduino sensors and Beacon. Also we propose the intelligent traffic system to protect the accidents in winter.

.Keywords: Fuzzy rules, Arduino sensor, Traffic safety system

1. Introduction

100-car pileup was happened because of fog in Youngjing bridge. these days the researches to protect the large scale traffic accidents in winter which fog and freezing area like this were often formed, have been performed. in this paper, we have done the simulation for the traffic safety system based on Arduino sensors of temperature and humidity.

Also the project which makes the road traffic system suitable for protecting the traffic accident more intelligent, was started in early 1990s. Now it is in on-site test, trial operation, and service providing step after planning step. But now for our country, the weather forecast of road is dependent on just the wide area forecast that Meterological administration announces. And there are not enough the real-time road observation information and the forecast information for main areas. So the researches based on both IoT and Arduino sensors are needed to meet the social and economic requirement[1-5]. The existing expressway and road have the level that transfers the measured results to the main server through the sensors, and then the

user confirm it in person. This service is passive type that user connects the server in person and then gains information from it. Also it has the limitation in perceiving the data about the dramatic variable environment through a little sensor. The sequence rear-end collision accidents that happen frequently because of fog is the typical example. This environment has been developed to the pervasive computing one through the communication between user and server in Ubiquitous computing[6-7].

Because the existing system receives the fixed data, there are much data blank. So we want to install the system that users receive information from in real time and transfer the surrounding environment information through the use of IoT to solve the data blank. The real-time information exchange through IoT can gain the real-time variable exact information instead of information based on just the fixed sensor and CCTV. In this paper, we will research the technology that analyze the fog and freezing area in advance using IoT technology and smart sensors to protect the large-scale traffic accidents, such as the traffic accident in the freezing area of YoungDong expressway and 100-car pileup in the fog area of Youngjing bridge, and detect the location of traffic accident automatically using USN function, and then can transfer the data to Meterological administration and traffic control center.

2. Traffic Safety System

Our country has not enough both the integrated information service and the road traffic information service system using local fog and read line information. Also, the fog warning system in aviation and harbors is relatively good because of the installation through the satellite, but the service about the local fog and road line information is insufficient for the road traffic. From 2009, some local governments have introduced ITS(Intelligent Transportation System) actively, but the road face information comprehensive system about the road of high traffic accident rate is insufficient on a national scale. In the advanced countries, the system suitable for each area has been provided and then installed for the multiple local fog occurrence area through the connection to the road safety facilities. Specially, information and warning service for the multiple local fog occurrence area has been provided immediately to decrease the death rate of traffic accident. So the technologies to protect the traffic accident are being developed using Ubiquitous and smart sensor technologies. In this paper, we have simulated the traffic safety system using Arduino, temperature and humidity sensors. Arduino sensors is the open source microcontroller board. using AVR of Atmel company.

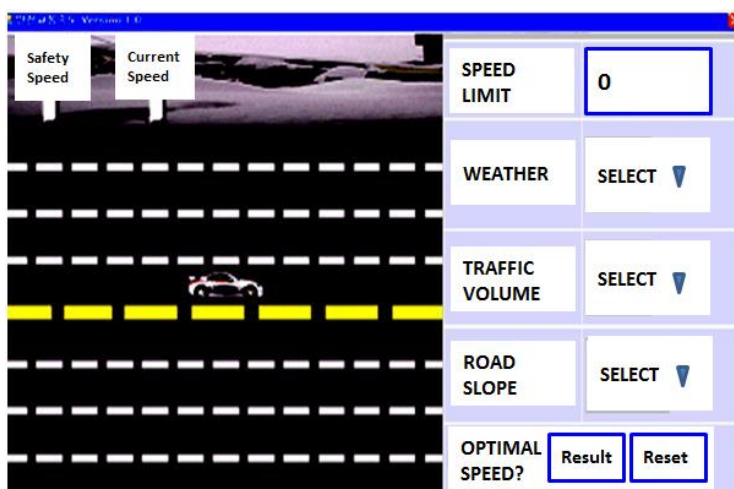


Figure 1. Smart traffic safety system

Figure 1 shows the weather information system using the IoT and smart sensors to protect the traffic accident caused by the sudden weather variation. In order to calculate optimal speed, it must consider whether condition, traffic volume and road slope in simulation of Smart traffic safety system in this paper.

3. Smart sensors

Smart sensor : Arduino is the microcontroller board based on the open source, the developing tools and environment. Arduino receives the values from multiple switches and sensors, and then can control various devices, such as ultrasonic sensor, temperature sensor, infrared ray sensor, illuminance sensor, DC motor, and remote camera.

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DHT11 Pin 1 (Vss) -> Arduino +5V
DHT11 Pin 2 (Signal) -> Arduino Pin 2
DHT11 Pin 2 (Signal) -> Arduino +5V via Resistor 4.7K
DHT11 Pin 3 -> N/C
DHT11 Pin 4 (GND) -> Arduino Ground
void setup()
Serial.begin(9600);
void loop()
int err;
float temp, humi;
if((err=dht11.read(humi, temp))==0)
Serial.print("temperature:");
Serial.print(" humidity:");

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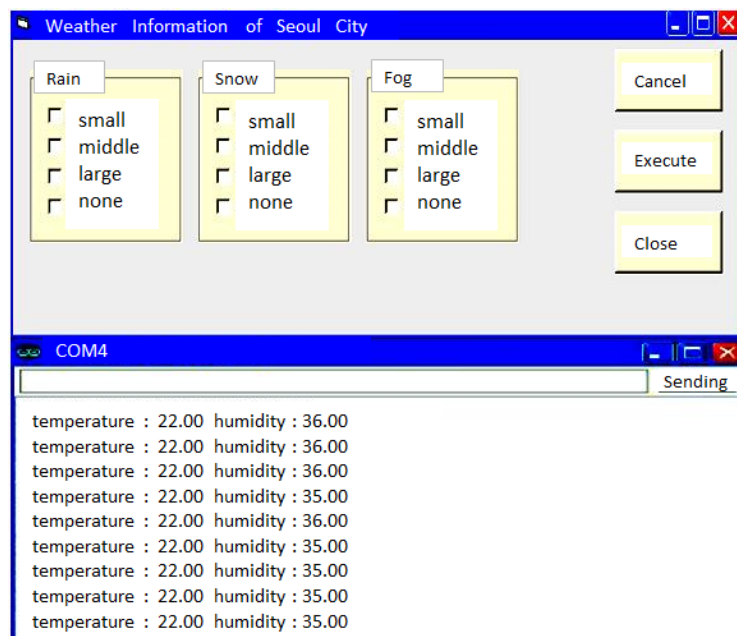


Figure 2. Simulation of traffic safety based on Arduino

Figure 2 shows the simulation results that indicate the fog and humidity area in real time using Arduino temperature and humidity sensor, and then inform the drivers of the fog area in advance to protect the traffic rear-end collision accidents.

4. Simulation

In this paper, we have simulated the traffic safety system using Arduino temperature and humidity sensor to analyze the fog and freezing area to protect the large-scale traffic accidents like 100-car pileup in the fog area of Youngjing bridge. Moreover, It suggested arguing sensor technology to be used, in order to calculate traffic safety speed, to establish a traffic network that predicts the optimal traffic speed for emergency traffic weather conditions.

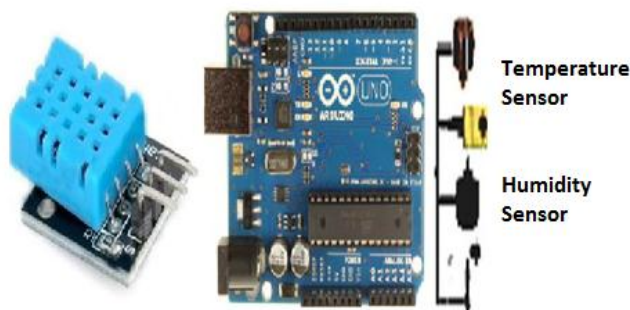


Figure 3. Simulation for optimal speed

Figure 3 shows the process where the optimal safety speed is computed, based on fuzzy theory, to be 27 Km when the humidity sensor indicates 75 %, the slope was turned out to be 25% and the distance from front car is 30 meters.

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Traffic accident information RFID TAG access CODE
//AVR in the receiving side is in normal "Start Bit" detection state. so it sends PreAmble.
for(i=0;i<NPREAMBLE;i++) // send Preamble for over 3ms
SendRF485(ch); // Average=0 (0x55)
SendRF485(~ch); // Average=0 (0xAA)
void SendRF485(BYTE ch)
while( !(inportb( LSR1DOS ) & TX_EMPTY) );
outportb( THR1DOS, ch );}
default:
buff[nRead] = 0; // terminate the string
CString szTemp(buff);
m_strRecv = szTemp;
DisplayReport(m_strRecv);
CSocket::OnReceive(nErrorCode);
void CSMSClient7296::OnClose(int nErrorCode)
DisplayReport((LPCTSTR)"Connection is finished.");
Rule : IF A is t1 THEN C is B2
    
```

(Fu)

fact : A is t1' (Fr)

conclusion : C is t2'

(FC)

A : Road condition

C : Reasoning result

Fu : fuzzy number for rule's uncertainty

Fr : fuzzy number for fact's uncertainty

FC : fuzzy number for conclusion's uncertainty

V1, V2, V1', V2' : value (values)

pos-tprocessing RULE (freezing condition+humidity and temperature safety decision)

IF SNOW = Med And Baram = High And Machal= High And N time = Med And

Then Strongwave = CNF 70

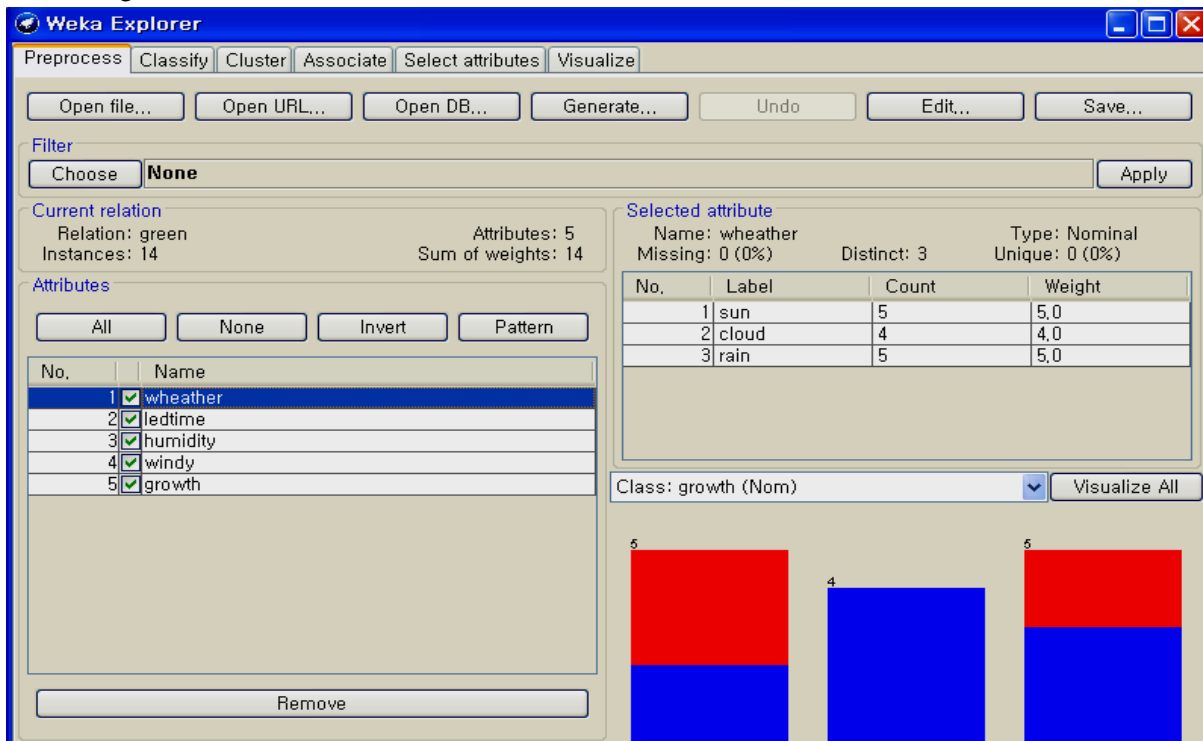


Figure 4. Simulation for traffic safety using Fuzzy rules

Figure 4 shows the process that calculates the traffic safety speed through Fuzzy rules to protect the traffic accident in real time. It shows the result of traffic accident data using WEKA analysis. This explains the process that analyzes the various factors, such as temperature, humidity, state of road face in the traffic accident area through the big data to protect the traffic accident in fog area.

5. Conclusion

In our country, there are many traffic accident victims in the fog and freezing area because of the sudden weather variation in winter. many researches have studied the system that decides various situations, such as the sudden curve area, the fog area, and the freezing area in advance, and then inform the drivers of these

situations through the protection disaster broadcasting to solve these problems. In this paper, we propose and simulate the technology that analyzes the fog and freezing area in advance using IoT technology and smart sensors, and then detect the location of traffic accident automatically using USN function, and then can transfer the data to Meteorological administration and traffic control center to protect the large-scale traffic accidents like 100-car pileup in the fog area of Youngjing bridge in 2015.

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