Pollution Based Traffic Control System using Internet of Things

N V V N J Sri Lakshmi, K Durga Bhavani, O Tejaswi, K Swapna Bhanu, N Aswini, K Mahima

Abstract: ***Traffic congestion is the extreme concerned problem in enormous cities around the world. As the traffic increases at the signal zone area, automatically the area is polluted with harmful gases. The architecture of our proposed design is implemented on the traffic signaling junction point. In the signaling area, the road junctions are fully cooperated with the gas sensor. This gas sensor is interfaced with the ESP8266 Micro controller, which observes the traffic density and increase the time delay by traffic congestion. The circulation method of signaling system is further implemented by the extension of adding the MQ series gas sensor. By using the Wi-Fi microcontroller, the pollution data from the gas sensor is uploaded in the cloud with the service 'ubidots' using Internet of Things (IoT) technology. The Application programming interface (API) in the cloud will store the values of the MQ sensor data. This data will be continuous visualized in the dashboard for the incoming status of the road junction pollution. By observing the pollution at the signal area, the time interval is increased to clear the traffic. Thus, heavy traffic movement thickness is reduced and allow the citizens to flow the traffic easily.***

Index Terms*: *MQ series-based gas sensor, Internet of Things, Traffic density, internet of Things

I. INTRODUCTION

Currently in the metropolitan and urban area, the city pollution is increased due to the number of vehicle transportations. Road traffic is mostly responsible for the hazardous gas emissions in the atmosphere. Loss in the quality of environment is the biggest threat for the human well-beings of the world. The natural calamities which are occurring and the environmental changes are the reason of global warming. Air pollution plays a vital role in the significance of global warming. The compositions of various resources added to the air leads to the hazardous pollution in the environment. Our main concern in the proposed design is to reduce to traffic on the bases of air pollution is shown in the Fig.1. In this proposed design, the Internet of Things technology is a paradigm that has a growth in the future. The objects are interconnected to each other with a network states IoT. According to the Gartner 50 billion of objects will be connected to each other by 2020. The daily objects will be connected with the help of microcontroller and the data communication protocols are used to communicate with the users. This technology is adopted in the different field areas such as home automation, industrial automation, medical health care applications, energy management applications etc. In the proposed system, the data of the sensors from the four junction fields are secured in the cloud area.

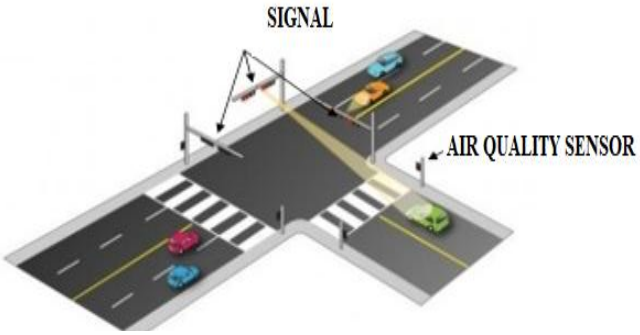

Fig.1. Overview of the model

II. LITERATURE SURVEY

The literature survey in the traffic signal is mentioned in below sections. The use of RFID and GSM had managed the traffic signal system dynamically to know the average speed of the automobile vehicles [1]. The density is observed from the image processing and the captured images are gather at the server to know the density [2]. For fixed signalling time interval is provided at the junction area is observed in the device [3]. This system will consume more fuel from the vehicles. In the application related to the RFID Technology, the maximum tree algorithm is used to know the exhausted pollution in the environment is observed [4][5].
From the literature survey based on the authors from [1], [2], [3], [4] the disadvantage of reducing the traffic congestion is taken as a main scope of the proposed design and the system is developed to store the data in the cloud and improved to reduce the traffic by interfacing the time intervals to the junction signalling point.

III. METHODOLOGY

The Proposed methodology regarding to the pollution-based traffic control system using IoT is shown in the Fig.2.

Revised Manuscript Received on May 08, 2019.
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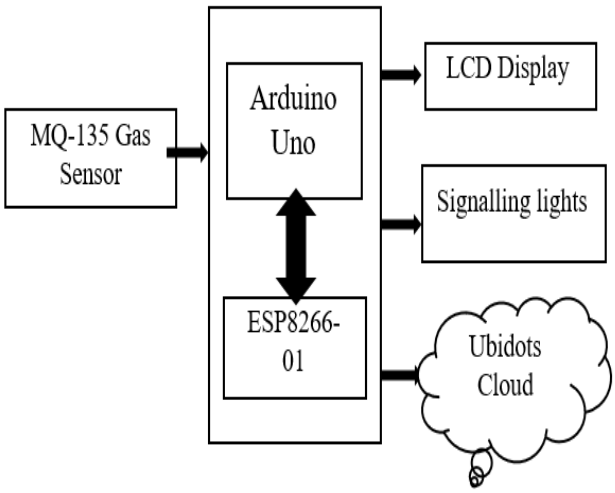

Fig.2. Methodology of proposed design

The flowchart based on the parameters of MQ135 is considered and implemented in the following is shown in the Fig.3.

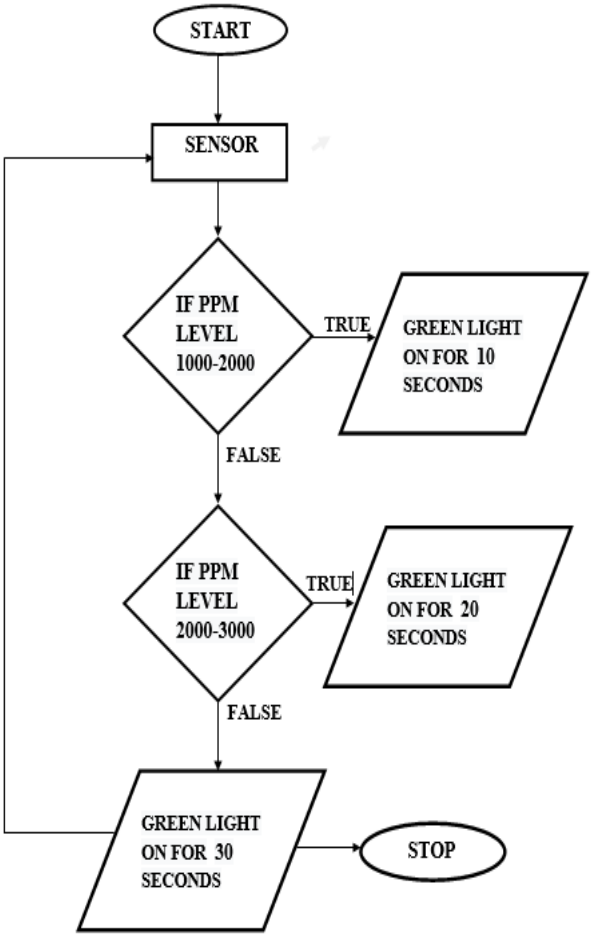

Fig.3. Flow chart of the procedure

V. PROPOSED DESIGN

The proposed design of the system, the MQ-135 sensor is taken at the four-signalling junction. Each sensor is placed at the junction point which are controlled by the microcontroller Arduino Uno and ESP8266-01. While following the signalling procedure, the gas sensor MQ-135 is used to observe the gases and calculate the traffic density in that signalling route. If the route had high congestion of traffic, the time interval is delayed to 10sec and allowed to clear the traffic. This process is followed by other three signalling routes. By this proposed design, the pollution and traffic can be reduced. The data of the gases released in the atmosphere is gathered in the ubidots cloud can be further analysed.

IV. HARDWARE & SOFTWARE CO-DESIGN

The hardware and software of the system is explained in the following sections a,b,c, d.

a) MQ-135 Gas sensor

The sensor is used to check the quality of the air which includes the NH3, NOx, alcohol, Benzene, CO2 and smoke. The sensor has the high sensitivity of the sulphite, Benze steam and Ammonia and also sensitive to smoke and other harmful gases. This sensor is used to observe the pollutant released at the junction and calculate the density is shown in the Fig.4.

Fig.4. MQ-135

b) Arduino Uno

Arduino Uno is developed by the Atmel company and is based on the ATmega 328 which has 6 analog input/output and 14 digital input/output is shown in the Fig.5. The microcontroller is used in the prototype building stage. It has the high flexibility to use and write the programming in the Arduino IDE customized for the microcontroller.

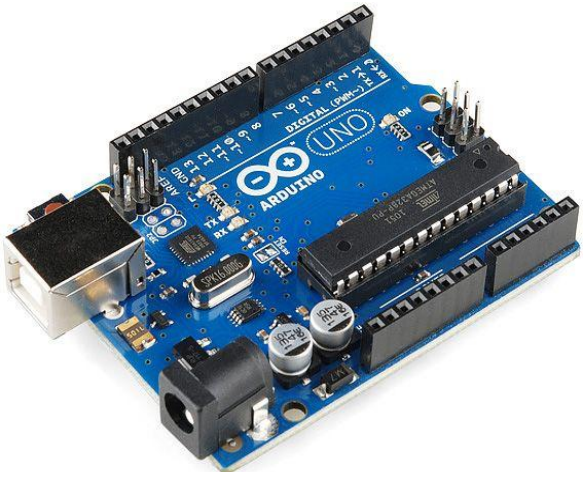

Fig.5. Arduino Uno

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c) ESP8266-01

The ESP01 is a microcontroller with the Wi-Fi trans receiver module integrated with the TCP/IP protocol stack. The Wi-Fi module uses the 802.11b/g/n protocol. This wi-fi module is used to sense the data from the gas sensor and send the data to the cloud.

Fig.6. ESP01

d) Additional features

The signaling lights and the LCD Display is used to display the time interval for the user to understand the signaling procedure at the junction.
The software requirements used in the proposed design is the Arduino Integrated development environment (IDE) where the source code is dumped into the Arduino using the software firmware of AT mega 16U2.
The ubidots cloud computing platform used to assemble the smart apps using the unique dashboard serves for the purpose of IoT.

VI. EXPERIMENTAL RESULTS

The experimental results are observed in the Fig.7.

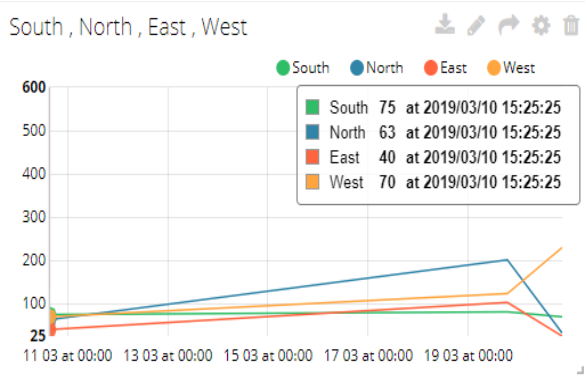

Fig.7. Experimental Results

Table.1. Pollution density

DATE & TIME	SOUTH	NORTH	EAST	WEST
March 10 2019 at 15:25:25	75	63	40	70
March 10 2019 at 15:25:05	75	73	39	74
March 10 2019 at 15:24:44	71	74	42	70
March 10 2019 at 15:24:27	70	73	43	76

Table 1 Depicts the pollution density levels in all the four directions.

VII. CONCLUSION & FUTURE SCOPE

With the use of the system, the traffic signals are adjusted dynamically on the bases of the pollution in the route junction area. The system is reliable and cost efficient. By controlling traffic, the pollution will be reduced and also traffic congestion decreases. On the bases of the pollution, the rate of traffic hazard will also come into the action for the preventive measures.

The system can be further implicated by providing user interface access for the citizens to understand the traffic on the bases of the pollution. Using the technology of internet of things, the data gather from the real time source can be further forwarded into the action by the data analytics which can be done as a future scope for this proposed design to predict.

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ACKNOWLEDGEMENT

The authors would like to thank the editors and anonymous reviewers for their insightful comments and constructive suggestions. This work is supported by K L University and the Fundamental Research Funds for the Central Universities

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