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IoT Based Noise Pollution Reduction in Traffic Jams

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ABSTRACT

Due to the increasing population of vehicles on road, the noise pollution levels have risen beyond limits. No longer can a person travel from one place to another without being subjected to high intensity noise coming from vehicles. This noise can have varying effects on a person,such as hearing imparity, high blood pressure, stress etc. At traffic signals or traffic jams, people tend to horn relentlessly adding nothing but noise to the environment. This paper tries to solve this problem by proposing an IoT-Based solution. With the use of an ESP-8266 microchip and a sound sensor, the noise produced in the traffic can be reduced by cutting down on the unnecessary honking by drivers. Reduction in the levels of noise pollution helps to increase productivity, reduce stress etc.

Keywords: IoT, traffic jams, noise pollution, honking, environment, technology.

I. INTRODUCTION

The decrepit state of public transport in our country is driving up sales of private vehicles at an alarming rate.This is reflected in the substantial increase in traffic especially in the urban areas. According to a study done by World Resource Institutein Bangalore, traffic moved at the speed of 35 km in an hour in 2005 as compared to 9.2km in 2016. Increase intraffic and congestion has led to several negative impacts, one of which is the drastic increase in the noise pollution .A noise study conducted by Kalra's NGO in Gurgaon, has shown that the recorded levels on some of the busy stretches of the city went well towards the 60-70 dB bracket, when the acceptable range for the human ears is of around 40-50 dB.

Figure 1

II. LITERATURE SURVEY

In Gwalior city noise level survey was undertaken along four roads namely TansenRoad(Site I), Jinsi Nala Road (Site II), Kilagate Road (Site III) and Laxmibai road(Site IV). Noise level was recorded with the help of a sound level meter at the edge of road for every interval of 15 sec. A weighted noise level dB(A) was measured.[2]

Table 1
Sound Level in dB(A)

75.3	81.3	75	69.8	69.8
70.6	77	73.8	72.9	71.3
81.3	72.7	72.6	96.7	78.5
69.8	74.2	71.2	77.8	70.3
72.5	71.9	80.9	72.7	27.8
76.3	78.8	75.7	77.6	85.3
85.6	72.2	75.4	73.8	82.6
71	74.8	72.1	91.6	79.8
74.4	78.4	71	70.9	78.3
98.3	71.3	81	68.9	71.2
73.9	73	73.9	69.8	68.6
71.4	79.5	80.1	75.6	72.9
90.2	76.3	76.4	70.6	73.1
69.3	84.7	71	73.3	78.3
71.2	73.7	74.3	78.4	75.3
73.4	72.6	80.5	71.3	75.3
75.2	81.2	78.9	82.3	74.8
78.4	75.3	80.6	75.6	79.3
69.4	72	68.2	84.2	72.3
72.3	70.9	87.6	72.5	75.8
69.3	86.3	76	73.8	71.1
76.2	83.2	71.6	78.5	69
69.8	73.5	76.6	89.1	80.2
79.6	76.9	70.8	74.2	75

The main contributor to these figures is the noise generated by honking from vehicles such as cars, bikes and trucks. In the same study, it was noted that vehicular honking in cities has reached an alarming level and contributes approximately 70% of the noise pollution in our environment.

III. LITERATURE SURVEY CONTINUED

A soundless horn system was proposed in [1]. In this system, a camera, a processor, a transceiver and a LCD display is used. A vehicle intending to overtake another vehicle captures the number plate of the vehicle to overtake using ANPR(Automatic Number Plate Recognition System). It then sends a request with its own vehicle ID(VID) as the source and the number plate captured(VNUM) as the destination. This request signalis transmitted through a DSRC(Dedicated Short-Range Communications) transceiver. This signal is received by all the vehicles within the range of the transceiver. Each vehicle checks the destination field with is vehicle ID.

The vehicles whose number does not match with the destination of the request, discard the request. The request signal appears as a notification on the LCD display of the on board equipment of the target vehicle. The target vehicle sends an acknowledgement signal containing its own VID and allowance of pass to the requested vehicle. This pops up on the LCD of the source vehicle indicating whether it can overtake the target vehicle or not. In this way, the motive of horn is achieved without using any honking mechanism.

IV. IMPLEMENTATION

The proposed system consists of a NodeMCU board which runs on the ESP8266 Wifi-enabled microchip and a sound sensor. The device is fitted inside a vehicle and is connected to the vehicle's horn. The sound sensor is placed near traffic signals and other tactically chosen locations where congestions or pile-ups are frequent.

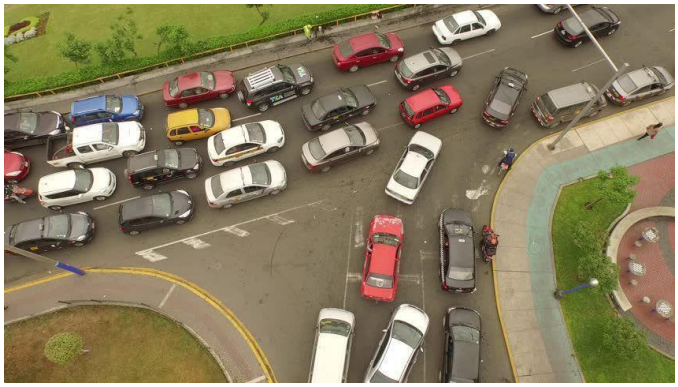

Figure 2

Table 2. Relation BetweenAdc And Decibel Values

ADC value	dB
460	44
480	47
500	59
508	60
550	61
600	63
613	65
700	70
859	78

i) TECHNICAL SPECIFICATION

The sound sensor measures the noise at the traffic signal/jam and sends this analog value to the microprocessor. The board has an in-built Analog-to-Digital converter(ADC) which always returns a value between 0 and 1024. This is because according to the ESP8266 datasheet, the ADC pin has 10 bit resolution. This means that analog reading will return a value between 0 to 1024. This digital value is sent to the server from where the data is read by the vehicles. The following table[3] gives a suitable relationship between the ADC value and the decibel value-

During traffic jams and congestions, we see that a lot of drivers honk excessively and unnecessarily. This is of no use and only adds up to the noise pollution in the environment.

So, what we propose is this:
The sensors that are located near the signals and other points sense the sound level around and send this information to the server. If the sound level is above a certain threshold (around 60dB) the value for the intensity of the horn is reduced. All the vehicles around that sensor read this updated value from the server and accordingly the intensity of its horn will be reduced. This ensures that the sound intensity coming out of the vehicles is kept in check and unnecessary honking doesn't add to the overall noise

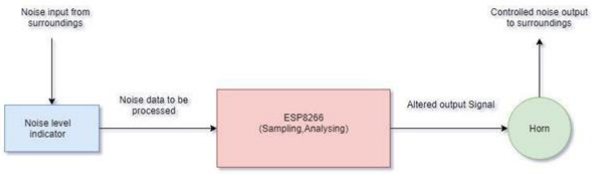

Figure 3

V. RESULTS

From the survey[2] we found out that the average noise levels on the roads were crossing levels as high as 90dB. For a human ear, continuous exposure to high noise levels, of over 70 dB can be harmful.

In India, the horn level for a car is about 95 dB.The entire purpose of our paper is to reduce noise pollution caused by honking. So, for this sake we cut down the horn level as follows-
We set the threshold value to be at 60dB.

So if average noise level in the surrounding is

- ✓ below the threshold - do nothing
- ✓ between 60 dB and 80 dB - reduce the horn level intensity of vehicles by 30%
- ✓ between 80 dB and 100 dB - reduce the horn level intensity of vehicles by 40%

Table 3 gives a suitable relationship between minimum and maximum values of decibels, ADC and volts

Table 3. Min And Max Values Of Decibels,Adc And Volts

	ADC	VOLTS	dB
Min	0	0	7.83
Max	1023	3.3	100.23

The graph depicted below gives a clear picture of the impact caused by the system. We see that as the noise levels in the surrounding increases, the intensity of the horn decreases accordingly.

In particular, at t = 25 sec(approx), the noise level crosses the threshold (60 dB) and hence there is a sharp decrease in the intensity of the horn in the surrounding vehicles.

This ensures that the noise level in the surrounding remains at an ideal level which helps to keep the noise pollution in check.

Table 4. Tabular Representation Of The Results

Time (sec)	Sound Sensor Reading(ADC value)	Value in volts	Sound (dB)	Updated Horn Level(dB)
0	460	1.48	44	95
10	480	1.55	47	95
20	500	1.61	59	95
30	508	1.63	60	95
40	600	1.93	63(-30%)	67
50	613	1.97	65	67
60	700	2.25	70	67
70	859	2.76	78	67
80	863	2.77	86(-40%)	59
90	877	2.82	88	59
100	885	2.85	92	59
110	895	2.88	95	59
120	899	2.89	97	59

Sound Level Variation

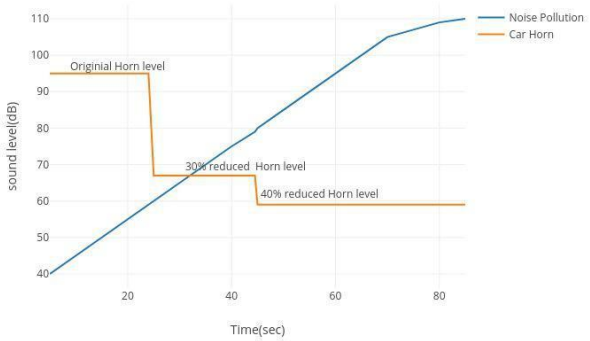

Figure 4

VI. CONCLUSION

In India like many developing countries the residents of cities are now becoming aware of environmental problems that result from the transportation facilities in general from road traffic and in particular from automobiles. Traffic noise is a major factor of environmental pollution. Noise affects human body in a number of ways ranging from Psychological to Physiological, e.g. auditory damage, speech interference, sleep interference, general annoyance, reduces the working efficiency, increases blood pressure & fatigue etc.

While the paper presents an honest attempt to reduce noise pollution, it also faces several obstacles and shortcomings which are as follows

- ✓ The proposed idea depends heavily on internet connectivity. Thus, internet should be accessible freely and conveniently across the city.
- ✓ The usage of the system is restricted to junctions and gridlocks or any such places where congestions are frequent.
- ✓ The system cannot tell the difference between noise from a horn and other loud noises such as that of sirens or loudspeakers.

VII. ACKNOWLEDGEMENTS

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VIII. REFERENCES

[1]. PrRajiv Kapoor, Rajesh Birok, Divi Sai Manoj Department of Electronics and Communication Engineering "Soundless Horn And Remote Patroller" 2014 IEEE International Conference on Vehicular Electronics and Safety (ICVES)

[2]. P. D. Marathe "Traffic noise pollution" IJED: Vol. 9, No. 1, (January-June 2012)

[3]. https://circuitdigest.com/microcontroller-projects /arduino-sound-level-measurement