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Intelligent Honking System

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Abstract*: This paper aims an introducing a new form of honking systems for automobiles. Unlike conventional technologies the concept used here aims at alerting the automobile nearby using signals. The alert signals are transferred from one vehicle to the other through electromagnetic waves. The signals transmitted from one vehicle reaches the adjacent vehicle where the signal is decoded to transfer the alert signal. The processed signals are then given to the speaker inside the car cabin or helmet thereby reducing the amount of noise pollution.
Keywords: ***Smart Honking, Alert signal, Regulating system, Logic gates, feedback system.***

I. INTRODUCTION

The urban environmental quality of developing countries has been deteriorated by an unlimited increase of vehicles, infrastructure, and population. Consequently, the continuous increased intensity of traffic noise level due to the population has degraded urban quality of life. Road traffic noise is the big challenge for urban planners and environmental engineers to overcome road traffic noise in cities. Continuous high level of noise can cause serious stress on the auditory and non-auditory, and nervous system of the city dwellers. It is also leading cause of great annoyance for exposed population due to the poor conditions of engine, exhaust etc. In addition, there are various studies carried out on road traffic noise pollution, which effect severe health problems such as, physical and psychological, irritation, human performance and actions, hypertension, heart problems, tiredness, headache and sore throat respectively. Noise is an unwanted sound; it causes social effects, feelings of disturbance, stress reactions, sleep disorders, some hormonal changes, increased blood pressure, increased risk of myocardial infarction, impairment of well-being and general quality of life. The effect of noise pollution has been studied on humans, animals and plants and buildings. Noise is a major factor that should be considered in the design and construction of new transport systems, as well as when improvements are made to existing systems. In addition, local authorities and environmentalists recognize the importance of monitoring trends in noise pollution when developing mitigating plans. As such, there is an obvious need to measure and model noise pollution. Non-auditory physical health effects that are biologically plausible in relation to noise exposure and annoyance from noise exposure include changes in blood pressure, Heart rate, and levels of stress hormones the biological mechanism linking noise to hypertension is thought to be mediated through sympathetic and endocrine stress response with subsequent acute changes in vascular tension. The hypothesis is that long-time exposure to noise could result in lasting cardiovascular changes such as atherosclerosis and increase cardiovascular risk as well as hypertension. The present work analysis the vehicular traffic noise during the morning peak hours and evening peak hour.

II. PROPOSED WORK

Noise pollution finds its roots at the horns of the vehicles in traffic. We devised a unique feature to nullify the sound thrown into the surroundings and create a peaceful environment. This system works in such a way that all the vehicles are equipped with a transmitter and a receiver of electromagnetic waves (infrared). These sensors are intern connected to a circuit which amplifies and converts the signal accordingly. The signals are further sent to a (machine) which relays the information making a small beep go off inside the vehicle (if car) inside the helmet (if bike). This notifies the driver about the vehicle behind and prompts him to move. As the horn is going off inside the car there is no noise pollution on the outside thereby negating any disturbance to the surrounding environment. Taking a scenario in perspective, let's say there is a traffic jam in the city, instead of there being a barrage of horns going off for a long time we can stage it such there isn't a single sound emitted into the environment. Considering five cars back to back in a traffic jam and the problem being the first car not moving, car 5 emits electromagnetic waves which is received by car 4 and it in turn emits electromagnetic waves further and so on. This way Car 1 receives the electromagnetic waves sent by the series of vehicles waiting behind in the jam. Car 1 emits the electromagnetic waves to find there isn't any other vehicle to receive it as there is open space ahead. This prompts the system to let the horn go off inside the Car1 alerting the driver to move the car.

III. COMPONENTS

As cited earlier this kind of systems are proposed to have two parts. A transmitter circuit and another receiver circuit. These circuits are in pairs and are connected to logic-gates, microcontrollers or advance algorithm-based circuits [4] depending upon the

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sophistication. These are responsible for information processing and control in the system. In this paper the system considered is controlled by means of logic gates. The block diagram of the transmitter circuit is as depicted in Fig.3.1. This circuit functions as both the initiator circuit and transmitter circuit i.e., it can either generate the alert signal using the alert key or even transmit the alert signal when being a part of the transmitting vehicle.

A. Alert key

As perceived the signal is initiated by an alert key. The alert key acts as a switch and functions similar to pressuring the honk in conventional systems. The point of alteration between the alert key used in this proposed system to the honk in conventional systems is that instead of generating a sound/honk noise, it generates an electrical signal that is transferred onto the regulating systems connected to the circuit. The alert key used can ideally be a push-button switch that generates electrical impulses when pressurised.

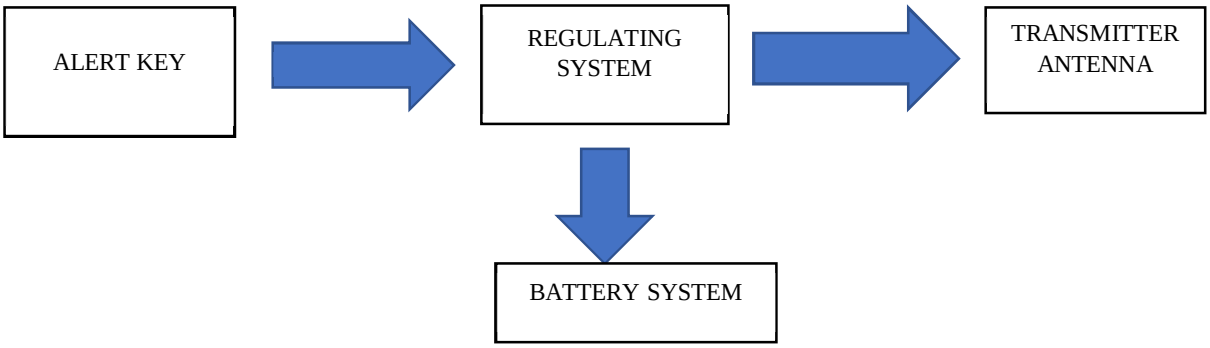


Fig. 3.1 Block diagram of the transmitter circuit

B. Regulating System

The regulating system is the brain of the entire Intelligent honking system. The control system is connected to both the transmitter and the receiver circuit. It receives signal from multiple circuits, processes the signals and decides on which control action has to be taken. A detailed report on the working of the control system is explain in the upcoming sections. Control systems used in this envisage are logic-gates. With further advancement of technology in the future microcontrollers, advanced algorithms [4] or hybrid programs can be used.

C. Transmitter Antenna

This component is the ultimate part of the transmitter circuit. In this part of the circuit the electrically processed signal obtained from the control system is converted into an electromagnetic wave form of desired frequency. The electromagnetic wave signal transmitted must be efficiently received by the receiver circuit. The transmitter antenna used in this proposed system is a directional antenna [1]. These antennas are placed on all four faces of the automobile such that the signal waves are transmitted outwards. The transmitting antennas toward the sides are called lateral antennas.

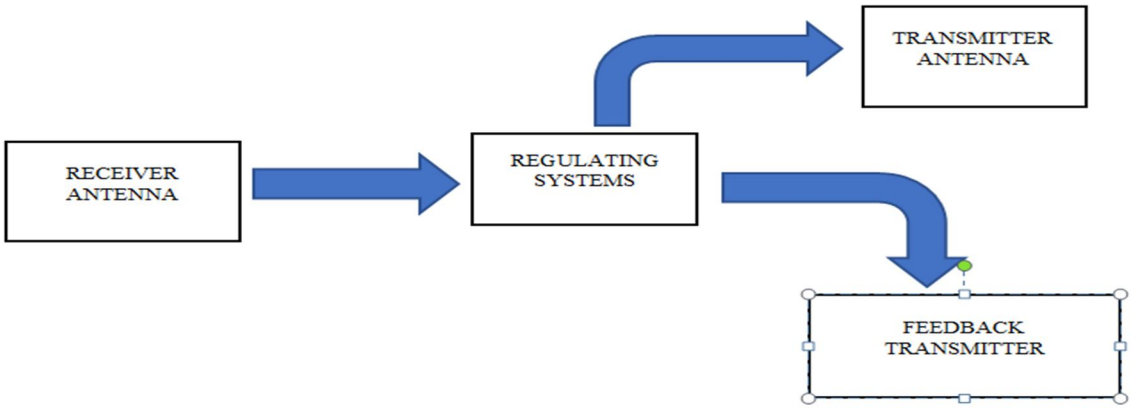


Fig. 3.2 Block diagram of receiver circuit

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D. Receiver Antenna

This is a counterpart of the transmitter antenna in the receiver circuit. Its construction is similar to that of the transmitter antenna while the point of contrast lies in its working. The receiver antenna is responsible for collecting the information signal transmitted by the transmitter antenna. Both the transmitter and receiver antenna are tuned to transmit and receive the wave signal of same frequency. The receiver antenna transmits the information received to the control system in the form of electrical impulses. The receiver antennas on the lateral sides of an automobile are proposed to have a smaller range compared to the ones in the front and rear ends. The receiver antennas are also directional antennas [1] as the lateral antennas receive signals from lateral transmitters of its counterpart.

E. Regulating System

The regulating system is the master component of both the receiver and transmitter circuits. It's the brain of the system. A detailed report of the control systems is given in the upcoming sections. The regulating system also has to take care of interference reduction. A detailed report of this concept is explained in reference [2].

F. Transmitter Circuit and Feedback Transmitter

The control systems process the information acquired. A part of the processed signal is sent to the transmitter antenna and the other to the feedback transmitter. The transmitter circuit used in this part of the system doesn't have an alert key but electrical impulse is directly transferred into electromagnetic waves and transmitted to the vehicle beyond it. The feedback transmitter is responsible of the emission of a feedback waveform to the parent vehicle from which the signal was received. Thus, every vehicle the obtains a wave signal emits two waves in response. One being the secondary transmitted wave to the succeeding vehicle and another feedback wave to its preceding vehicle.

IV. WORKING

This section deals with the detailed working of the proposed system. The working of this system can be divided into three stages. One considers the parent vehicle, the second deals with the transitional vehicle and the final stage deals with the terminal vehicle. The important point to be noted in this proposed system is that there may be numerous transitional vehicles in any given system however there is only one terminal vehicle.

A. Stage 1(Parent vehicle)

The stage one is where the honk/alert signal is initiated. The vehicle initiating the signal is referred to as the parent vehicle. As the alert key is pressurised the transmitter circuit gets activated and a resulting waveform is produced. The succeeding vehicle need not be directly in front of the parent vehicle. The parent vehicle can transmit waves even to the sides which makes it possible for the vehicle that are overtaking also to receive the transmitted information.

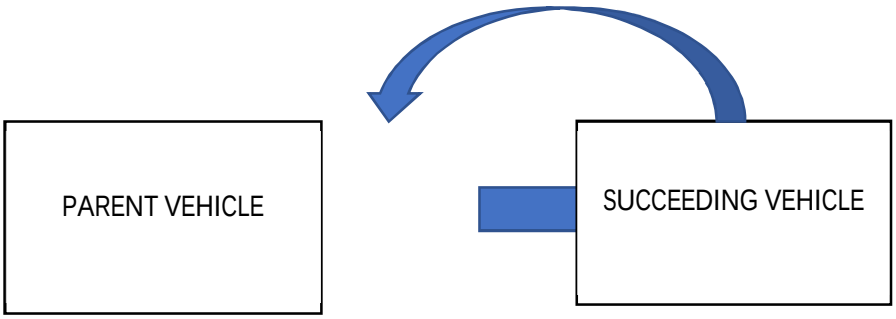


Fig. 4.1 Block diagram of the first stage of signal transmission

The vehicle receiving the honk/alert signal send a feedback signal through the feedback transmitter back to the parent vehicle. The feedback signal is fed to the control system which indicates that the alert signal has been successfully transmitted through the system. The absence of a feedback system would indicate that there is enough space for the vehicle to reposition. An emergency honk in the form of a conventional honk is also included in the system so that in a worst-case scenario like the system failure or interference due to animals the conventional honk can be used.

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B. Stage 2 (Transmitting vehicle)

The succeeding vehicle in the above scenario may function as the transmitting vehicle or the terminal vehicle depending on the whether space is available in front of the vehicle to move ahead. This is efficiently determined by the feedback signal that is obtained.

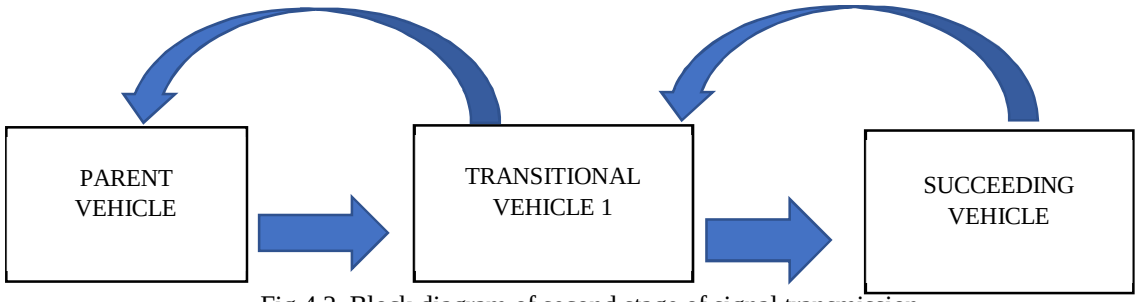


Fig.4.2. Block diagram of second stage of signal transmission

1) *Alert signals being received from the rear ends*- As understood earlier the vehicle receiving the signal from the parent vehicle send a feedback signal to the parent vehicle but then again, the transitional vehicle also produces another wave which to the vehicle in front of it. Considering a case in which there is another vehicle ahead of the transmitting vehicle 1, the signal transmitted by the transmitting vehicle 1(TV1) yields a feedback signal from its succeeding vehicle. This would indicate that there is no space for the TV1 to move ahead and hence a honk doesn't go off in the TV1. Instead the alert signal is transmitted to the succeeding vehicle. A block diagram of such a method of transmission is depicted in the Fig. 4.2.
2) *Alert signals being received from the sides*- In another case where there is an overtaking vehicle, the alert signal generated by the parent vehicle reaches the secondary vehicle through the lateral receivers.

In such a case, the feedback signal is generated. Instead of generating another signal that would be transmitted to the vehicle beyond the secondary vehicle the honk inside the vehicle receiving the alert signal would go off thereby alerting the driver of the overtaking vehicle.

Fig. 4.2.2.a and 4.2.2b depicts two scenarios where the overtaking problem is taken into consideration in both these cases the secondary automobile upon receiving the alert signal through its lateral receivers doesn't transmit the signal to an adjacent car but the honk goes off in the secondary automobile. The range of the lateral receiver and transmitter used are lesser than the other transmitters and receiver on the front and rear of the automobile.

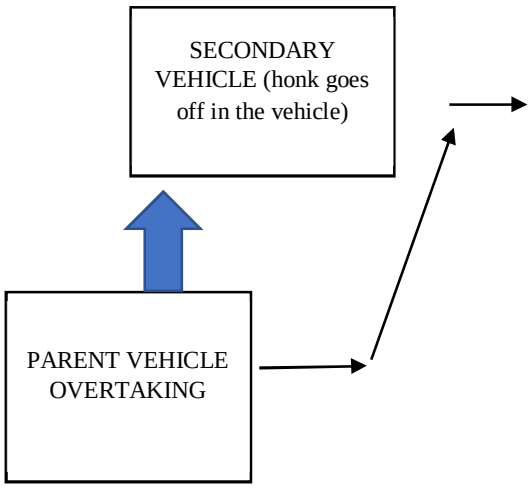


Fig. 4.2.2a. Case of overtaking parent vehicle

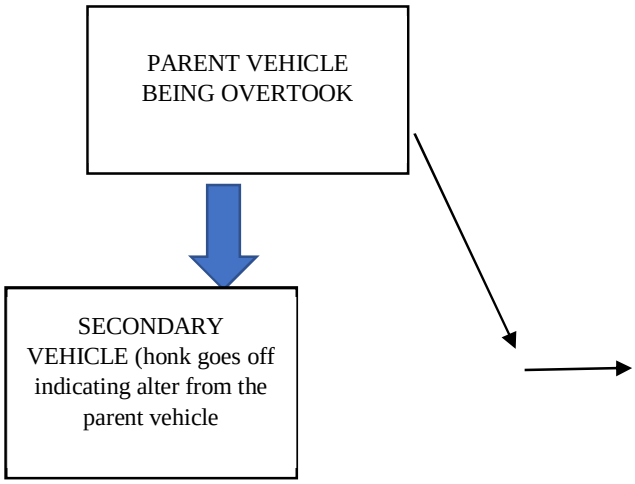


Fig.4.2.2b. Case of overtaken parent vehicle

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C. Stage 3(Alerted vehicle)

This is the vehicle that receives the alert message in the form of a sound signal in the car cabin or helmet. Once the alert signal is generated by the parent vehicle the signal is transmitted through various transmitting vehicle who don't have enough space in front of them to relocate. The alert finally reaches the vehicle which has adequate space to relocate. The information regarding the amount of space available is obtained by the information obtained by the feedback signal. In a case wherein the vehicle in front of the system has no vehicle succeeding it, it fails to receive a feedback signal. Their absence or low strength of a feedback signal would indicate empty space in front of the automobile and thus the honk would go off in that automobile thereby terminating the process.

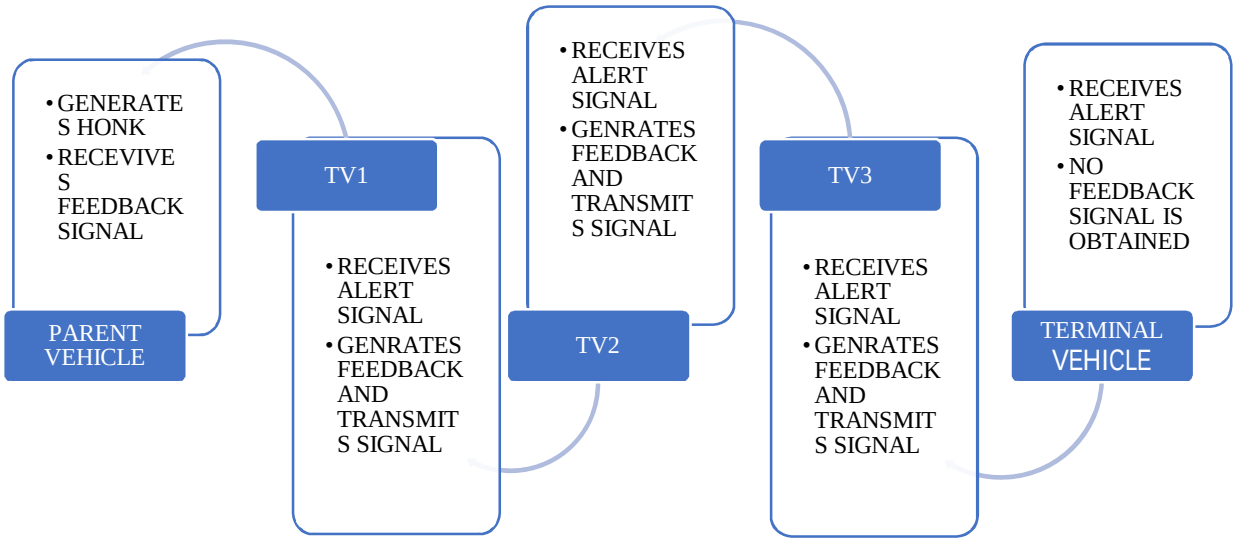


Fig.4.3. Working of IHS

V. REGULATING SYSTEMS

A group of units which maintain the output based on the present quantity by controlling and manipulating parameters responsible for the output constitutes the control system [5]. The most vital component in this proposed system functions as a brain by receiving transmitted information, processing it, transmitting the processed information to the appropriate components. The regulating system also takes care of functions like signal amplification, filtering and attenuation. The control system in this proposed system is a logic gate [3]. Here, let X be the condition of generation of an alert signal and Y being the condition of feedback being received. The table gives an idea of the output signal that is connected to the speaker that is responsible for generating the alter sound in the car cabin or the helmet. Both the X and Y elements are connected to the transmitter circuit and feedback receiver circuit respectively.

Considering a first case scenario wherein an alert signal is generated by the parent car. Thus, the signal X becomes 1. Upon receiving a feedback from the secondary vehicle, the signal Y also becomes 1 thereby yielding an output of 0. Thus, a honk doesn't go off in the parent automobile. On the other hand, if the automobile generates or transmits an alert signal but fails to receive a feedback signal it would mean that the is enough space for the automobile to relocate thereby authorizing the honk to go off.

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TABLE I
LOGIC GATE FOR REGULATING SYSTEM

X	Y	O/P
1	1	0
1	0	1
0	0	0

An additional emergency honk similar to conventional honk is also provided that can be used in case of system failures or external interference of life forms. The regulation system is connected to the battery of the car to power the entire system. In the case of a bike an additional Bluetooth component is added that transmits the alert signal to the helmet of the rider. The control system proposed in this paper can be optimized to higher level of standards by using advanced programming techniques and hybrid algorithms.

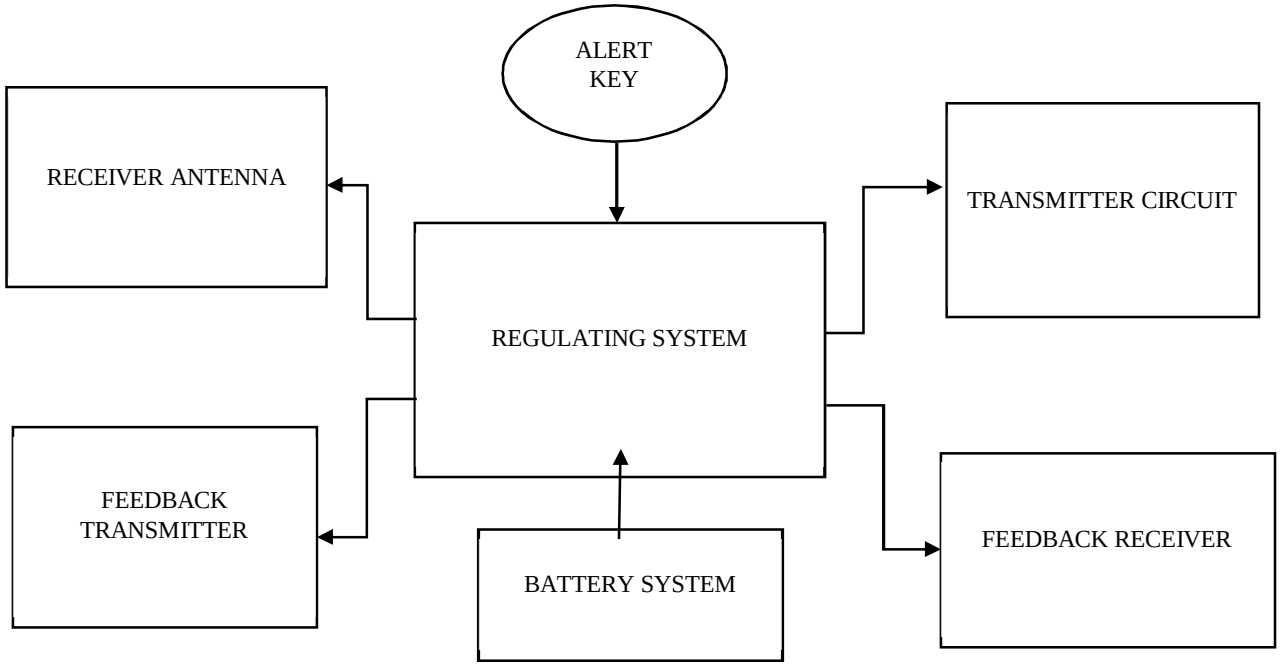


Fig.5.1. Block diagram of the control systems

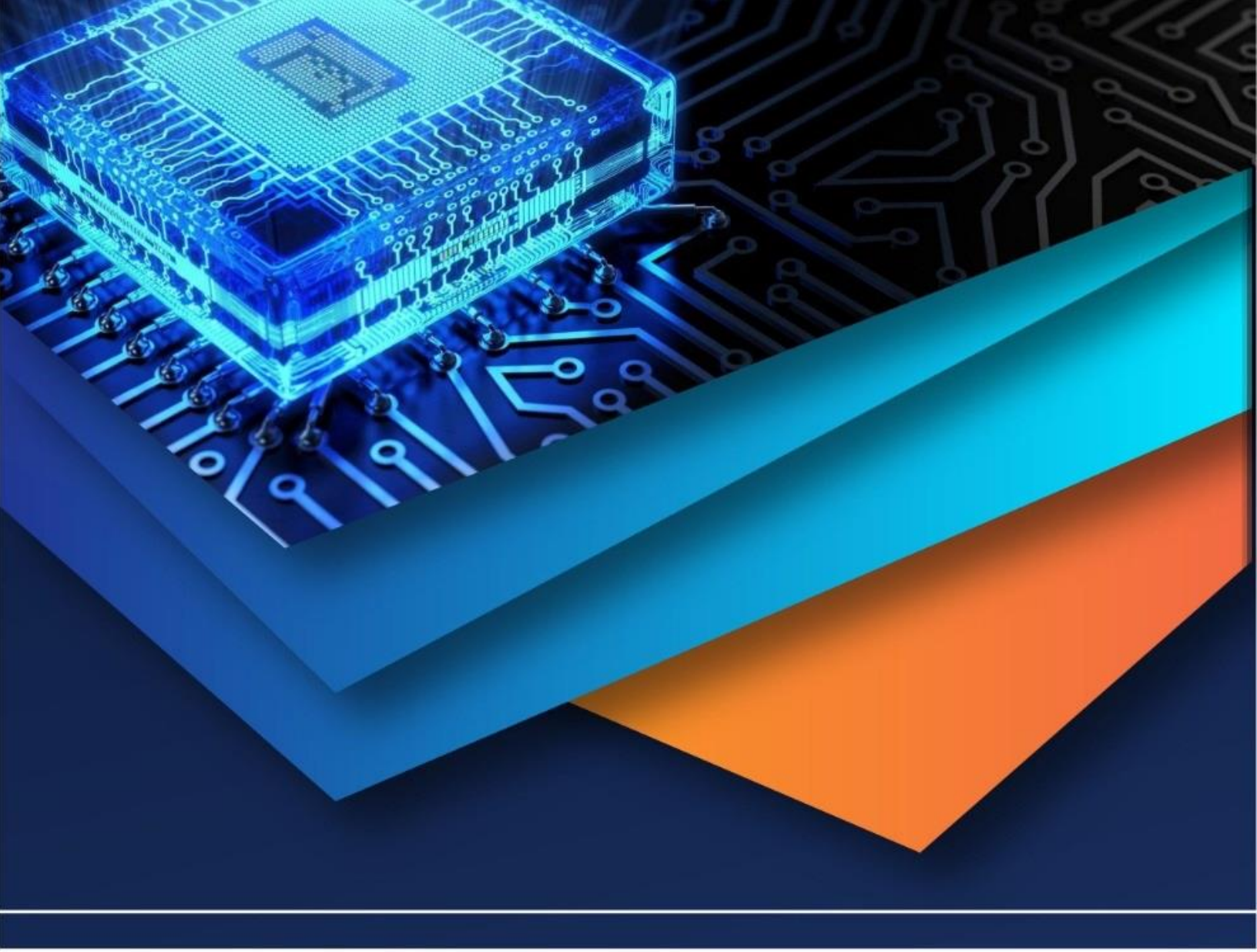
VI. CONCLUSION

Its seen that by implementing the technology mentioned in this paper the amount of noise pollution caused due to aggressive and uncontrolled honking. The noise caused due to honking as in conventional techniques is converted into signals. With further advancement in technology this technology can be developed even further using advanced algorithms to suit the desired customizations.

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