India Innovation Challenge Design Contest 2019

IICDC 2019 PROPOSAL

Team ID : 1175343

College Name : College of Engineering and Technology

Title of the Idea : Ultrasonic Radar Based Horn System to Reduce noise pollution in big cities.

Table of Content

The suggested length of the proposal should be limited to 8-10 pages with File Size < 10MB

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1.0 Business Details:

a. Project Abstract

□ Describe the problem that your project intends to solve

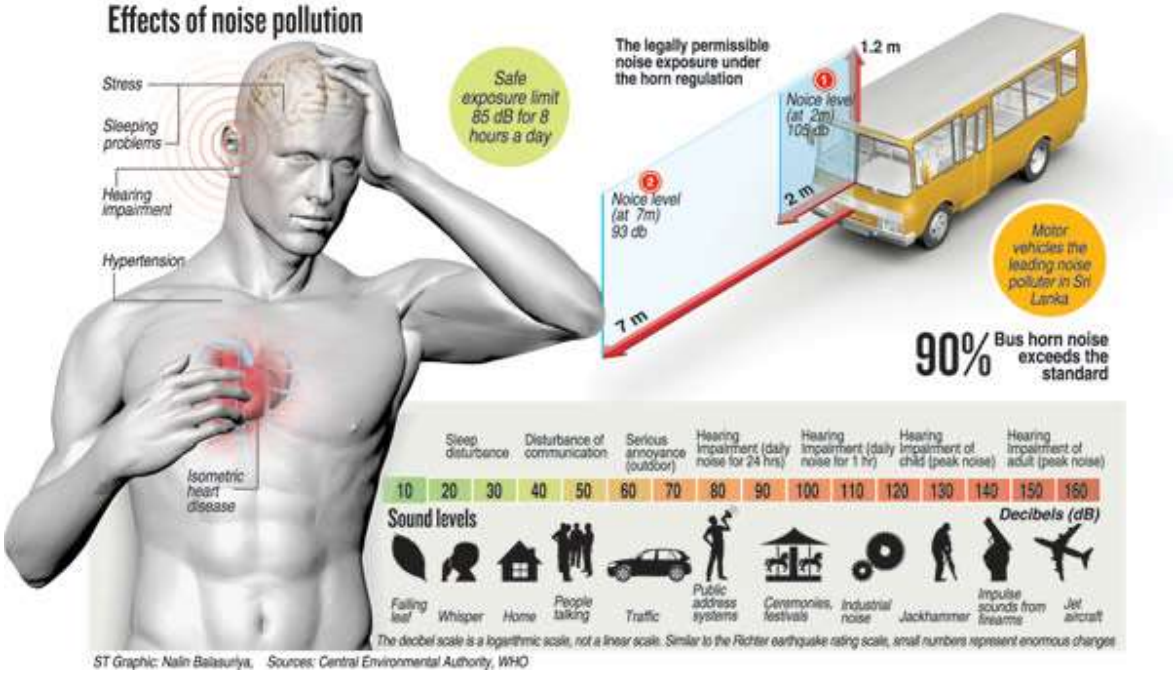
Cars are getting quieter. Should horns be getting quieter as well?

According to the World Health Organisation (WHO), noise is second only to air pollution in the impact it has on health. It is a major cause, not only for hearing loss, but also for heart disease, learning problems in children and sleep disturbance. Automobile revolution in urban centres has proved to be a big source of noise pollution. Increasing traffic has given rise to traffic jams in congested areas where the repeated hooting of horns by impatient drivers pierce the ears of all road users. Thus our project intends to reduce the excessive noise pollution occurring due to automotive honking in big cities and towns through proper use of existing technology.

□ Give a brief abstract our idea/problem being solved

The main reason for noise pollution in cities is vehicle density and traffic congestion. Vehicle engines and horns are the main contributors to this. Traffic congestion leads to honking, which in turn leads to noise pollution. Thus we plan to design an automotive radar based prototype where your vehicle will have two radars one for transmitting and other one for receiving. The one that is at the back of the vehicle will receive signals from other vehicles thus will monitor vehicles behind your vehicle and will give haptic feedback to the driver as per the density. And the other one in the front will transmit signal to other vehicles in front of it to transmit noiseless bypass signal.

□ Why does solving the problem matters?



ST Graphic: Nalin Ballasuriya, Sources: Central Environmental Authority, WHO

This project can be a great step towards reducing noise pollution and thus its effects in big cities with high pollution of automotives. It may not be cost saving compared to normal horns but it can be a revolutionary change that could affect the level of noise pollution in current cities scenario and after all this is much cost effective than using it in autonomous vehicles whose cost is much more for middle class pollution to support.

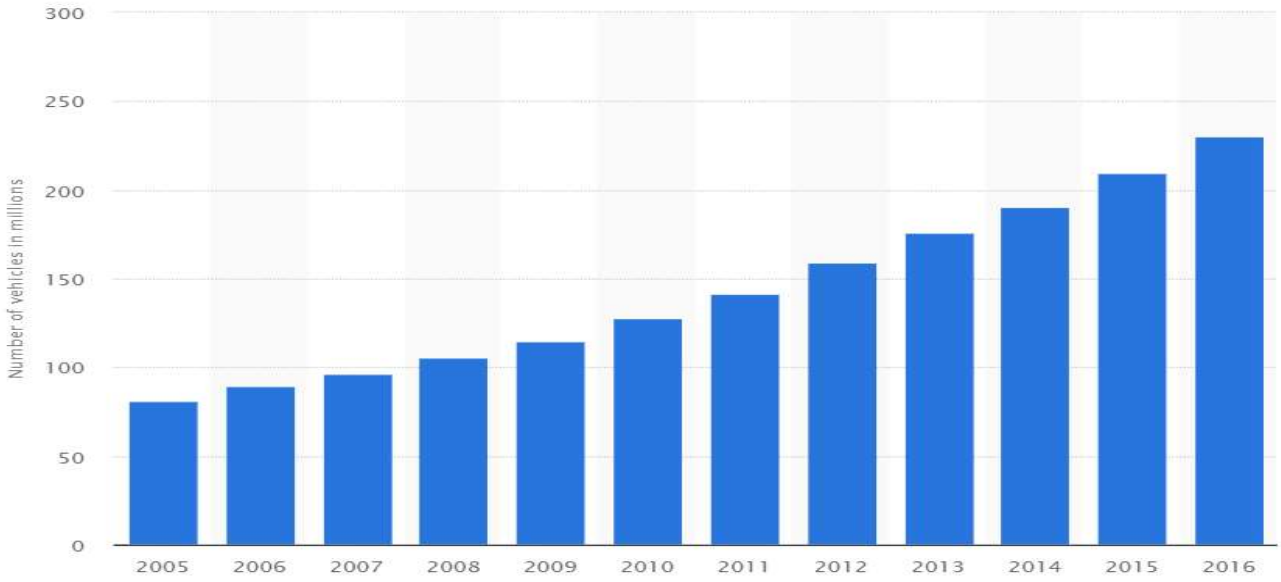
b. Market Analysis

- **Customer need identification**

Our solution aims to help the **Central Pollution Control Board (CPCB)** of India and Indian car manufacturers in making critical decisions for optimizing resources to fight and keep noise pollution under control. We offer a unique noise reduction and pollution control technique by using automotive radar applications to design a radar based horn system. Currently automotive radar applications which are currently popular for their use in autonomous vehicles are not affordable by middle class user, our proposed solution is effective in terms of initial and maintenance cost.The customers will have benefits of **exact detection** and **minimum detection delay**.

- **Serviceable Addressable Market (SAM) identification**

Our Total Addressable Market is the total pollution of india using automobiles comprising of 60 percent of the population who used personal or shared vehicles for commuting. But in initial stages our Serviceable Addressable Market(SAM) would be those 46% of automobile users those who use cars because cars play the lead role for noise pollution in big and crowded cities of india.



- **Product differentiation with respect to competition**

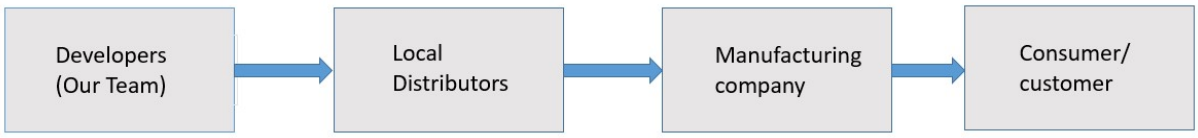
The technology used may not be unique but the idea behind it is unique in its way of design and applications.If we take the case of automotive radar applications which are currently popular for their use in autonomous vehicles are not affordable by middle class user. “Mercedes-Benz has taken the level of safety offered in its cars up a notch by rolling out radar-based safety features in some of its vehicles in India.”

The proposed idea can be used in two wheelers like bikes and scooters or in any normal vehicles at lower cost to reduce noise created due to excessive honking. Our system outperforms the existing systems in terms of **Detection Delay** (using Ad-hoc network system), **System Cost** and **Environmental Conditions** doesn't affect the detection technique.

- **Understanding customer/user**

Most of our time in the modern world is spent in commute hence exposure to pollution problems. Noise pollution causes innumerable health hazards like heart issues and hearing impairment, sleep disturbance, serious annoyance resulting in additional medical expenses/trouble.
In the suggested prototype, the component list and cost analysis gives us:
(i) TSP62122DRVT step down converter- 1274.95 INR
(ii) MSP-EXP430FR6989 launchpad development kit - 39 INR
(iii) PGA460-Q1 Transducer Driver- 180.01 INR
Total: 1493.96 INR
Prevention is better than cure. It is wiser to invest in a low cost radar based horn system. The Ad-hov network used makes our commute smarter and the low range ultrasonic waves used in this application are safer.
This is an opportunity for equal availability of this technology which only certain automobile companies have access to and not every middle class man can afford it. The prototype can easily operate under normal traffic conditions.

- **Distribution channel**



2.0 Technical Details

a. Product Brief

What is your core technical innovation?

As we all know unlike invention innovation is the way of making a significant contribution to an existing product. Thus in making our proposal a truth we aim to use technology inspired from automotive radars but in a bit different way. Usually automotive radar is popular for their use in autonomous vehicles by locating objects, such as vehicles and pedestrians, in the vicinity of the car. But we plan to use this tech in cars as well as two wheelers but not for autonomously. In our prescribed design we plan to introduce vibrations to car steering and handles of two wheelers that will give hepatic feedback to the driver as per the density of vehicles near it, making this design cost effective than its application in autonomous vehicles. Thus we wish that our design can immensely contribute in reducing noise pollution in cities due to excessive vehicular honking.

Describe the uniqueness of your product design

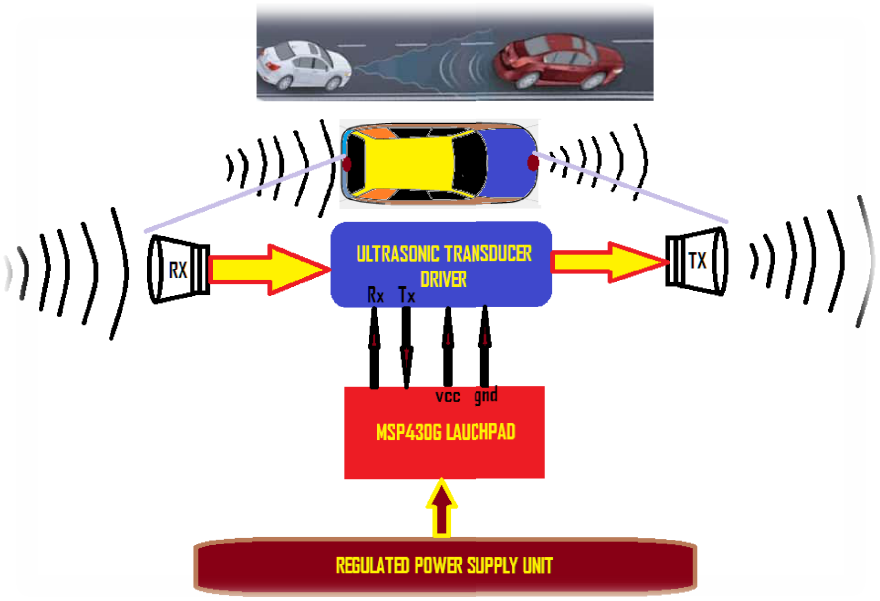
The tech used may not be unique but the idea behind it is unique in its way of design and applications. If we take the case of automotive radar applications which are currently popular for their use in autonomous vehicles are not affordable by middle class user and moreover can't be used in two wheelers like bikes and scooters, can be used in normal vehicles at lower cost to reduce noise created due to excessive honking in big cities. The way people have approached towards noiseless horn system through Ad-hoc network system is really appreciable where signal from one vehicle is to be targeted to another vehicle to give a bypass signal but this approach lags behind when it comes to heavy traffic congestion in crowded cities in connecting vehicles in clusters is bit complex thus making the applicatio n of Ad-hoc network inefficient in case of heavy

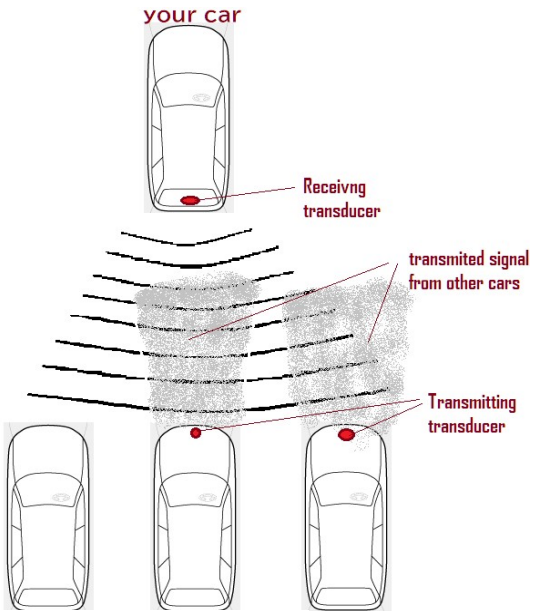
traffic jams. But our product will be more efficient since its working principle is same as normal vehicle horns but in place of horn sound we will be using ultrasonic waves which are not complex and can work efficiently in any crowded traffic.

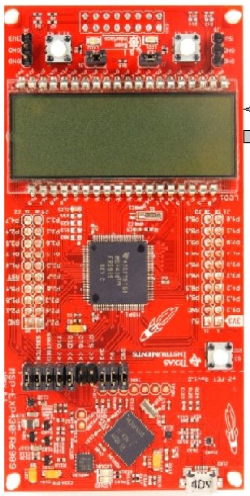
□ Objective

The prime objective behind this proposed idea is to design a cost effective automotive radar based horn system which comes up with much more developments than the existing techniques that will help in reducing those irritating noisy vehicular horns which in turn will help in reducing the level noise pollution in big cities due to unnecessary honking by the vehicles which immensely affects the life of people living there.

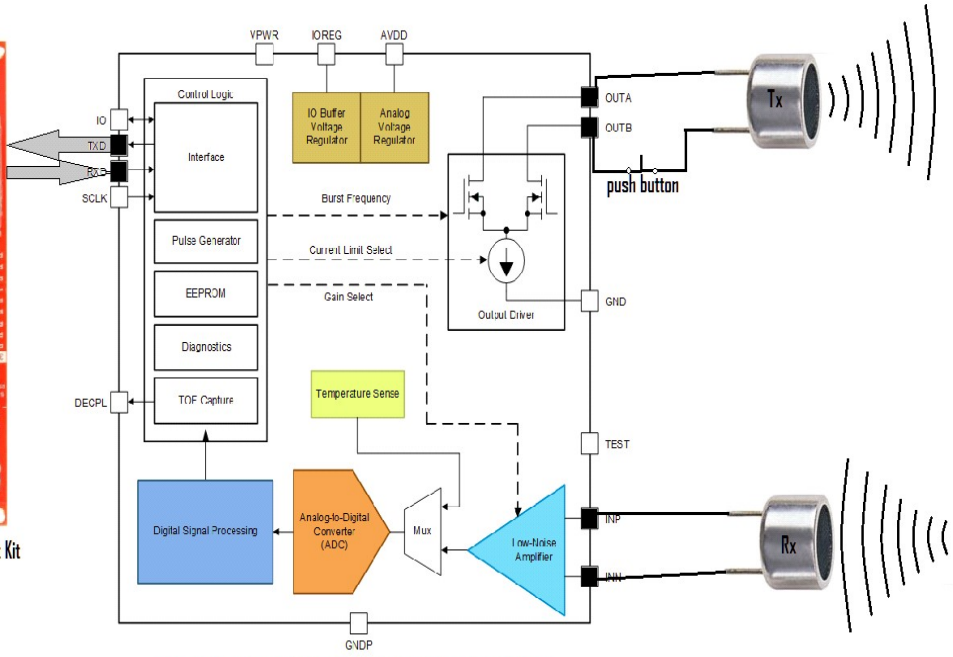
b. Proposed Design





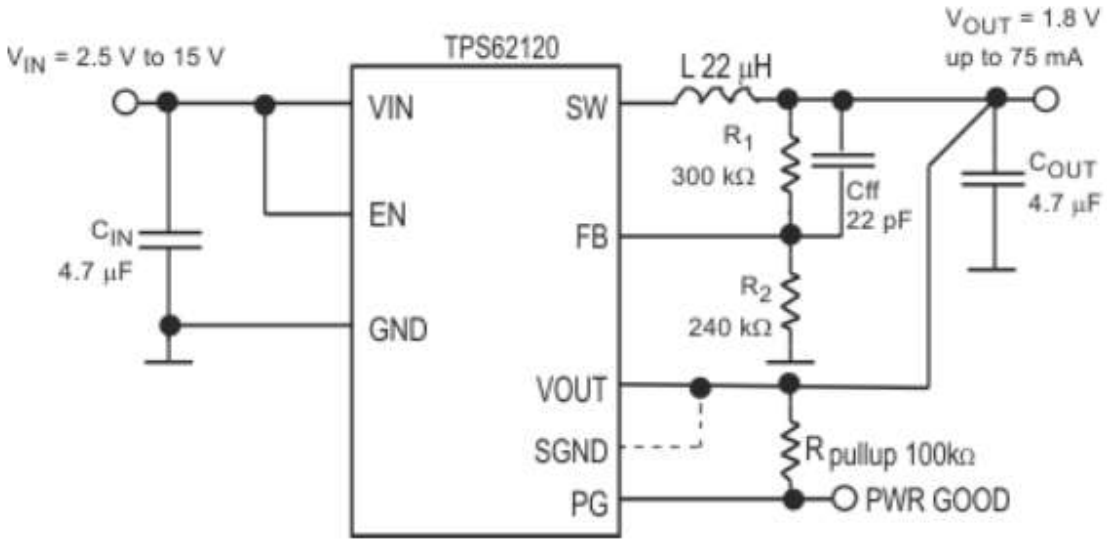


MSP430FR6989 LaunchPad Development Kit



Automotive ultrasonic signal processor and transducer driver

Automotive ultrasonic transducer driver: It will be used for triggering and processing ultrasonic signals through the ultrasonic transmitter and receiver transducer pair.
Transmitting transducer: It will release the ultrasonic signal from the front of the vehicle.
Receiving transducer: It will receive ultrasonic signals from the vehicles coming from behind.
MSP430F launchpad: This is a microcontroller kit to process the input signal from the other vehicle and to give desired control signal (Displayed output and haptic feedback) to the driver.



Power supply module for MSP430F

c. Innovativeness of the Proposed Solution

As per the proposal is concerned there will be a radar connected to the back of the receiver vehicle and the signal transmitter will be connected to the bypassing vehicle that will send the signal to the receiving vehicle. On receiving the signal from vehicles behind the vibration motors on the steering and handles will vibrate giving the driver a haptic feedback regarding vehicles want to bypass thus creating no noise or sound due to honking.

In the current scenario there are as many two to three existing competitors to this proposed project but unlike the existing competitors this can work under any condition of traffic congestion ,since this device will aware the driver of which vehicle wants to bypass and from which direction through a displayed output and haptic feedback.

Now if we talk of the size, power consumption, performance and functionality, this will be a compact peripheral device maximum to the size of the indicators connected to the vehicles and will consume power as much as the indicators or your traditional horn consumes .And when it comes to performance, can't tell that it'll be 100% efficient because none of the devices present on this manmade world is purely efficient but how much efficient can be predicted after prolonged uses. Now if we talk about its functionality its working mechanism will be completely similar to the working of a horn , as when we press the horn button instead of sound it will produce ultrasonic waves as signal for the vehicles in front of your vehicle.

And lastly if we consider the cost, it's going to be higher than the traditional horns to as much as some thousands but while considering the effect of noise pollution on humans this price can be considered cheaper because everything is priceless in front of human life.

d. Impact of the proposed solution

With the help of the proposed solution there will be huge reduction in noise pollution hence, helps in reducing:-

- a wide range of health consequences, including cardiovascular problems, stress, high blood pressure, and various sleeping disorders etc can be reduced to a great extent.
- In metropolitan cities a driver has to always keep his ear open due to this he has a constant exposure to noise levels that might be deemed as chronic then he or she could suffer hearing loss.
- The people residing in urban area faces more amount psychological consequences of noise pollution, which can include fatigue and an increase in aggressive behaviour ,low patience and mental stress due to the prolong noise exposure.
- Some species do rely on sound not only for catching their prey but also for many other common activities. A range of other behaviours like locating food, finding mates and locating offsprings. Noise pollution has a great impact on them hence with proposed solution one of noise factor can be reduced.
- Research has also shown that vehicular noise impacts the reading and learning skill development of children attending school nearby busy roads. Furthermore, noise can affect children's blood pressure, as it can with adults