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ARDUINO BASED NOVEL FUEL CONSERVATION SYSTEM FOR AUTOMOTIVE

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ABSTRACT
The fuel prices are increasing year by year due to the limited sources and extensive use. Automotive industries have taken initiatives to shift from conventional fuel to renewable and E-vehicles. Still a day is long where all the conventional vehicles in India will be replaced with E-vehicles. Another approach in this regard is utilizing the fuel/ energy to optimum level. The effective use of the fuel is conventionally achieved through modifications in the engines, while the fuel consumption of the vehicles can further be controlled with the automatic ignition and turning off method. It is observed that in standstill condition at traffic signals, the fuel consumption of the vehicle is comparatively more than running condition and it is wasted as not utilized for the movement. Authors have identified the opportunity to develop a system for auto ignition and turning off the automotive engines with traffic signals. Authors have proposed the Arduino based system to address the said issue and is presented in this paper.

Keywords: Arduino, Fuel Conservation, RF Receiver, RF Transmitter, etc.

INTRODUCTION
India is one of the high fuel consuming countries in the world. India stands behind US, Europe and China in terms of fuel consumption. Indian fuel demand is reduced by 5 to 9 % over last one year due to the Covid-19 pandemic. In coming year, the demand is expected to increase by considering the increase in number of vehicles on road.

Reduction in the fuel consumption is always on priority while designing the vehicles. In the countries like India, where maximum fuel demand is fulfilled by importing the fuel from different countries, the cost of fuel and the fulfilling the demand is always a challenge. Different approaches for reduction is consumption of the fuel have been adopted by automotive industries in terms of mileage enhancement. On the other hand, India is on verge of shifting the major automotive needs from conventional to E-vehicles.

Fuel conservation is always on the priority of the researchers in automotive area. Authors have identified the need of fuel conservation system for vehicles at traffic signals. The system requirement is to save the fuel by means of turning of the engine when traffic signal is red and turn it on when displayed green.

It is proposed to use the RF transmitters at traffic signals for transmitting the signal according to the state of the display. The proposed prototype uses the RF receiver for identification of state of the traffic signal and arduino controls the engine turn on and off process. Electronic Control Unit (ECU) takes the logical decisions for the engine according to the signal received at the receiver.

More consumption of the fuel not only is affecting the cost of the fuel but also hazardous to the environment as the conventional combustion engines produces the pollution during its operation. The different engines such as spark ignition, diesel and gas turbine are the sources of pollution by means of production of carbon monoxide, unburned hydrocarbons and nitrogen oxides, etc.

According to PCRA Petroleum Conservation Research Association, it is better to switch off the engine rather than keeping it on for more than 90 Seconds in standstill condition. The fuel consumption trends show that, the consumption is more in city driven vehicles than the highway driven. The emission rates are also high in the vehicles when driven in cities with high traffic densities. The basic proposed model is presented in the figure below.

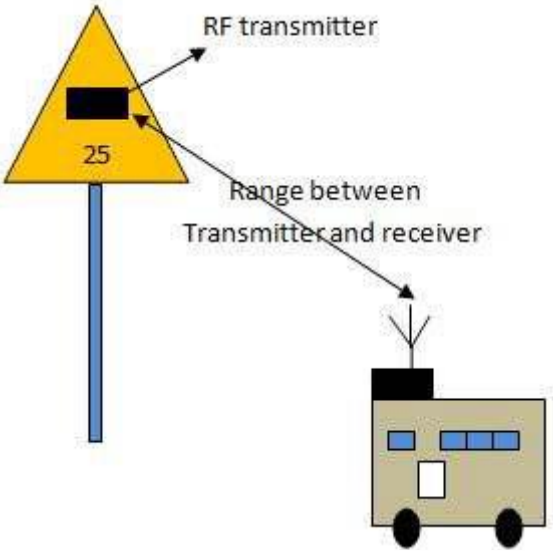

Fig. 1: Basic Proposed Model

The block diagrams of the transmitter and receiver is shown below as proposed in the system model.

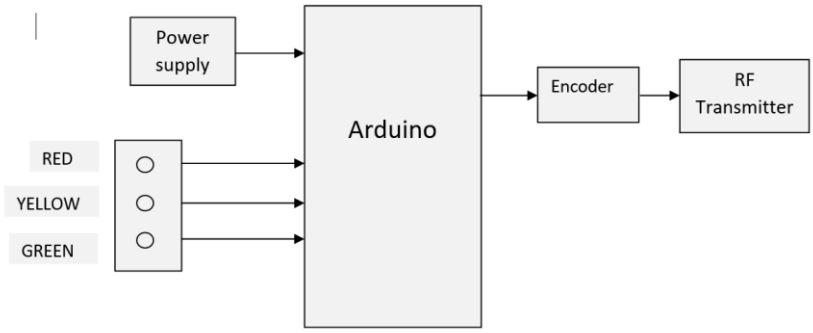

Fig. 2: Block Diagram of Transmitter (In traffic signal)

The arduino based signal transmitter is proposed to be fitted with traffic signal. The arduino produces the signal according to the display of the traffic signal. The signal is encoded and transmitted through encoder and RF transmitter as shown in figure 2 above.

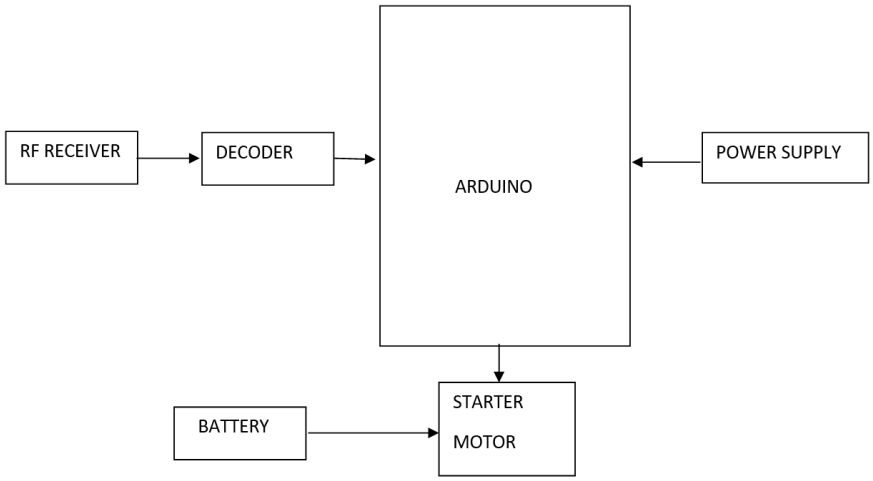

Fig. 3: Block Diagram of Receiver (In Vehicle)

The receiver is fitted on the vehicle which receives the signal. According to the signal received, Arduino controls the starter of the engine. This results in the reduction of the fuel consumption.

OBJECTIVES OF THE WORK

The work is carried out to attain the following objectives:

- Developing automatic on-off system for automotive.
- Reducing the fuel consumption
- Reducing the emission in automotive
- Developing the hardware of the system

SYSTEM DEVELOPMENT

The prototype of the system is developed with Arduino, transmitter and Receiver.

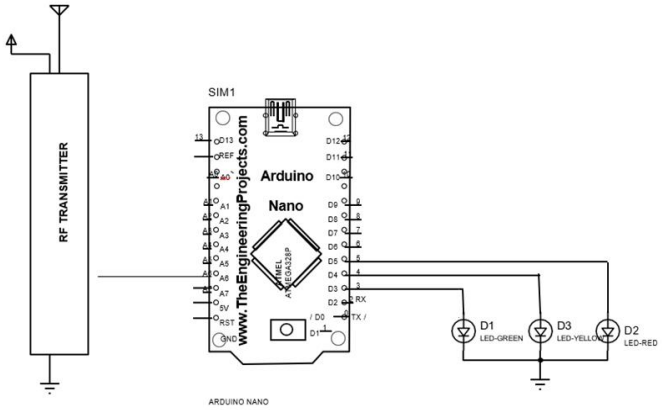

Fig. 4: RF- Transmitter

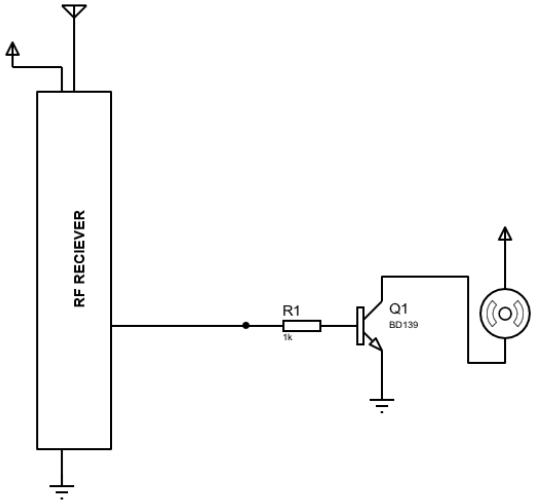

Fig. 5: RF- Transmitter

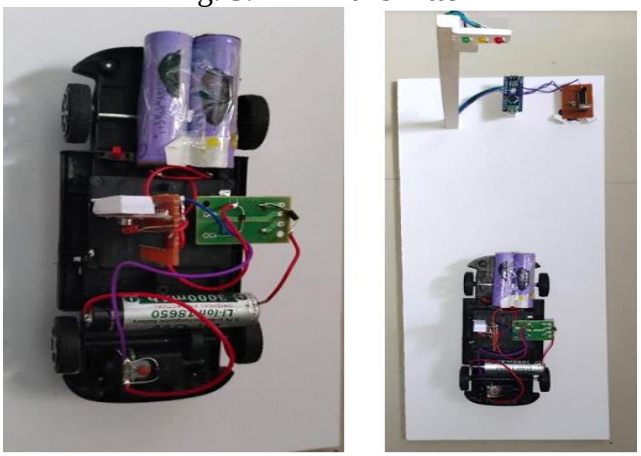

Fig. 6: RF- Prototype of the Proposed System

The prototype is implemented for the proposed system and it is observed that, the energy saving will be 20% with implementation of the system. The arrangement of clearing the lane with emergency vehicle is also possible with the system.

CONCLUSION

The conventional sources of fuel are limited and are getting consumed with developments in the world. Reducing the wastage of fuel will be beneficial for reducing the overall fuel demand. It is observed that the fuel is mainly wasted in automotive, when engine is on and in standstill condition. Authors have developed a prototype for fuel conservation system to address the issue. The proposed system is useful for fuel consumption which automatically turn on and of the engine on the basis of traffic signal display. The prototype is developed using Arduino and the trans-receivers for signal detection and communication. The system is found suitable for the automotive, while the actual system development is the part of future work with consideration of the vehicles and fuel consumption types of the vehicles.

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