Autonomous Driving in Traffic and Parking area using WSN for Fuel Consumption

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***Abstract*—The number of on-road vehicles have increasing day by day, thereby increasing the air pollution, wasting the fuels in traffic and parking areas particularly in metropolitan cities. In these areas most of the traffic jams where happening. At the time all the vehicles have run only in 1st gear or 2 nd gear, by this way there is huge amount of fuels get wasted. To overcome this situation the switch over method is used in it, which means at the time of traffic and parking area the vehicles have run through the DC motors by the help of ultrasonic sensors, line following sensors. At that time hand brake and car steering get unlocked. It can be controlled through the wireless sensor network. In the parking area whether the vehicle identifies any space, it automatically gets parked at the available space with help of line following technique and after that hand brake and car steering get locked and also motor get into off condition after the vehicle get parked. Again the user can pick up their car through RFID. In that situation hand brake and car steering get unlocked and motor get starts automatically. And then in the traffic area by using the obstacle detector the vehicle moves autonomously and separate space is allocated for ambulance and two wheelers for emergency purpose. In this driving the power supply is given to the motors through the solar panel and car dynamo.**

Keywords*—Ultrasonic senor; wireless sensor network; obstacle detector; line following sensor; Fuel Efficiency; solar panel

I. INTRODUCTION

In this world the daily requirements are very difficult to produce as well as the people supposed to destroy the environment for their needs. By using vehicles like four wheelers are wasting the fuels in the traffic and parking area.To control this situation there is the idea to make the vehicle to run autonomously by the help of DC motors without starting the engine. Because electric car does not give more efficient mileage for long travelling. So to implement this concept in fuel cars to avoid more fuel wastages. In the *Fig 1* and *Fig 2* says many countries launched the rules in traffic and parking areas. By using this method to the idea can implement in it.

Fig 1

Execution of Parking Rules

Fig 2

Execution of Traffic Rules

I. EXISTING METHOD

A. Traffic System

In traffic & parking area mostly all the vehicles moving in 1st or 2nd gear, in that way there is more number of fuels get wasted. In the below screenshots indicates the wastage of fuels in one metropolitan city. In below *Fig 3* represents the proof of google search.

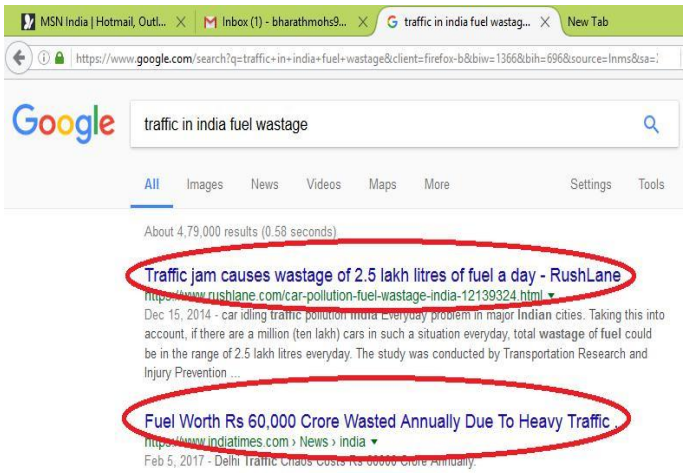


Fig 3 : Google search of fuel wastage

In the below concept *Fig 4* represents the traffic areas are monitored and stored in the database by the cloud computing process. In that way the traffic instruction are communicate to the vehicle drivers. Through that the drivers are change their direction in the less traffic way. In this way the travellers can save their time.

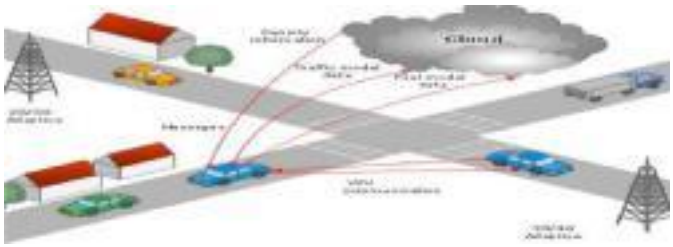


Fig 4 : Block diagram of Existing method (Traffic system)

B. Drawback of traffic system

- Need more storage space
- Difficult to implement
- Chance to accident

C. Parking System

By this system the vehicles are parked through the help of RFID is represented by *Fig 5*. Its main moto is to give the give the instruction to the each car of their vacant places before entering in to the parking area.

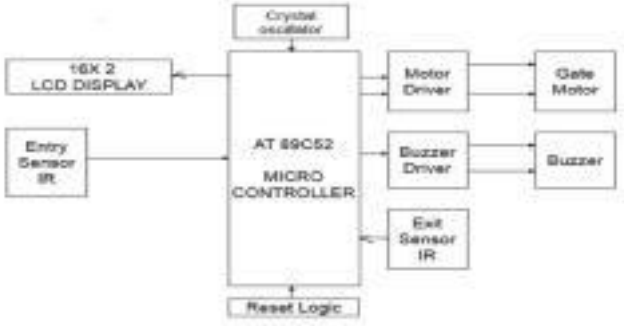


Fig 5 : Ciruit Diagram of Display method

D. Drawback of Parking system

- High power consumption in traffic area
- Large circuit
- Complex implementation
- Not equal to cost and benefits
- No fuel Consumption
- Causes air pollution

II. PROPOSED METHOD

A. Hand Unit

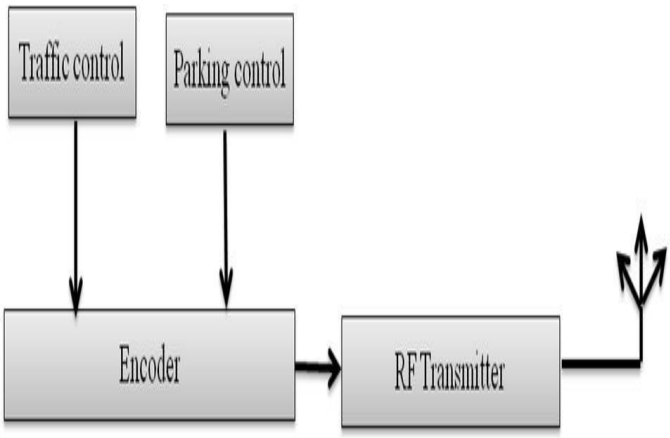


Fig 6 : Proposed method Block Diagram (Hand Unit)

In this unit *Fig 6* represents there is two types of the control should be handled in the appropriate areas. In the parking area all the sensors have worked for accurate parking. And in the traffic areas the obstacle detector sensor have work to avoid the overtaking another vehicles and also to avoid accident.

B. Vehicle Unit

To Overcome the existing method *Fig 7* represents there is the idea to introduce the new techniques. To find the space availability, ultrasonic sensors are used. Whether the vehicle identifies any space, it automatically gets parked at the available space with help of line following technique. The instruction to the vehicle is giving through RFID. And also in traffic area this technique is used to run the car automatically. By using the obstacle detector sensor the car can drive safely and then the vehicle could not overtake another vehicles to avoid the accidents in traffic jams.

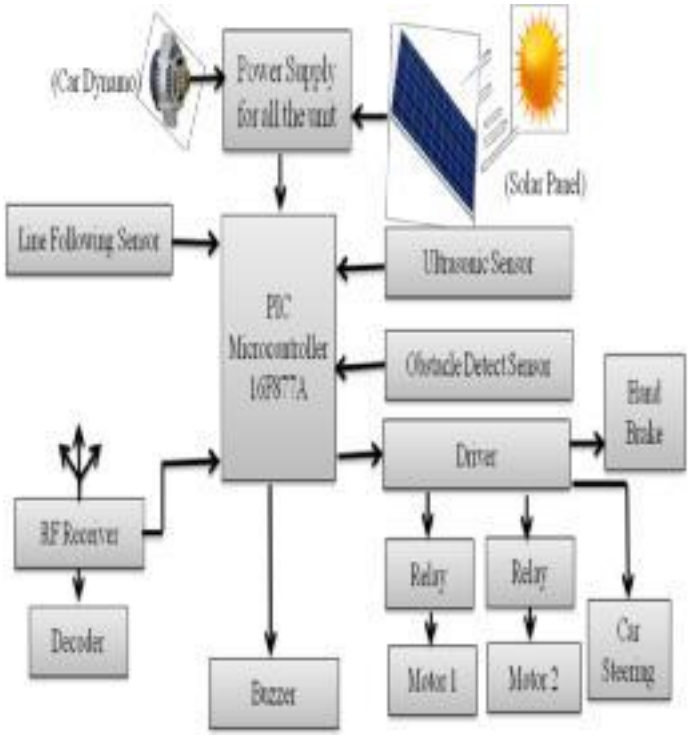


Fig 7 : Proposed method Block Diagram (Vehicle Unit)

III. SYSTEM WORKING

The proposed idea is to make the vehicles parking easy and safely. This project consist of two units, vehicle unit and hand unit. The vehicle unit is controlled through the RFID. In that time the vehicle is switch over the control of engine to the DC motors. And then to find the space availability,ultrasonic sensors are used. Whether. the vehicle identifies any space, it automatically gets parked at the available space with help of line following technique. This project will reduce the constraints in parking and saving the precious time of vehicle owners and also the consume more fuel. It should also helpful in Traffic area.

IV. HARDWARE USED

A. Microcontroller

PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in PIC 16877 is flash technology, so

that data is retained even when the power is switched off. Easy programming and erasing are other features of PIC 16F877. PIC16F877A microcontroller is used in the project.

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640.Originally developed by General Instrument's Micro electronics Division. The name PIC initially referred to "Programmable Interface Controller".Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability. Microchip announced on February 2008 the shipment of its six billionth PIC processor.

- It has inbuilt CPU, memory and peripherals to make it as a mini computer. A microcontroller combines on to the same microchip:
- CPU core
- Memory (both ROM and RAM)

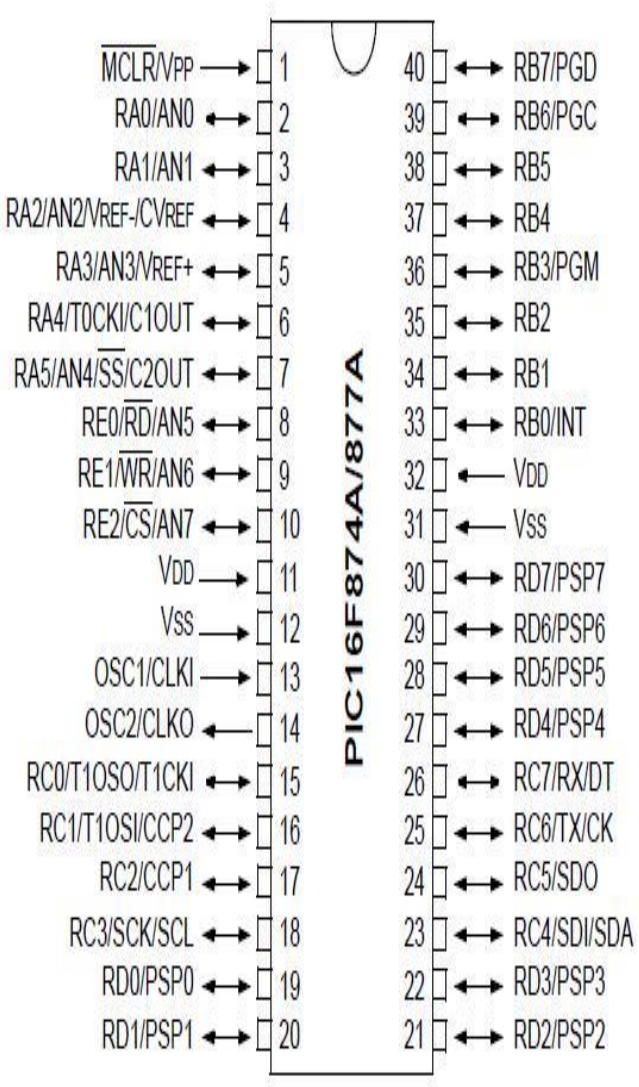


Fig 8 : Pin Diagram of PIC16F874A

B. IR Sensor

IR Transmitter

An IR LED' also known as IR transmitter, is a special purpose LED that transmits infrared ray in the range of 760nm wavelength.

Fig 9 **:** IR LED

An IR LED shown in *Fig 9* also known as IR transmitter, is a special purpose LED that transmits infrared ray in the range of 760nm wavelength. Such LEDs are usually made of gallium arsenide. The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED.

IR Receiver :

An IR led is operated in forward bias just like any ordinary led. When it is in reversed biased condition if there is no light falling on the diode it will decreased and TX. The basic sensor circuit will be as follows

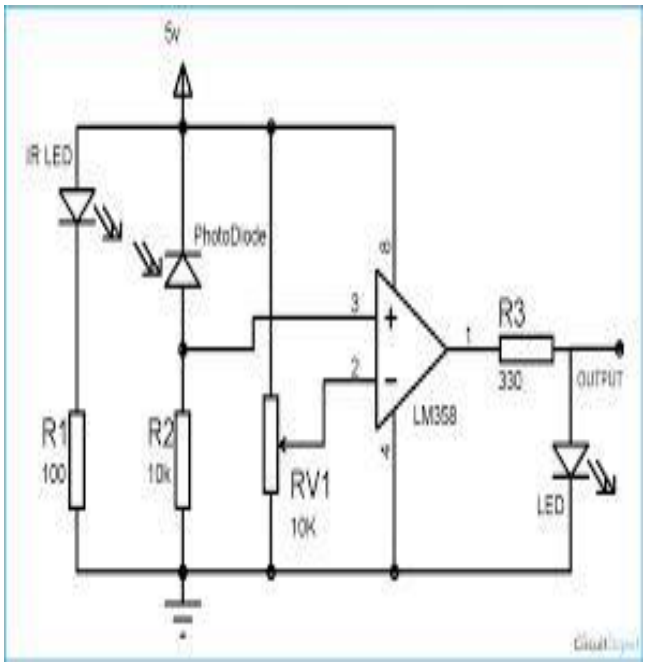


Fig 10 : Circuit Diagram of IR receiver

When the sensor is placed in front of a white surface the light emitted from led gets reflected on to diode so the

photodiode act as a short circuit. So the voltage at the output will be almost equal to 0v in case of black body or space then no light falls on the diode so it will act like an open circuit. So voltage at output will be almost equal to 5v.

C. Ultrasonic Sensor

Fig 11 : Ultrasonic Sensor

(i) Working Principle

In fig 8 represents the Ultrasonic ranging module offers a 2cm - 400cm non-contact measurement function, the ranging accuracy could reach up to 3mm. The building modules includes ultrasonic transmitters, receiver and control circuit.

The basic principle:

(1) Making use of IO trigger for at least 10us high level signal

(2) The Unit inevitably sends eight 40 kHz and detects whether there is any pulse signal back.

(3) If any of a signal is received back in a high level, time of high output IO duration is the time from sending ultrasonic signal and receiving it back.

Test distance = (high level time× velocity of sound (340M/S) / 2

(ii) Operation

Here electrical energy is transformed into sound to send the pulse. The sound that is received back is converted into electricity. Thus the time lag between the sent and received sound signal is used to estimate the distance to the object. Spacing between sensors is dogged by their beam angles. The sensors must be spaced so that they do not interfere with each other. This interference is sometimes referred to as "crosstalk". The target should be mounted perpendicular to the axis of the sensor.

D. RFID Transmitter and Receiver

RFID tag is a tiny device is represents in Fig 12 that stores and forwards the data to RFID reader. They are characterized in two types – active tag and passive tag. Active tags are contains an inherent internal battery and do not demands power from the reader. Stereotypically active tags have a longer distance range than passive tags. Passive tags are slighter and lighter in dimensions than that of the active tags. They do not contain an inbuilt battery and thus they look upon RFID reader for its operating power and undoubtedly have a lower range limited up to few meters.

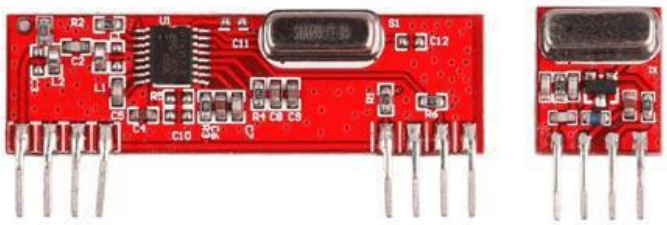


*Fig 12 :*Hardware of RFID *E. Encoder HT12E:*

The HT12E encoder is a CMOS IC built especially for remote control system applications. It is capable of encoding 8 bits of address (A0-A7) and 4 bits of data (AD8-AD11) information. Each address/data input can be set to one of the two logic states, 0 or 1. Grounding the pins is taken as a 0 while a high can be given by giving +5V or leaving the pins open (no connection). Upon reception of transmit enable (TE- active low), the programmed address/data are transmitted together with the header bits via an RF medium.

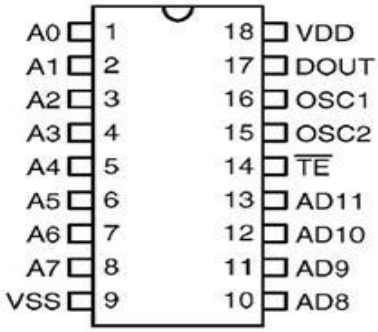
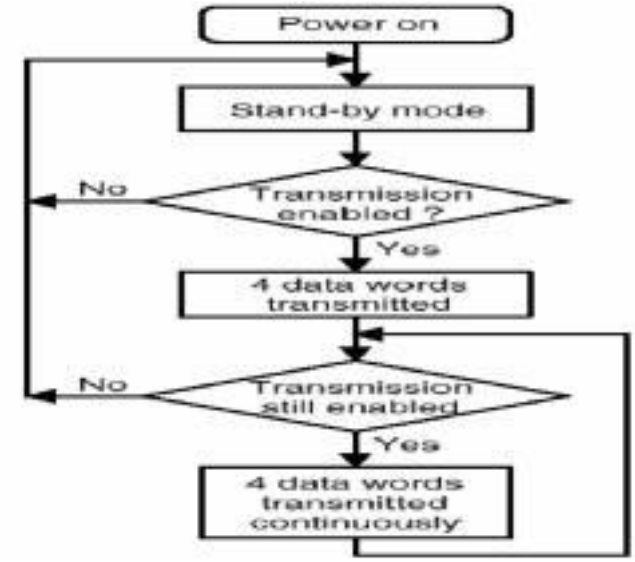


Fig 13 : Encoder PIN Diagram

Encoder Operation Flowchart



F. Decoder HT12D

The HT12D is a decoder IC made especially to pair with the HT12E encoder. It is a CMOS IC made for remote control system application. The decoder is capable of decoding 8 bits of address (A0-A7) and 4 bits of data (AD8-AD11) information. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from programmed encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses.

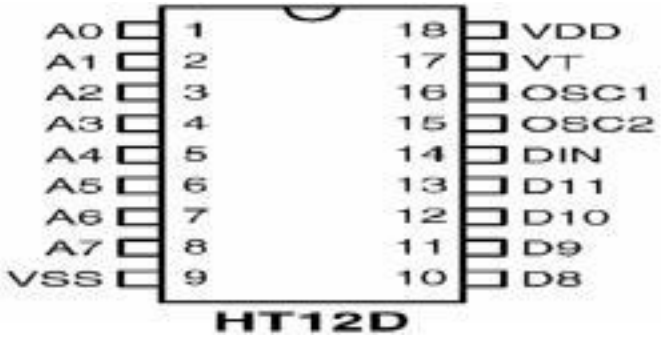
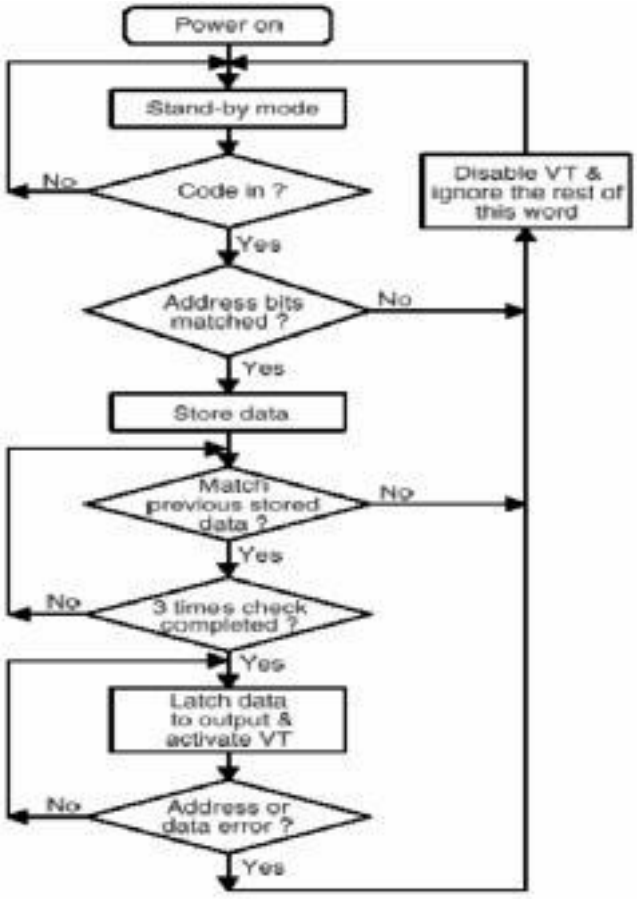


Fig 14 : Decoder PIN

Diagram Decoder Operation Flowchart



V. Output of Project

The work is to make the car to switch over the control of engine to motors by the RF id processor. And to execute the accurate parking and traffic rules.

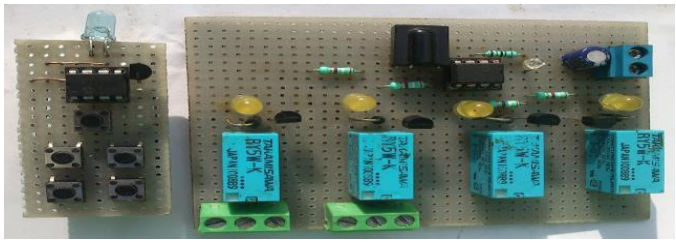


Fig 15 : Output of Hand Unit

In *Fig 15* represents the hand unit is the type of remote control which is used to control the vehicle through the RFID. It contains traffic and parking system. By choosing the command it will operate in it. It may need 9 volt battery supply. And in th Fig 12 the vehicle unit have the power of 5V DC supply is needed and the PIC microcontroller need 12 volt supply.

Fig 16 : Output of Vehicle Unit

Phase 1 – In this phase,5the discussion of the RF id for to control the vehicle through the wireless.
Phase 2 – In this phase, the encoder and decoder have operate the vehicle in the particular distance in the parking area to park the vehicles in appropriate place and also the autonomous driving in traffic .
Phase 3 – In this phase, PIC microcontroller is the main controller for all the devices and also to implement the programs through it.

Result and Discussion

- This section analyses the results obtained from the investigation of the proposed method it will save more fuel particularly in metropolitan cities.
- The performance is evaluated based on the following metrics: Sensitivity, Specificity, Accuracy, and implementation.

- During the testing phase, it do not disturbs any living things and it could not make any losses.
- In the proposed work, there is the well controlling of our environment.
- Whereas, it make happen for all possible manner including the emergency purpose also.

Implementation Procedure in Real Life

STEP 1:

Make awareness to the car manufacturing company to construct the car by fixing these facilities. STEP 2 :

And make the government to involve in this project and give much more support to the constructing the roads and parking area.

STEP3 :

Finally all people should combine to follow the rules and regulation for to save the fuel and also save our environment.

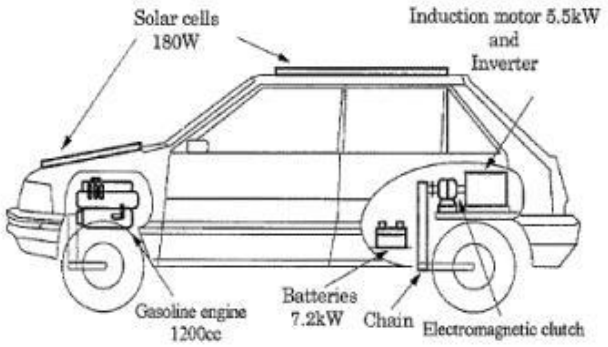


Fig 17 : Design of car in raeal life

Advantages

Fig 18 : Advantages of implements

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