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Control of Air Temperature Inside the Parked Cars using Solar Energy

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Abstract*: In this paper the low cost car cooling system is implemented. The system is useful during the hot weather. During the hot summer the air inside the car gets influenced and the risk of health issues are more. The proposed system is designed to overcome this problem. Here the solar panels are used for absorbing the solar energy and are used to charge the battery. The rechargeable battery is used to power the circuit. For the cooling system, a simple micro fan is mounted and the Wi-Fi module is used for controlling the operation of the fan through the user friendly mobile application.
***Keywords*; Solar panels, Rechargeable Battery, Wi-Fi module, Mobile Application, Micro fan.**

I. INTRODUCTION

Embedded system plays a major role in the present technology. Embedded system is used in the day to day life. It is used in many of the controlling devices. The main purpose of using embedded system is for the controlling. Earlier the embedded system used was computer based and nowadays the embedded system is based on microcontrollers. Here the proposed system is also an embedded system and IOT based.

The temperature i.e. the weather condition is of high temperature during summer. There are many issues we face due to high temperature. One of the issues is the suffocation inside the parked car. The temperature inside the parked car increases more than the ambient temperature.

The heated up air inside the parked car leads to many health issues. Health issues like giddiness, sudden increase in body temperature etc. if the passenger is a physically disabled, baby or the elderly person then the risk is more. Even though it's not a very serious issue leading to death, it is definitely an issue which everyone should take care.

The main objective of the system is to provide the low-cost cooling system. The heat exchange inside the parked car is the main objective of the proposed system. The solar panels are mounted on the roof top of the car so that the system needs fewer amounts to be spent on the fuel. The system is designed to be efficient for keeping the air temperature in control by the owner of the car.

Paper is organized as follows. Section II describes the car cooling system inside the parked car and about the battery usage, block diagram and the methodology is given in Section III. Section IV presents experimental results. Finally, Section V presents conclusion.

II. RELATED WORK

The thermoelectric element [1] is used for cooling the air inside the parked cars. The rechargeable battery is used to power up the overall system. The petroleum products usage is more seen in the transportation [2]. Another few years the petroleum products availability decreases. Therefore the solar energy is utilized to charge the rechargeable battery. To obtain the electrical energy from the solar energy directly, PV cells are made use. Using solar energy the cars are also built. Cars run on the solar energy instead of the petroleum products. In order to interface the Photovoltaic array and DC load the two uni-directional DC ports are used [3]. Even one Bi-directional DC port is utilized to interface the battery. The weight of the solar panel plays a major role in the air crafts vehicle. Heavier the weight if the height of the altitude increases. [4]

III.METHODOLOGY

The proposed system is a real time embedded system. It uses the solar energy to charge the battery. The solar charger is connected between the solar panels and the battery. The solar charger helps in controlling the charging and discharging. The block diagram is as shown in the figure 1.

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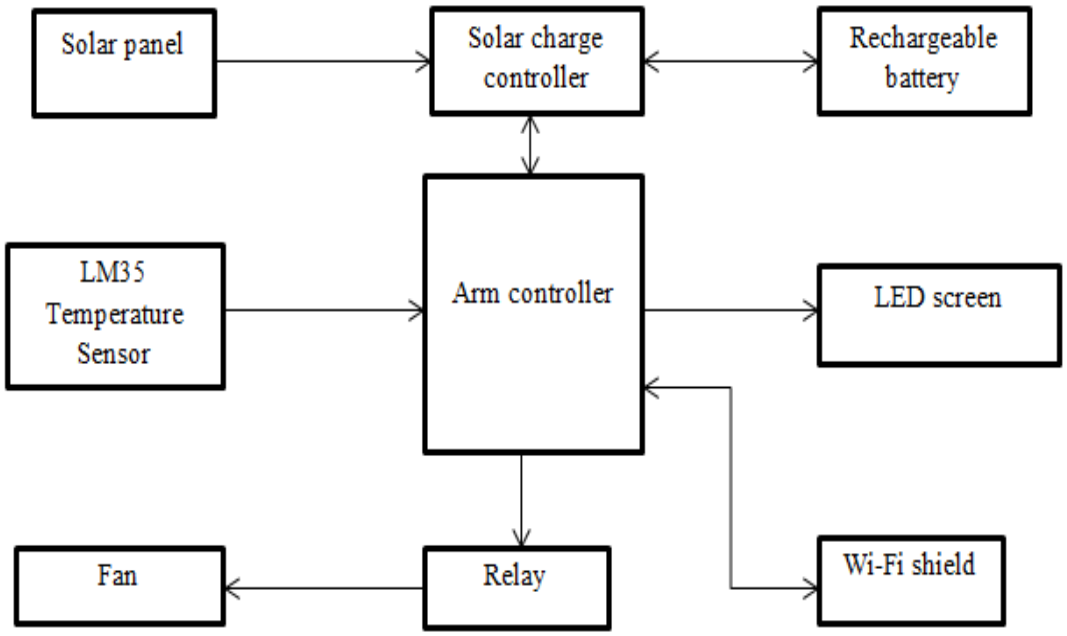


Figure 1: Block diagram of the proposed system

The temperature sensor is placed inside the car. When the owner wants to know about the temperature inside the car he can know it through user friendly mobile application. Through which owner can control the ON and OFF of the fan. By using Wi-Fi module the access of the application and controlling of fan becomes easier. Relay is used for the switching action and LCD screen is used to know about the process. The overall procedure is controlled by ARM controller.

When the solar panels absorb the solar energy and it is made to charge the battery through solar charger. So from the solar panel the charge goes to solar charger. From there it goes to battery. Again from battery it charges the solar charger and the solar charger is connected to voltage divider circuit, through which the ARM controller is powered up. When the owner opens the user friendly mobile application the temperature value is updated. The temperature updating process is based on IOT technology i.e. the Wi-Fi module is used. The temperature sensor is used for sensing the temperature. If the owner of the car wants to TURN ON or TURN OFF the fan he can do it through the mobile application. The controller controls the relay and the fan is operated according to the need.

A. Hardware

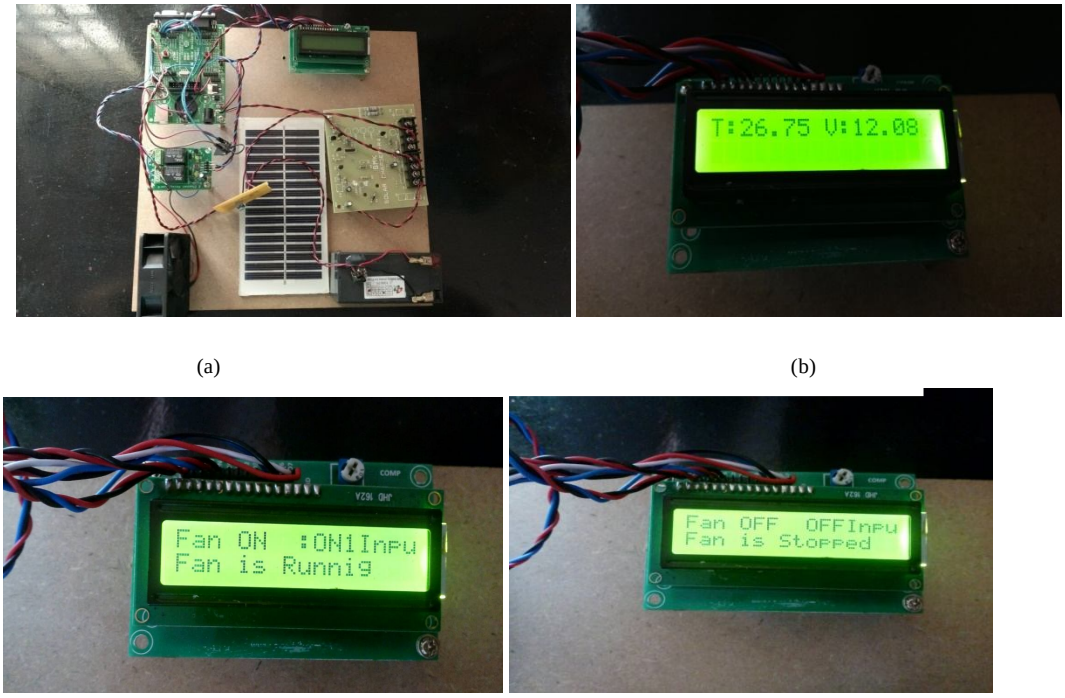
1) *Rechargeable battery:* The battery used is of the capacity 12V, 1.2Ah. The ratings are suitable for the proposed system. The type of the battery used is a sealed battery i.e. valve regulated lead acid battery which is abbreviated VLRA.
2) *Temperature sensor:* LM35 temperature sensor is used. It has the sensing range of -55^0C to 150^0C. by making use of LM35 temperature sensor we need not to subtract any big constant value after we obtain an output because temperature sensor gives the output in centigrade.
3) *Solar panel:* Solar panel used is of 7V, 1.3W power. The dimension of the solar panel used is 180x90mm.
4) *Solar charger:* The solar charger is a PWM charging system which helps in having the long life span of the battery. The PWM used is more efficient because the duty ratio of the switches is adjusted.
5) *Wi-Fi module:* Here the Wi-Fi module used is ESP8266 Wi-Fi module which is of low cost. It requires 3.3V to power up.
6) *LCD Screen:* The LCD screen used is of 16x2. It is used to know the status of the operation of fan and the temperature reading.
7) *Relay:* Relays are used for switching purposes. It is of the rating 12A, 24VDC. Normally closed and te common pins are utilized for the switching action.
8) *Fan:* the micro fan used is of the rating 12VDC, 0.25A.

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IV. EXPERIMENTAL RESULTS

The figures show the experimental results of the proposed system i.e. the cooling system inside the car. The step by step procedure is shown in the figures below.



(a) (b)

(c) (d)

Figure 2: (a) Overall view of implemented system (b) Indication of temperature (c) Fan running indication (d) Fan being stopped indication

IOT technology implementation is shown below. The temperature indication in the mobile phone is captured and it is show shown below.

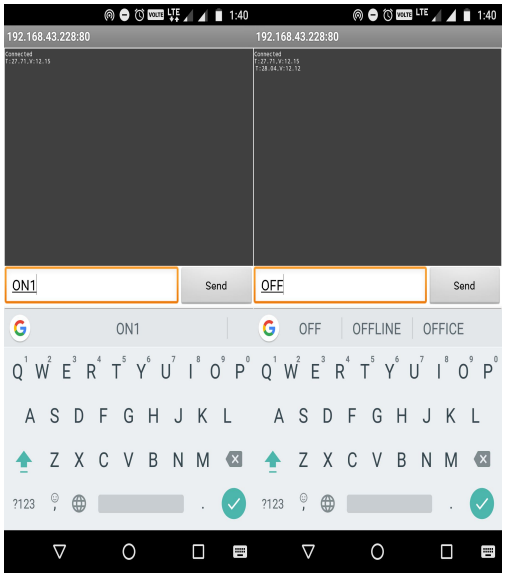


Figure 3: Temperature indication in Mobile phone and the control of fan to TURN ON or TURN OFF through mobile.

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V. CONCLUSION

The proposed system is implemented successfully. The system which is implemented is an eco-friendly system. The cooling system can be done in a larger value by increasing the power. The implemented module is successful in cooling according to the design. The fuel consumption is reduced and it is cost efficient since the IOT technology is also involved in it.

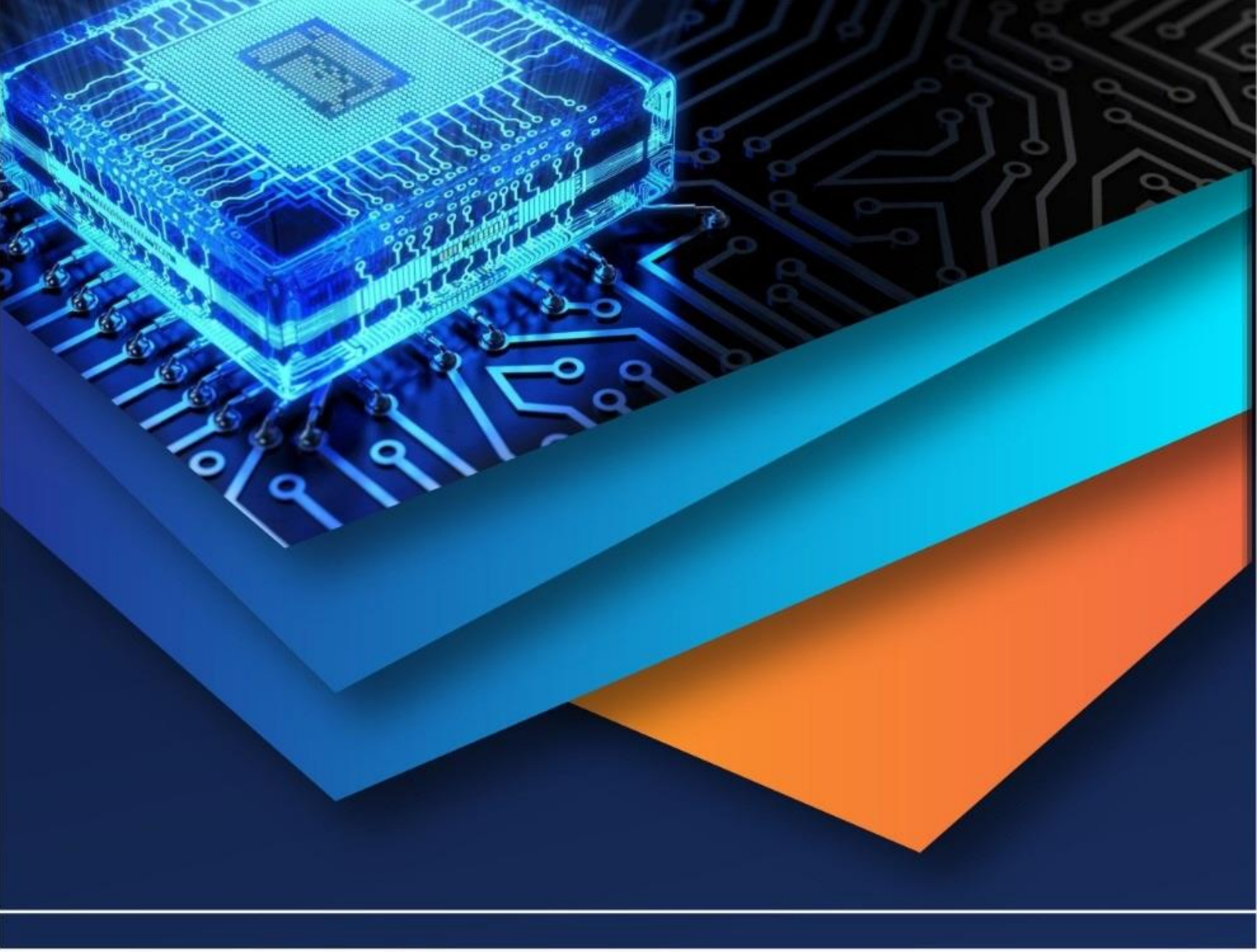
VI. ACKNOWLEDGMENT

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