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Solar based Application for Soldiers with Temperature Varation

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Abstract: Soldiers or army plays an vital role in protection of nation and maintaining nation's peace. To survive in extreme weather conditions it is much more difficult for human being/ soldier while protecting the nation. There may be extreme hot or extreme cold conditions of weather. So considering all this we are going to design a framework in protection of soldiers. In this framework we are going to design microcontroller based soldier jacket in which two main biometric sensors will be used i.e. heart beat and temperature sensor. Along with this GPS is also connected to microcontroller which is used for tracking location of the soldier. This Uniform will make the soldier to work in any kind of environment.
Keywords: Embedded System, ARM Microcontroller, Solar Panel, Sensors, Peltier Plate.

I. INTRODUCTION

Soldiers are the Army's most vital asset and the spine to keep the country's tranquillity in place. They will dependably be the one in charge of taking and holding the obligation in extraordinary climate conditions consistently. While giving security to the country, they may confront inconveniences in extraordinary sweltering or cool climate conditions. We have planned and delivered a sun based fueled warm coat which gives better security to them who are working in extraordinary climate conditions. Here we utilized a peltier plate of 5V, 500mA supply for cooling and warming the coat. This peltier plate, basically called as thermo electric cooler, will be controlled by a level plate sun oriented board. A 12 V Direct Current lead corrosive rechargeable battery is utilized for putting away the vitality.

Sun powered vitality is brilliant light and warmth from the sun outfit utilizing a scope of consistently advancing advancements, for example, sun oriented warming, sun powered photograph voltaic, sun powered warm vitality, sun based design and simulated photosynthesis. It is a critical wellspring of sustainable power source and its advancements are extensively portrayed as either uninvolved sun based or dynamic sun based relying upon the way they catch and circulate sun based vitality or change over it into sun based power. Dynamic sun oriented methods incorporate the utilization of photovoltaic frameworks, concentrated sun based power and sunlight based water warming to outfit the vitality. Uninvolved sun powered methods incorporate situating a working to the Sun, choosing materials with positive warm mass or light scattering properties, and planning spaces that normally circle air.

The Earth gets 174 Peta Watts (PW) of approaching sun oriented radiation at the upper air. Energy reflected back to space is around 30% while the rest is consumed by mists, seas and land masses. Earth's territory surface, seas and climate retain sunlight based radiation, and this raises their temperature.

II. GOALS AND OBJECTIVES

A. To provide safety for soldiers
B. Track the location of soldier.

III. LITERATURE SURVEY

[1] This paper presents the design of a wearable energy harvesting jacket, which harvests energy from solar and body heat in the outdoor environment. The energy harvesting system consists of 16 photovoltaic (PV) cells, 12 thermoelectric generators (TEGs), and five power management chips, and it charges two AAA NiMH batteries in series. The 16 PV cells are partitioned into four zones (chest, back, right and left shoulders), where PV cells in the same zone are roughly subject to the same irradiation level. All the PV cells in the same zone are controlled to operate at nearly the same maximum power point.

Six TEGs are connected in series to increase the output voltage, and two sets of those six TEGs are controlled by the same power management circuit. The average power harvested by the solar system ranges between 475 mW to 500 mW on a sunny day. The power generated by TEGs lies in μW range due to the low temperature gradient available within the jacket. The prototype illustrates the proposed solar energy harvesting system with partition of cells into different zones is simple, yet effective.

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[2] The present work was performed to apply thermoelectric technology to a low power dehumidifying device as an alternative to the conventional vapor-compression refrigeration systems. The experimental prototype of a small-scale thermoelectric dehumidifier (TED) with rectangular cooling fins was built and its operation performance was studied experimentally.

The results showed that the TED experienced two typical thermodynamic processes including the cooling dehumidification and the isothermal dehumidification, where the latter was dominated.

It was found that there existed a peak during the variation of the average coefficient of performance (COP) as a function of the input power of the thermoelectric module. Under the present experimental conditions, the COP of the TED reached the maximum of 0.32 and the corresponding dehumidifying rate was 0.0097 g/min, when the input power was kept at 6.0 W. The rapid elimination of condensed liquid-drops on the cooling fins amounted on the thermoelectric module is a major approach to improving the operation performance of the TED.

[3] Non-traditional approach to explain the thermoelectric cooling is suggested. It is based on the Le Chatelier Braun thermodynamic principle. New effect of cooling and heating of junction of two materials (barrierless thermoelectric cooling) is theoretically predicted, and this effect is different from the Peltier effect (barrier thermoelectric cooling). The suggested thermoelectric effect must be displayed always at the finite values of the junction surface heat conductivity η. Barrier less thermoelectric effect occurs even in the case when the conducting materials are identical with the same Peltier coefficients. It is shown that both barrier and barrier less thermoelectric cooling effects always exist simultaneously in the general case. The reasons proving reversibility of the thermoelectric cooling process are resulted.

[4] A Framework for Optimizing Thermoelectric Active Cooling Systems Contents: Thin-film thermoelectric cooling is a promising technology for mitigating heat dissipation in high performance chips.

In this paper, we present an optimization framework for an active cooling system that is comprised of an array of thin-film thermoelectric coolers. We observe a set of constraints of the cooling system design. Firstly, integrating an excessive amount of coolers increases the chip package cost. Moreover, thermoelectric coolers are active devices, which dissipate heat in the chip package when they are in operation.

Hence, setting the supply current level to operate the cooler improperly can actually lead to overheating of the chip package. Besides, the supply current needs to be delivered to the integrated cooler devices via dedicated pins. However, extra pins available on high-performance chip packages are limited. Observing these constraints, we propose an optimization framework for configuring the active cooling system, which minimizes the maximum silicon temperature. This includes determining the amount of coolers to deploy and their locations, the mapping of supply pins to the coolers, and determining the current levels of each pin. We propose algorithms to tackle the optimal configuration problem.

We found that only a small portion of the silicon die needs to be covered by TEC devices (18% on average). Our experiments show that our algorithms are able to reduce the temperatures of the hot spots by as much as 10.6 oC (compared to the cases without integrated thermoelectric coolers).

The average temperature reduction is 8.6 oC when 4 dedicated pins are available on the package. The total power consumption of the resulting active cooling system is reasonably small (~2 W). Our experiments also reveal that our framework maximizes the efficiency of the cooling devices. In the ideal case where hundreds of pins are available to tune the supply level of each individual cooler, the additional average reduction of the hot spot temperature is only 0.3 oC.

[5] In present scenario refrigeration and air conditioning, because of energy consumption is a big issue of our country. For reducing the energy consumption, several researchers had performed work to enhance the proficiency of refrigeration system and lessen the energy consumption.

Thermoelectric refrigeration is an eco-friendly (sustainable) technique used for producing refrigeration effect. Thermoelectric devices are developed based on Peltier, Seebeck and Thomson effect which has experienced major advancement and development in recent years. This review paper is based on thermoelectric refrigeration system, explored by the many researchers. This paper encapsulates the advancement in thermoelectric refrigeration with the help of solar panel, design methodologies, application in domestic appliances.

IV. PROBLEM STATEMENT

Due to thrilling weather conditions it becomes difficult for soldiers to survive. So, we are going to design a system in which biometric sensors and microcontroller will be used to maintain the temperature of soldier and continuously monitor the heartbeat of soldier. Also we are going to use GPS system to continuously monitor the location of soldier.

V.SYSTEM ARCHITECTURE

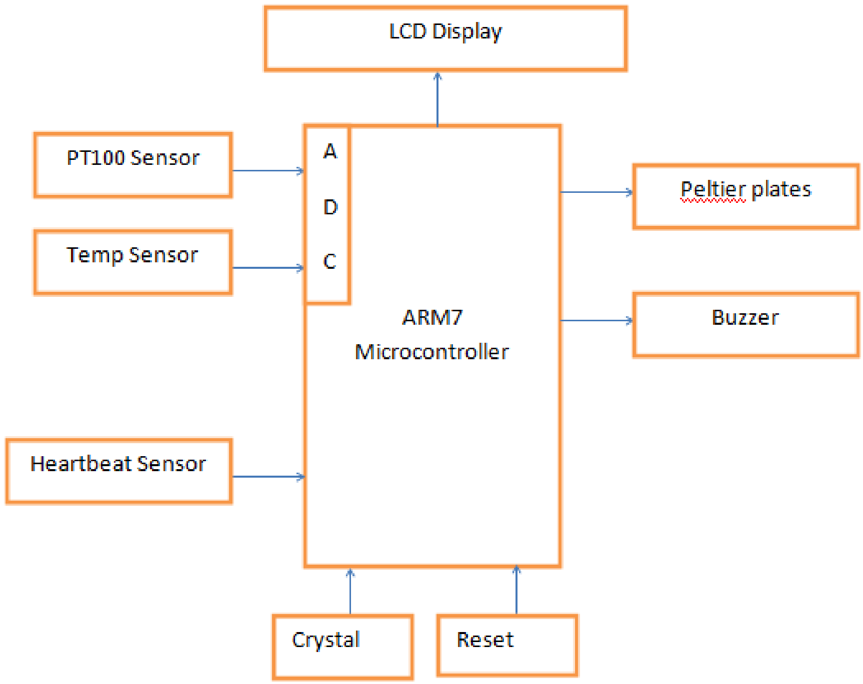

Fig1. System Architecture

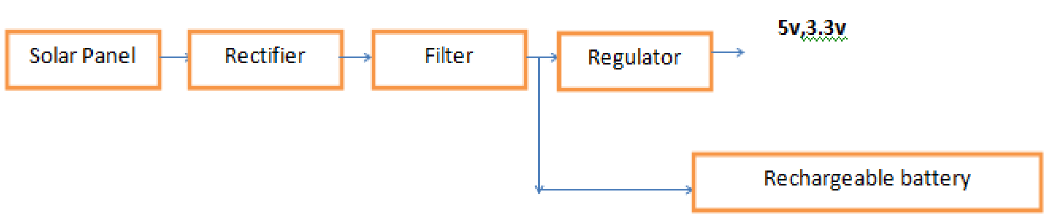

Fig2. Power Supply

In this project solar panels to be used for charging a Lead Acid Battery (12V, 1.2 Amp hrs), a peltier thermoelectric gadget which when associated with battery creates cooling impact on one side and warmth is scattered on opposite side through warmth sink. A regulator is utilized to drive the inward cooling fan and LED. Here we are utilizing Micro controller (LPC2138) permits dynamic and quicker control. Liquid crystal display (LCD) makes the framework easy to understand. Here we are using LCD Display for displaying the values of present and maximum voltage values which are present in the rechargeable battery. This system will operate in two modes winter mode and summer mode. These modes can be decided on the environmental temperature that will be sensed by temperature sensor. By selecting the mode of operation, it can drive body heater/cooler. The cooler or heater in turn will support us to provide warming or chilling effect inside the soldier's uniform which aids the soldier to endure to any kind of external environment and he can work efficiently without cold stress or heat stress. Then biomedical sensors are to be add to monitor health status of the soldier. Body temperature and heartbeat will be monitored continuously. If any of these two parameters seen abnormal, buzzer will blow for indication.

VI. CONCLUSION

By using this project in real time applications the thermal jacket can help soldiers to work even in extreme weather conditions. As we are using renewable energy source so the system will be highly durable. With the help of GPS technology location updates of can be monitored continuously in the control room.

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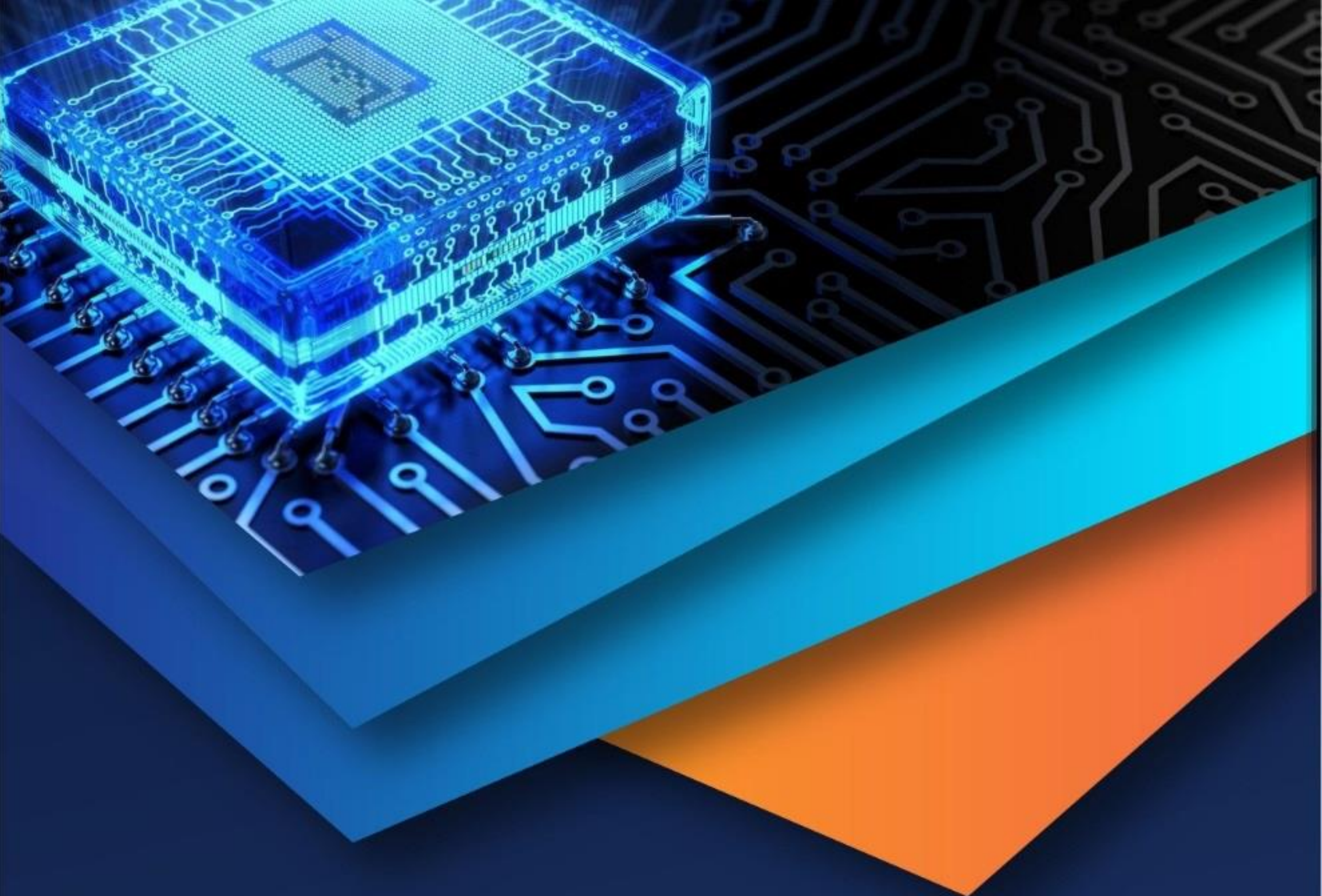

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