SOLAR BASED E-UNIFORM FOR SOLDIERS

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ABSRTACT

Soldiers working in harsh climates will benefit from the improved protection provided by solar-powered E-Uniforms. The E uniform's interior electronics is powered by solar panels. Rechargeable lead acid batteries are used to store energy. It is possible to charge a battery using a regular battery. All functions are controlled by the LPC2148 microcontroller. In order to show battery voltage on a 16X2 LCD, an ADC voltage sampler is connected to the system. A new E-Uniform built for troops who operate in adverse weather conditions has been presented in this study. The soldier will be more comfortable working in a variety of settings thanks to this uniform. The circuit is installed on a jacket.

INTRODUCTION:

The Internet of Things (IoT) was first thought of as a network of devices with unique identifiers. Remote computers linked to the Internet might be used to track, control, or monitor the gadgets. IoT expands the usage of Internet providing the communication, and hence internetwork of the devices and physical things, or 'Things'. The two important terms in IoT are "internet" and "things". When you think of the Internet, you're referring to a worldwide network of interconnected servers, laptops, tablets, and smartphones. The Internet facilitates the exchange of information. There are a plethora of ways to say "thing" in the English language. Thing, as defined in the Oxford English Dictionary, is an expression that may refer to anything from a physical item to a concept to a situation or activity. Devices and physical items may connect with each other and collect data in distant places, making it possible for the Internet of Things (IoT) to be used in a variety of activities and services. In this vision, integrated sensors, computers, and communication devices are used to make everyday items (watches, alarm clocks, and other wearables) smart and alive by interacting with distant objects or people through connection. The scalable and resilient nature of Cloud computing is enabling developers to design and host their apps on it. IoT and the cloud go hand in hand since the cloud serves as a platform for storing and retrieving sensor data from many locations[11]. These causes gave birth to the fusion of both technologies therefore leading to the establishment of a new technology called Cloud of Things(CoT) (CoT). It was possible to access, monitor, and operate the objects (nodes) in CoT from any distant place through the cloud. Due to tremendous scalability in cloud any number of node might be added or withdrawn from the IoT system on a real time basis. IoT may be summarized as an equation: Physical Object + Controller, Sensor, and Actuator + Internet = Internet of Things. With the rise of the Internet of Things, establishing a Smart City is now a reality.

EMBEDDED SYSTEM:

It is a computer system that includes both hardware and software. All of the components of a bigger system may be integrated into an embedded system. embedded systems may be found in a wide range of products, from industrial machinery to vehicles and medical equipment to cameras and domestic appliances to vending machines and toys.

We can't do anything with an embedded system, therefore it's called that. For example, we can only wash our clothing with a washing machine. We shall only use a microwave oven to heat the items. But we did come up with a general-purpose system of our own. Using a laptop, for example, we create the numerous apps. Word documents may be created, for example, in Microsoft Office.

In the past, a mobile phone was only used for a single application. As a result, it falls within the category of an embedded system. Nowadays, smartphones are regarded as "general purpose systems" since they are capable of performing a wide range of functions.

CLASIFICATION OF EMBEDDED SYSTEM:

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Fig 1: TV with Remote

Example: A few milliseconds of delay will not harm either the television or the remote control in the case of a TV remote control system. Soft real-time embedded systems refer to systems that will not cause harm if they are not used for a long length of time.

Network communication embedded systems:

Embedded systems provide for a broad variety of network-interfacing interactions. Consider the usage of an internet-connected web camera to transfer photographs, images, videos, and other types of media to another computer on the internet anywhere in the globe. Consider installing a webcam on the doorknob to monitor entry and exit. An picture of a person is sent to your computer's internet-connected desktop every time a person walks by. With a single click of the mouse, you may unlock the door lock after receiving an alert message and a picture on your computer's desktop.

Fig 2: Network Communication Embedded System

EXMPLEOFEMBEDDED SYSTEM:

One silicon chip houses all of the components of a microcontroller, including a high-performance central processing unit (CPU), multiple I/O interfaces (such as a serial port, parallel port, timer or counter), an interrupt controller, and interfaces for data acquisition (such as an A/D or D/A converter). Specialized microcontrollers are designed to do a single task.

Using sensors and other input devices, a microcontroller may display or operate output devices like fans and motors, or it can do both, as demonstrated in the example below.

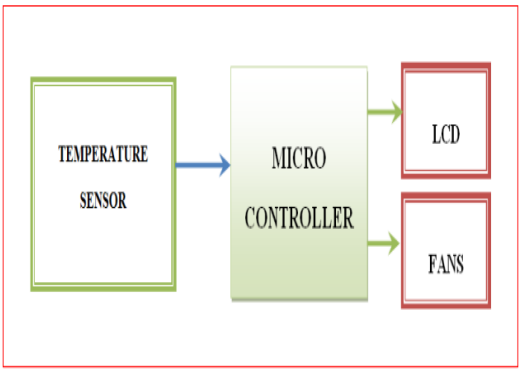

Fig 3: Application of microcontroller

The Temperature sensor may provide an electrical output whose value is directly proportional to the temperature (measured in °C). In order to measure temperature in °C, for example, an integrated circuit temperature sensor called the LM35 may be used.

An external source of input is received by the Micro controller, which then routes it to the appropriate devices according to its own internal programming.

The current temperature is shown on the LCD. It is also possible to use a microcontroller to turn on and off the fan in response to changes in ambient temperature.

STM32 MCU:

An integrated circuit from STMicroelectronics, the STM32 is a 32-bit microcontroller integrated circuit. The Cortex-M33F, Cortex-M7F, Cortex-M4F, Cortex-M3, Cortex-M0+, and Cortex-M0 are all STM32 processors based on the same 32-bit ARM processing core. Each microcontroller has a processing core, static RAM, flash memory, a debugging interface, and a variety of other peripherals built in.

Fig 4: STM32 MCU

ARM CortexM33F, Cortex-M7F, Cortex-M4F, Cortex-M3+, and Cortex-M0 cores make up the STM32 family of microcontroller ICs. [1] Licenses from ARM Holdings allow STMicroelectronics to use the ARM Processor IP. For each design, ST selects a different configuration for the ARM core design from a variety of possibilities. Before the design is turned into a silicon chip, ST inserts its own peripherals to the core. A list of STM32 microcontroller families may be found in the following tables.

STM32 Series	ARM CPU Core
L5, U5	Cortex-M33F
F7, H7	Cortex-M7F
F3, F4, G4, L4, L4+, WB	Cortex-M4F
WL	Cortex-M4
F1, F2, L1	Cortex-M3
G0, L0	Cortex-M0+
F0	Cortex-M0

POWER SUPPLY:

This article will show you three alternative methods for powering up your Arduino Uno or Nano. While working on any Arduino project, it's essential that you're familiar with these power supply flexibility approaches.

Using USB cable:

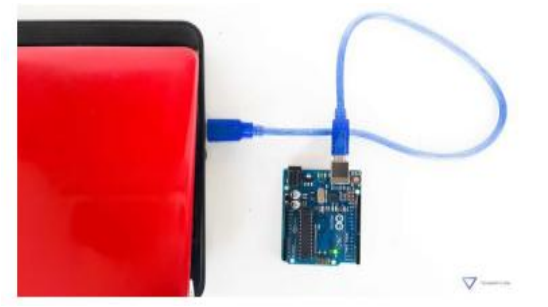

Fig 5: An Arduino Uno powered up using a USB cable

You may link your Arduino Uno to a computer via the USB connector. At 5V, the board receives 500mA of electricity if it is enumerated (i.e. recognized by the computer). 100mA at 5V is given if the connection is not listed.

Batteries with a voltage of more than 5 volts:

Using a 9-volt battery, connect the positive end to the Vin pin, while the negative end goes to GND. The Vin port accepts input voltages ranging from 7 to 12 volts, however a 9-volt battery is recommended. It is possible to use 12V, but keep the current values below 500mA for your application.

Fig 6: Connection layout to supply power to the board using a 9V battery

SOLAR PANEL:

There are several applications for solar cells and panels. Calculators, watches, and flashlights all use them. Toys, radios, and MP3 players may all be powered by the sun. Currently, there are solar-powered mobile phones and pagers on the market. You don't have to worry about running out of batteries when you use solar-powered gadgets like these. Road signs and bus stops may occasionally be lit using power generated by solar panels. For example, they might power parking meters and roadside emergency phones.

Fig 7: Solar panel The Sun constantly gives off energy.

Electromagnetic radiation carries the energy across space. Electromagnetic radiation comes in a variety of forms. One sort of light is illuminating. Another example is the transmission of information through radio waves. Unlike waves in water, electromagnetic radiation travels in a straight line. It goes up and down like a wave in the ocean. In terms of wavelength, electromagnetic waves are distinct from one other. Between two consecutive rises (or falls), this is the distance. Radio waves have longer wavelengths than visible light. The wavelength of red light is longer than that of blue light.

What Light Do Solar Cells Use?

There is a limited amount of solar energy that reaches Earth's surface. Some of the sun's rays are reflected back into the atmosphere. Some of it is taken up by the atmosphere. Visible light is the predominant kind of solar energy that reaches the Earth's surface. This light's energy can be harnessed by solar cells to generate electricity. However, not all types of light are compatible with them. Because different solar cells have varying efficiencies, their wavelengths must also vary. Cells are only able to utilize some of the sun's rays. A wide variety of solar cells are available. Some are smaller than a postage stamp in size. Sizes range from 3 inches to 5 inches (12 centimeters). A semiconductor is the substance used

to construct the cells. Silicon is the most common material used. It is possible for semiconductors to conduct electricity. However, they fall short of metals in this regard. Because of this, they are referred to as "semi." They can be used to regulate electric current since they only "semi-conduct" electricity. Metal contacts are often found on the top and bottom of these devices, allowing current to pass through them. Silicon is found in two distinct layers in a typical basic cell. The other is called n-type. p-type is the other kind Each layer is distinct from the next.

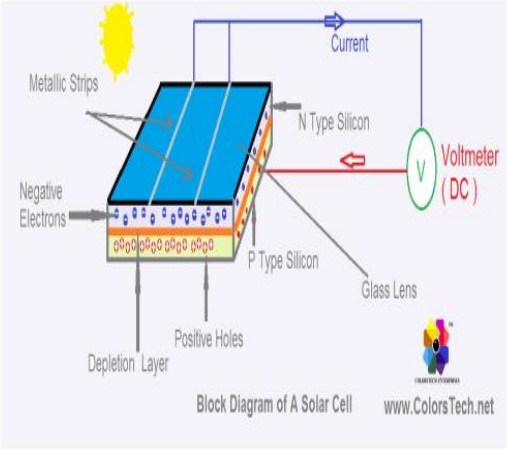

Fig 8: Block Diagram of a Solar cell

How Solar Cells Convert Solar Energy into Electrical Energy When silicon atoms absorb light, the electricity-generating process starts. The energy of the light knocks certain atoms' electrons out. The electrons fl ow between the two layers. Electricity is generated as a result of the flow. Metal connections allow the current to flow out of the cell and be put to use. When light hits a solar cell, much of its energy is wasted. The cell reflects or transmits some light. Heat is generated from some of it. Only light with the right wavelengths, or colours, is absorbed and then turned into electricity.

Only a little amount of power can be generated by a single solar cell. Many situations need the addition of more. As a result of this, cells are commonly grouped together to create solar modules. The cells are held in place by the module's frame. The length and width of some modules exceeds three feet. Many of them are capable of producing as much as 400W of power. Modules may be combined to build a larger solar array if additional electricity is required.

GPS:

GPS, or Global Positioning System, is a satellite navigation system that provides position and time information to the user under all weather circumstances. In addition to ships and aircraft, GPS is also utilized in automobiles and trucks for navigation. Using the system, military and civilian users around the world can take advantage of critical functionalities. GPS provides real-time, three-dimensional positioning, navigation, and timing around the world in real-time.

Fig 9: GPS

PASSIVE COMPONENTS:

Resistors are two-terminal passive components that implement electrical resistance as a circuit element in the form of resistance. Resistors are often employed in electronic circuits to restrict current flow and alter signal levels, split voltages, bias active devices, and terminate transmission lines. 330 ohm resistors are used to restrict the flow of current to LEDs from the Arduino in this project.

Fig 10: Resistors

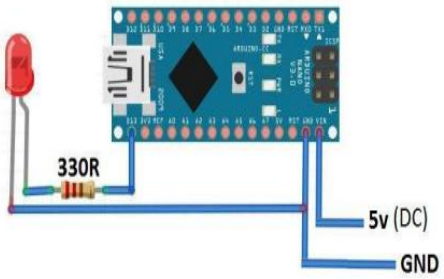

Fig 11: LED interfacing with Arduino using Resistor

WORKING:-

A peltier thermoelectric device, which when connected to the battery creates cooling effect on one side and heat is dispersed via a heat sink, is utilized in this study to charge a Lead Acid Battery. The microcontroller (LPC2148) we're employing here provides for more dynamic and rapid control. User-friendliness is enhanced by the usage of an LCD. In this case, we're utilizing an LCD display to show the rechargeable battery's current and maximum voltage levels. Summer and winter modes of operation are used for the project. By choosing a mode of operation that allows it to drive the heater/cooler in the body. When used in conjunction with a heater/cooler, we may create a chilling or warming effect within the soldier's outfit, allowing him to function effectively under all weather conditions. The utilization of solar electricity for military operations is a no-brainer since soldiers are always on the move and working in a variety of climates. Our AC ripple neutralizer is a voltage stabilizer, and we're applying it here. Solar electricity will no longer be subject to swells and swells. The unidirectional current controller will receive this power. Only the positive supply voltage may be controlled by the unidirectional current controller. It's time to move on to the rechargeable battery. Battery type: Lead-Acid The LPC2148's inbuilt ADC is used in this example. The controller's ADC then receives the signal. Samples are taken in this area, and the results are subsequently analyzed. LCD screens are used to show the battery's current voltage and its maximum voltage. The jacket has a peltier plate that serves as a cooling and heating mechanism.

System in OFF state

System in ON state

CONCLUSION

For every country, officers are a necessary component. Because they are the pillars of our country's security, working day and night to keep us safe. The responsibility is with us to make sure they are safe in this way This project has a significant role to play. An E Uniform has been designed to protect

the soldiers who labor under challenging weather conditions. During the summer and the winter, the project is divided into two distinct phases. Heating and cooling mechanisms are activated when the weather is either too hot or too cold for the system to function properly.

REFERENCES

[1]. Adarsh K S, Arun Dinesh, Jyothy Elizebeth D: "E-Uniform For Soldier's Who Work At Extreme Temperature Regions", International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015,, pp. 993 – 998.

[2]. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18