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SOLAR BASED E-UNIFORM FOR SOLDIERS WHO WORK AT EXTREME HIGH TEMPERATURE OR EXTREME LOW TEMPERATURE

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ABSTRACT:

Soldiers are the Army's most important resource. Soldiers play a vital role to protect one's country. The term soldiers include service men and women from the Army, Air Force, Navy and Marines. They will always be the one responsible for taking and holding the duty in extreme whether conditions through out the year. While providing security to the nation, they may face troubles in extreme hot/cold whether conditions.Both very cold and very hot temperatures could be dangerous to health. Excessive exposure to heat is referred to as heat stress and excessive exposure to cold is referred to as cold stress. In a very hot environment, the most serious concern is heat stroke. At very cold temperatures, the most serious concern is the risk of hypothermia or dangerous overcooling of the body. In this project we are going to design an E-Uniform which gives better protection to the soldiers who are working in extreme whether conditions. This Uniform will make the soldier to work in any kind of environment. Here we are using Solar Panels to power up the internal circuitry of the E-uniform. A 12 V DC lead acid rechargeable battery is used for storing the energy. We are using conventional battery charging unit also for giving supply to the circuitry.

AT89S52 microcontroller is the heart of the circuit as it controls all the functions. A voltage sampler is interfaced with the system using ADC 0808 to get the voltage generated from battery as a display on a 16X2 LCD.The project is operated in two modes summer mode and winter mode. By selecting the mode of operation, it can drive body heater/cooler. The heater/cooler in turn will help us to provide chilling or warming effect inside the uniform which helps the soldier to bear to any kind of external environment and he can work efficiently without heat stress or cold stress.

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the acd output of secondary of 230/12V step down transformer.

INTRODUCTION OF EMBEDDED SYSTEM:

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. A good example is the microwave oven. Almost every

household has one, and tens of millions of them are used everyday, but very few people realize that a processor and software are involved in the preparation of their lunch or dinner.

This is in direct contrast to the personal computer in the family room. It too is comprised of computer hardware and software and mechanical components (disk drives, for example). However, a personal computer is not designed to perform a specific function rather; it is able to do many different things. Many people use the term general-purpose computer to make this distinction clear. As shipped, a general-purpose computer is a blank slate; the manufacturer does not know what the customer will do wish it. One customer may use it for a network file server another may use it exclusively for playing games, and a third may use it to write the next great American novel.

Frequently, an embedded system is a component within some larger system. For example, modern cars and trucks contain many embedded systems. One embedded system controls the anti-lock brakes, other monitors and controls the vehicle's emissions, and a third displays information on the dashboard. In some cases, these embedded systems are connected by some sort of a communication network, but that is certainly not a requirement.

At the possible risk of confusing you, it is important to point out that a general-purpose computer is itself made up of numerous embedded systems. For example, my computer consists of a keyboard, mouse, video card, modem, hard drive, floppy drive, and sound card-each of

Which is an embedded system. Each of these devices contains a processor and software and is designed to perform a specific function. For example, the modem is designed to send and receive digital data over analog telephone line. That's it and all of the other devices can be summarized in a single sentence as well.

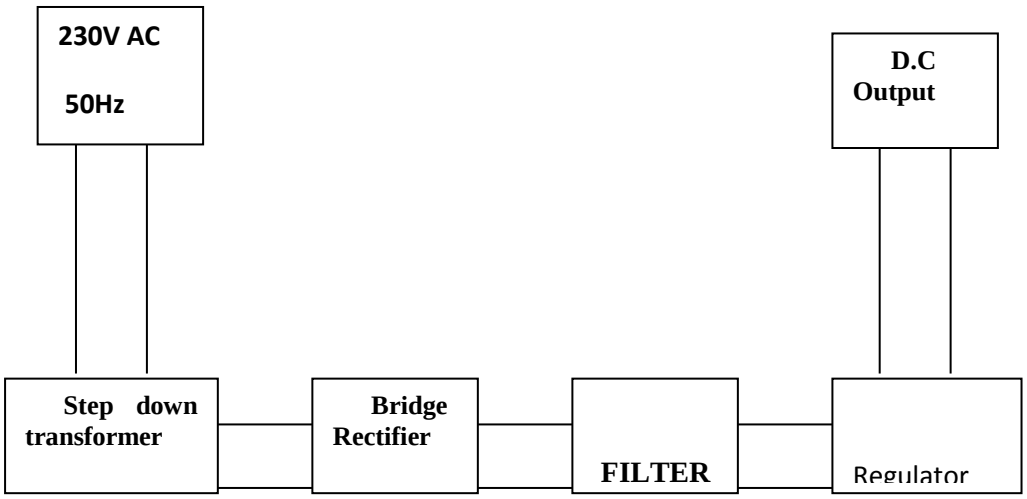
If an embedded system is designed well, the existence of the processor and software could be completely unnoticed by the user of the device. Such is the case for a microwave oven, VCR, or alarm clock. In some cases, it would even be possible to build an equivalent device that does not contain the processor and software. This could be done by replacing the combination with a custom integrated circuit that performs the same functions in hardware. However, a lot of flexibility is lost when a design is hard-cooled in this way. It is mush easier, and cheaper, to change a few lines of software than to redesign a piece of custom hardware.

Application-specific circuitry:

Sensors, transducers, special processing and control circuitry may be required fat an embedded system, depending on its application. This circuitry interacts with the processor to carry out the necessary work. The entire hardware has to be given power supply either through the 230 volts main supply or through a battery. The hardware has to design in such a way that the power consumption is minimized.

POWER SUPPLY:

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.



How Solar Panels Work

There are two main types of solar panels 1) solar electric panels and 2) solar water heating panels. We'll discuss water heating later. Right now, let's talk about solar photovoltaic (PV) panels, which provide electricity.

1) How PV Panels Work

PV panels collect energy from the sun and convert it into electricity. PV systems convert sunlight directly into electricity. “Photo” refers to light and “voltaic” to electricity. A PV cell is made of a semiconductor material, usually crystalline silicon, which absorbs sunlight. You’ve seen PV cells at work in simple mechanisms like watches and calculators. You’ve probably even seen them for signs on the road. More complex PV systems produce solar electricity for houses and the utility grid. The utility grid is the power source available to your local electricity provider.PV cells are typically combined into modules, or panels, containing about 40 cells. Roughly ten modules constitute a PV array, or grouping of panels

How PV Panels Work:

Most PV panels contain a top protective layer, two specially treated layers of silicon with collecting circuitry attached to the top layer, and a polymer backing layer.The top layer of silicon is treated to make it electrically negative; the back layer is treated it make it electrically positive. When sunlight knocks electrons loose from the silicon, electrons move up from the bottom layer of silicon and crowd the electrons in the top layer. The electrons freed from the top layer are collected by electrical contacts on the surface of the top layer and routed through an external circuit, thus providing power to the electrical system attached to the panels. New technology, which we’ll get to in a later section, uses different, less expensive materials than silicon in PV panels to capture sunlight more affordably.

SOFTWARE TOOLS

4.1 KEIL SOFTWARE: Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

4.2 Steps To Write An Assembly / C Language Program In Keil And How To Compile It:

1. Install the Keil Software in the PC in any of the drives.
2. After installation, an icon will be created with the name "Keil uVision3". Just drag this icon onto the desktop so that it becomes easy whenever you try to write programs in keil.
3. Double click on this icon to start the keil compiler.
4. A page opens with different options in it showing the project workspace at the leftmost corner side, output window in the bottom and an ash coloured space for the program to be written.
5. Now to start using the keil, click on the option "project".
6. A small window opens showing the options like new project, import project, open project etc. Click on "New project".
7. A small window with the title bar "Create new project" opens. The window asks the user to give the project name with which it should be created and the destination location. The project can be created in any of the drives available. You can create a new folder and then a new file or can create directly a new file.
8. After the file is saved in the given destination location, a window opens where a list of vendors will be displayed and you have to select the device for the target you have created.
9. The most widely used vendor is Atmel. So click on Atmel and now the family of microcontrollers manufactured by Atmel opens. You can select any one of the microcontrollers according to the requirement.
10. When you click on any one of the microcontrollers, the features of that particular microcontroller will be displayed on the right side of the page. The most appropriate microcontroller with which most of the projects can be implemented is the AT89S52. Click on this microcontroller and have a look at its features. Now click on "OK" to select this microcontroller.
11. A small window opens asking whether to copy the startup code into the file you have created just now. Just click on "No" to proceed further.
12. Now you can see the TARGET and SOURCE GROUP created in the project workspace.
13. Now click on "File" and in that "New". A new page opens and you can start writing program in it.
14. After the program is completed, save it with any name but with the .asm or .c extension. Save the program in the file you have created earlier.
15. You can notice that after you save the program, the predefined keywords will be highlighted in bold letters.
16. Now add this file to the target by giving a right click on the source group. A list of options open and in that select "Add files to the source group". Check for this file where you have saved and add it.
17. Right click on the target and select the first option "Options for target". A window opens with different options like device, target, output etc. First click on "target".
18. Since the set frequency of the microcontroller is 11.0592 MHz to interface with the PC, just enter this frequency value in the Xtal (MHz) text area and put a tick on the Use on-chip ROM. This is because the program what we write here in the keil will later be dumped into the microcontroller and will be stored in the inbuilt ROM in the microcontroller.
19. Now click the option "Output" and give any name to the hex file to be created in the "Name of executable" text area and put a tick to the "Create HEX file" option present in the same window. The hex file can be created in any of the drives. You can change the folder by clicking on "Select folder for Objects".

20. Now to check whether the program you have written is errorless or not, click on the icon exactly below the "Open file" icon which is nothing but Build Target icon. You can even use the shortcut key F7 to compile the program written.
21. To check for the output, there are several windows like serial window, memory window, project window etc. Depending on the program you have written, select the appropriate window to see the output by entering into debug mode.
22. The icon with the letter "d" indicates the debug mode.
23. Click on this icon and now click on the option "View" and select the appropriate window to check for the output.
24. After this is done, click the icon "debug" again to come out of the debug mode.
25. The hex file created as shown earlier will be dumped into the microcontroller with the help of software called Proload.

4.3 PROLOAD:

Proload is a software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller placed in the programmer kit and this is done by the Proload. Programmer kit contains a microcontroller on it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the keil compiler and dumps this hex file into the microcontroller which is to be programmed. As this programmer kit requires power supply to be operated, this power supply is given from the power supply circuit designed above. It should be noted that this programmer kit contains a power supply section in the board itself but in order to switch on that power supply, a source is required. Thus this is accomplished from the power supply board with an output of 12volts or from an adapter connected to 230 V AC.

1. Install the Proload Software in the PC.
2. Now connect the Programmer kit to the PC (CPU) through serial cable.
3. Power up the programmer kit from the ac supply through adapter.
4. Now place the microcontroller in the GIF socket provided in the programmer kit.
5. Click on the Proload icon in the PC. A window appears providing the information like Hardware model, com port, device type, Flash size etc. Click on browse option to select the hex file to be dumped into the microcontroller and then click on "Auto program" to program the microcontroller with that particular hex file.
6. The status of the microcontroller can be seen in the small status window in the bottom of the page.After this process is completed, remove the microcontroller from the programmer kit and place it in your system board. Now the system board behaves according to the program written in the microcontroller.

ADVANTAGES:

- Protection from extremely low temperature such as 0/Minus Degree in hilly regions
- In deserts where temp is high uniform will maintains cool.
- No need to handle torch lights.

APPLICATIONS:

- Used in military applications.
- This uniform can be used for all the climatic applications.
- Soldiers can work in extreme climatic applications.

Conclusion:

The project **"**Solar based E-Uniform for soldiers**"** is successfully tested and implemented. By using this project in real time applications we can help soldiers to work even in extreme climatic applications. It is a highly durable and self-repairing solar technology, ideally suited for mobile applications. Combined with integrated charge control and optional battery/charger systems, it provides the conveniences of back-up and always on, on-demand small scale solar electrical power.

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