

ECOAT

Overview

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Introduction

1 Electronic device meant to help soldiers in hilly areas mainly in snowy regions to withstand extreme cold conditions.

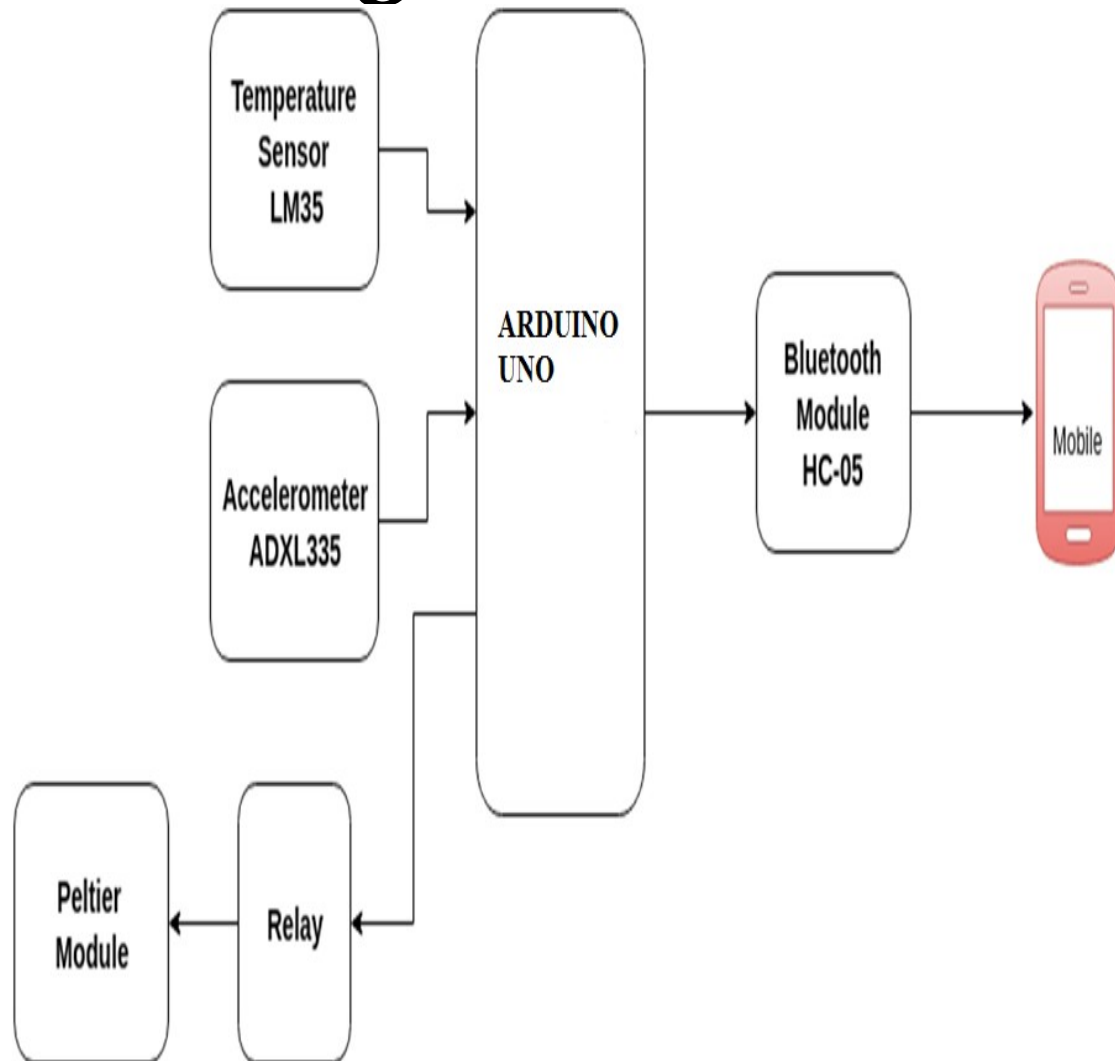
▫ Device is used to heat up the body of the soldier as the temperature falls very low.

▫ This device monitors continuously the temperature and has been integrated with a peltier module which helps to heat up the body of soldier.

▫ This device is also integrated with an accelerometer which determines the location of soldier whenever he loses path or get stuck somewhere. The location details will be sent to the soldier's android phone.

▫ The location message is then sent to a centralised control room which provides help.

Block Diagram



Hardware requirements

- Microcontroller – Arduino Uno
- Accelerometer – ADXL335
- Temperature Sensor -LM 35
- Bluetooth Module – HC05
- Relay
- Relay Driver – ULN2003A
- Peltier Module
- Android Mobile Phone
- Power Supply

ARDUINO UNO

Features

ATmega328P microcontroller

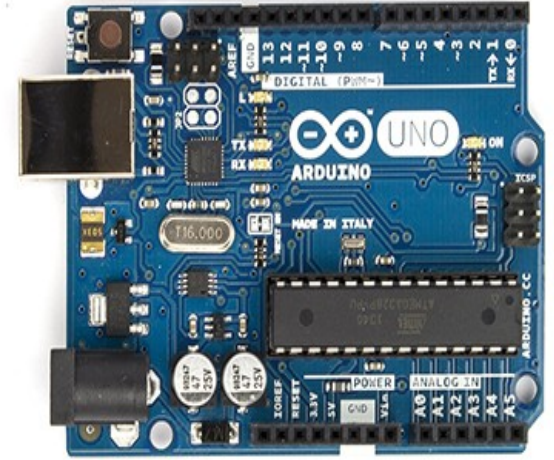
Input voltage - 7-12V

14 Digital I/O Pins (6 PWM outputs)

6 Analog Inputs

32k Flash Memory

16Mhz Clock Speed



Atmega328P

- 32K bytes of In-System Programmable Flash
- 1K bytes EEPROM
- 2K bytes SRAM
- 23 general purpose I/O lines
- 32 general purpose working registers
- three flexible Timer/Counters with compare modes, internal and external interrupts
- a serial programmable USART
- a byte-oriented 2-wire Serial Interface, an SPI serial port
- a 6-channel 10-bit ADC
- five software selectable power saving modes.

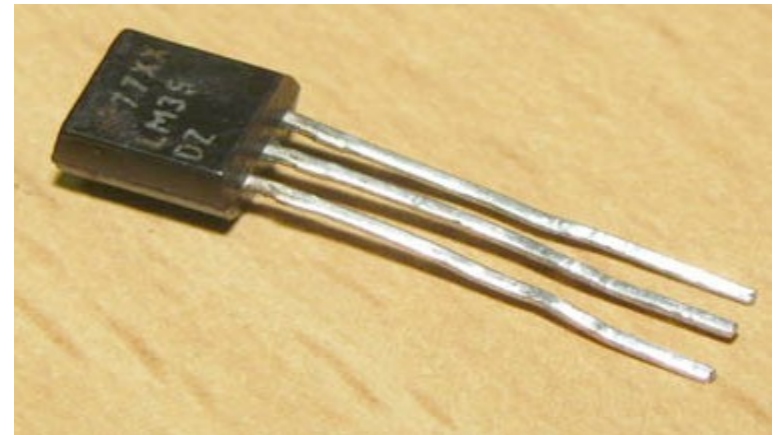
Accelerometer ADXL335

- 3-axis accelerometer
- Measure static acceleration of gravity in tilt sensing applications
- Measures dynamic acceleration from motion, shock or vibration
- Bandwidth can be selected using different capacitor values

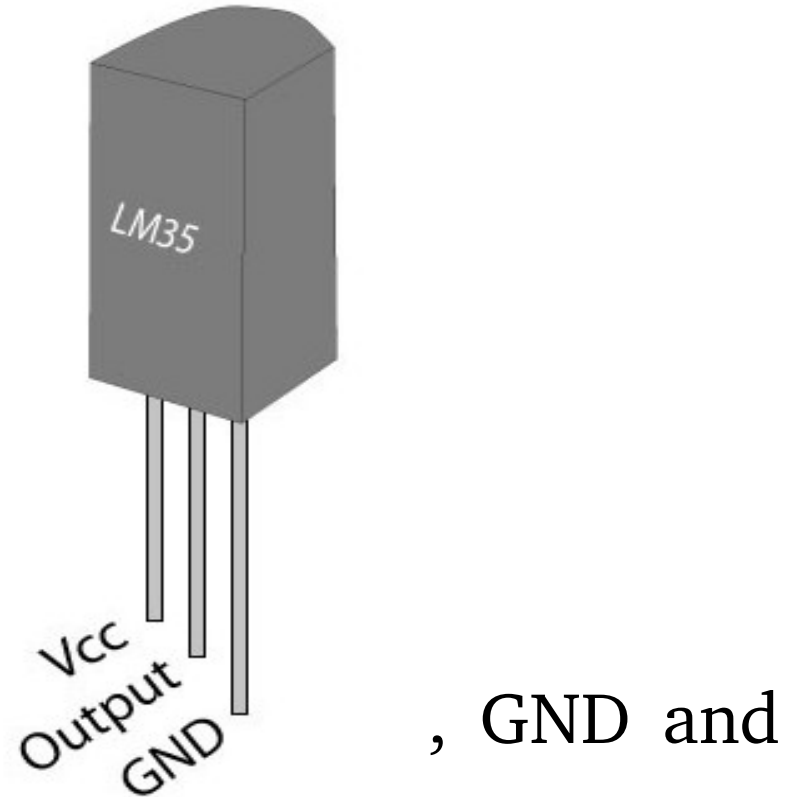


Temperature Sensor(LM 35)

- Precision IC temperature sensor with its output proportional to the temperature (in °C).
- The user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.
- It does not require any external calibration or trimming to provide typical accuracies over a full -55 to $+150^{\circ}\text{C}$ temperature range.

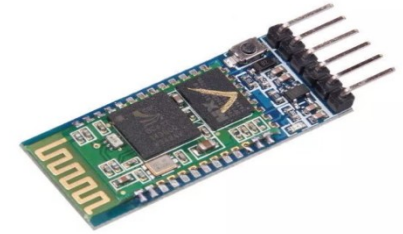


Pin Diagram



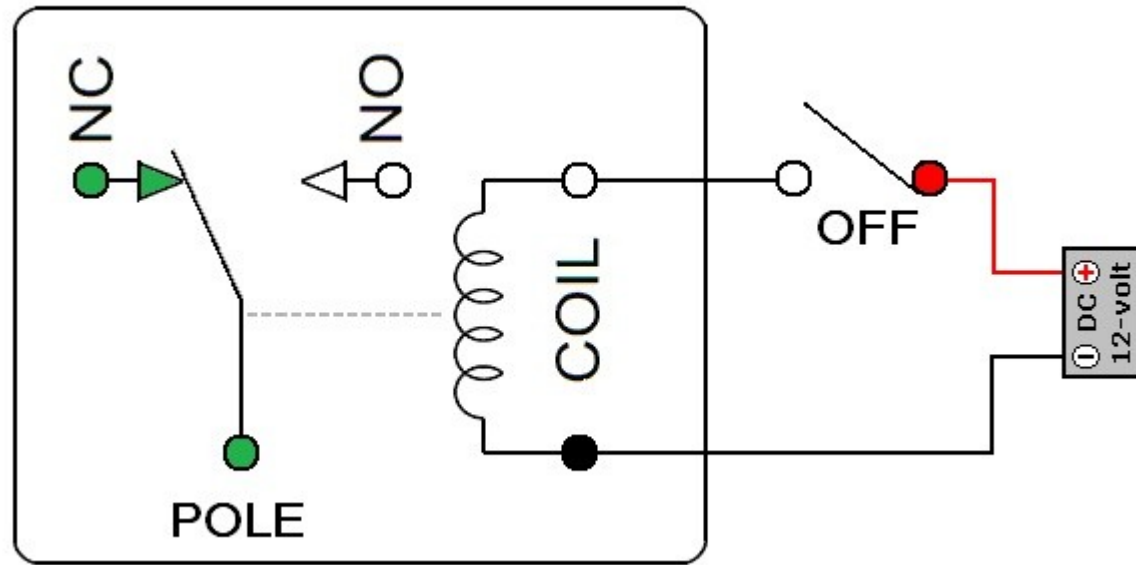
- LM35 digital sensor has output pin.
- when it is heated the voltage at output pin increases, it is connected to the analog to digital converter IC (ADC).

Bluetooth Module – HC05

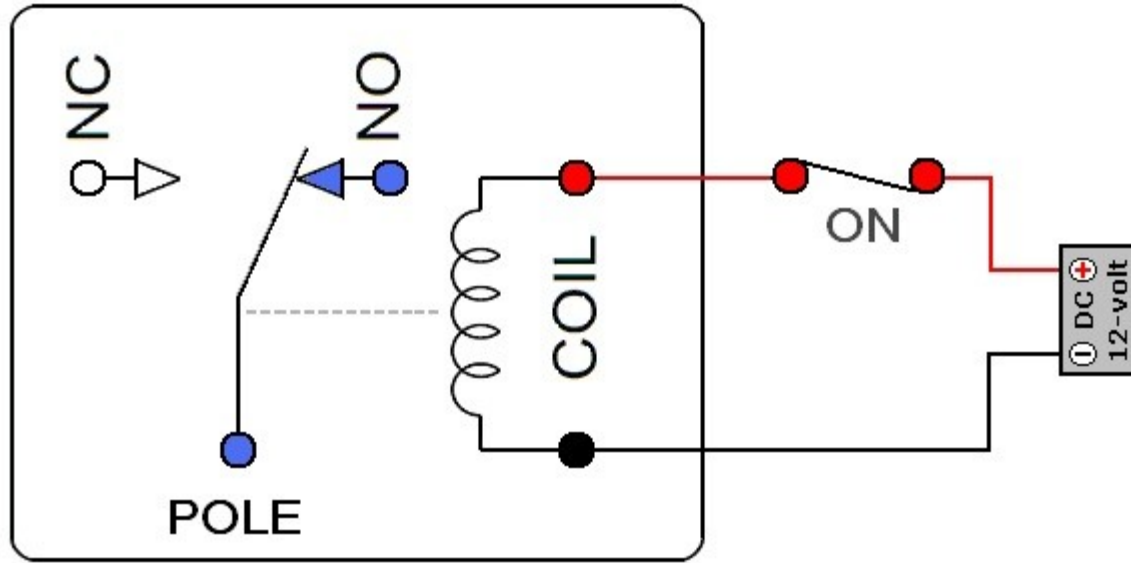


- For the communication between mobile phone and microcontroller Bluetooth module(HC-05) is used
- Low Power 1.8V Operation ,1.8 to 3.6V I/O .
- Serial port Bluetooth module have a Bluetooth 2.0+EDR (enhanced data rate), 3Mbps modulation with complete 2.4GHZ radio transceiver and baseband.
- Using Bluetooth profile and android platform architecture different type of Bluetooth applications can be developed.

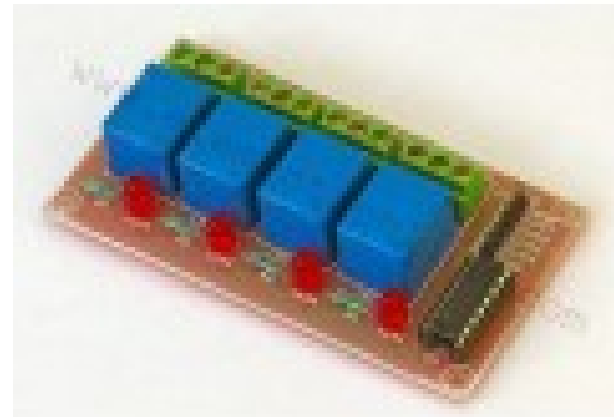
Relay



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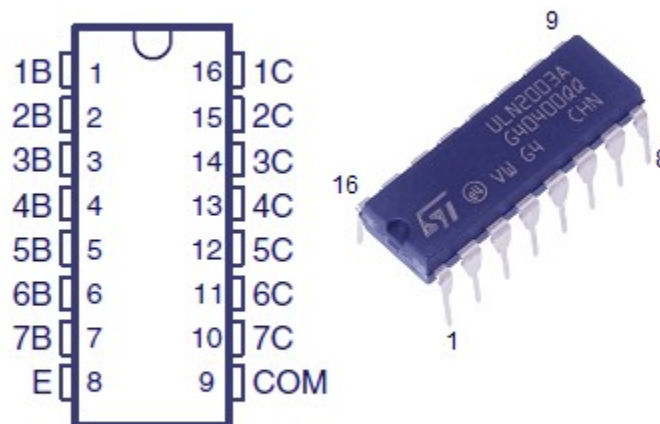
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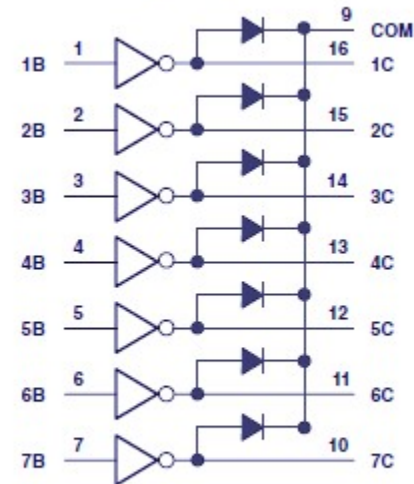
- Relay board module is used for controlling higher current loads from the microcontroller development board
- 4 onboard relays which can switch up to 7 Amp

Relay Driver

Pin configuration



Logic diagram



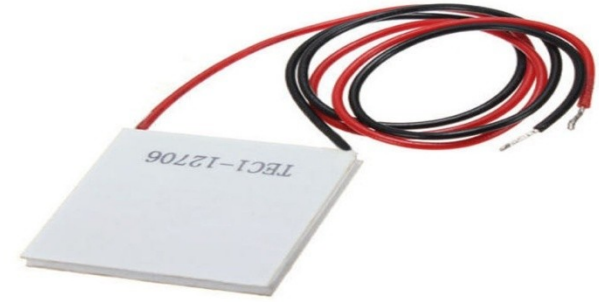
ULN2003A driver IC pin configuration and internal logic diagram

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- Relay safely driven by ULN2003 IC
- Protect microcontroller from relay kick back using integrated clamping diodes
- Has 7 high current Darlington arrays each containing 7 open collector Darlington pairs with common emitters

Peltier Module



Thermoelectric coolers operate according to the Peltier effect. The effect creates a temperature difference by transferring heat between two electrical junctions.

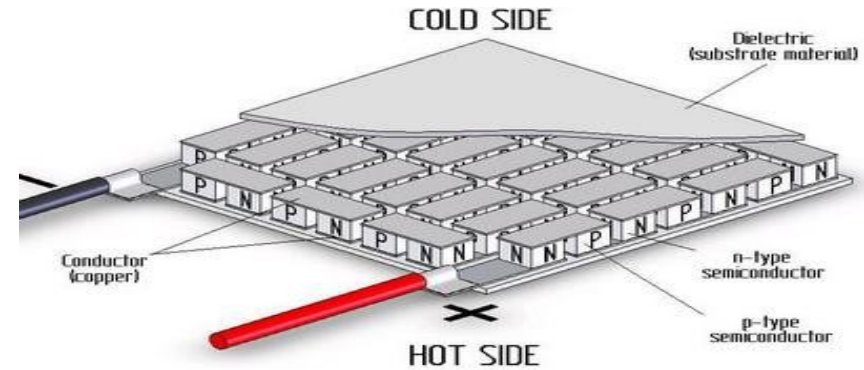
A voltage is applied across joined conductors to create an electric current. When the current flows through the junctions of the two conductors, heat is removed at one junction and cooling occurs. Heat is deposited at the other junction.

The main application of the Peltier effect is cooling. However the Peltier effect can also be used for heating or control of temperature. In every case, a DC voltage is required.

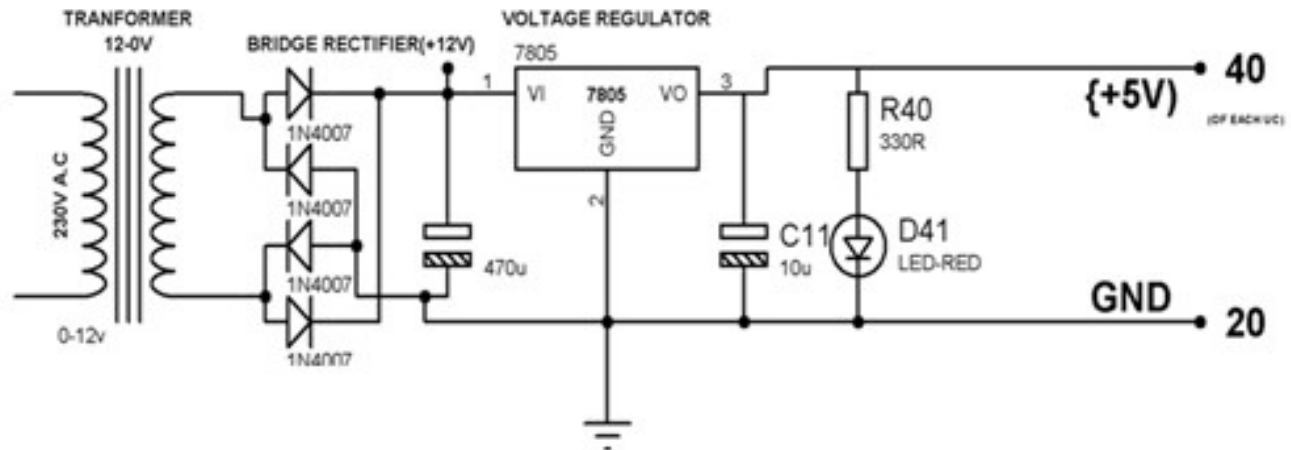
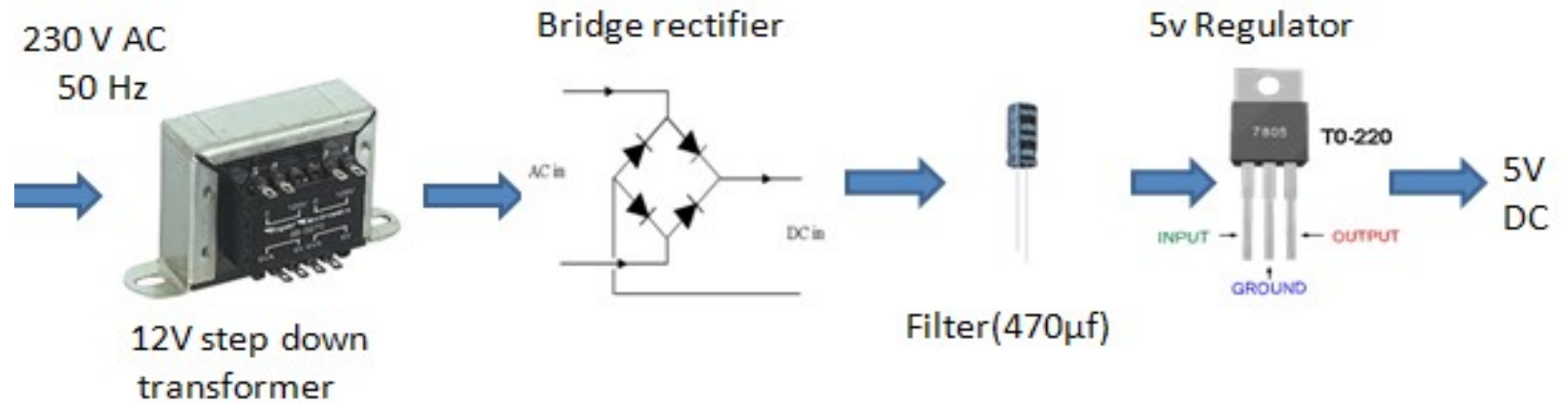
Working Principle:Peltier Module

1 Peltier module is for the operation of DC current. It can refrigerate while heating. By changing the DC current to determine the polarity of the same refrigeration unit to achieve cooling or heating. This effect is produced by the thermal principle.

When a N-type peltier element and a P peltier element combining into galvanic right (connection to DC current), can create energy transfer. N-flow components of the P-type connector components absorb heat as cold-end P-flow components of the N-type connector components release heat as hot end.



Power Supply



Software requirements

- Tool

Arduino IDE

- Programming Languages

Embedded C

Embedded C

- Reasonably simpler to learn, understand, program and debug.
- Unlike assembly, C has advantage of processor-independence and not specific to any particular microprocessor/microcontroller or any system. This makes convenient for a user to develop programs that run on most of the systems.
- C combines functionality of assembly language and features of high level languages, C is treated as a ‘middle-level computer language’ or ‘high level assembly language’.
- It is fairly efficient.
- It supports access to I/O and provides ease of management of large embedded projects.

Conclusion

¶The system or device to regulate human body temperature especially in adverse weather conditions like in hilly or snowy areas has been designed and set up.

¶The system is also capable of locating and sending details of position of soldiers or people who have lost track in inaccessible terrains using android phones.

References

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5. www.howstuffworks.com