AMIT'S Graduation Project:

Smart Home Using Bluetooth

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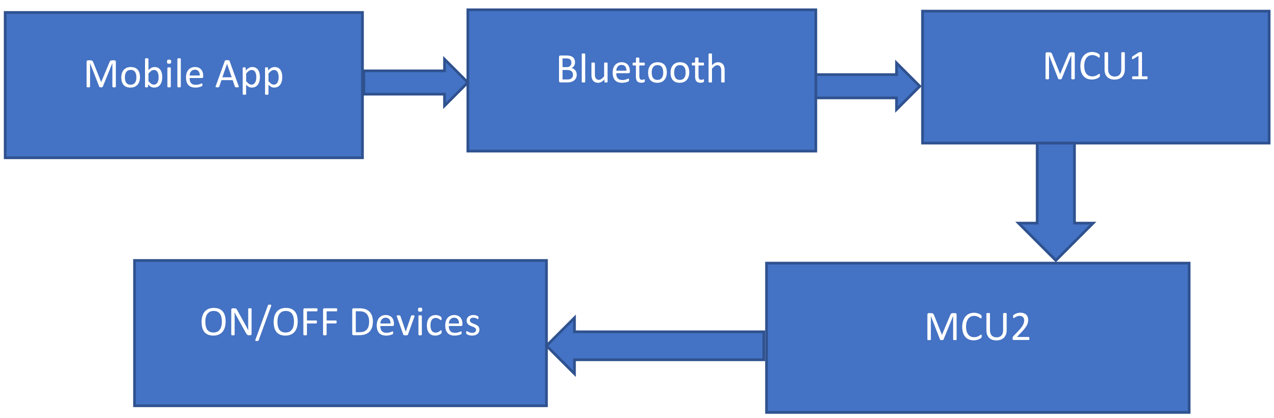
Requirement:

- This project is Smart Home based Bluetooth where we want to control home appliance wirelessly using Mobile App via Bluetooth.

- Two ECU's Communicate with each other the first is a control ECU which takes the input from Bluetooth and send it to the Sink (Actuator) ECU via SPI to interpret which action should be taken.



Programming steps

Master:

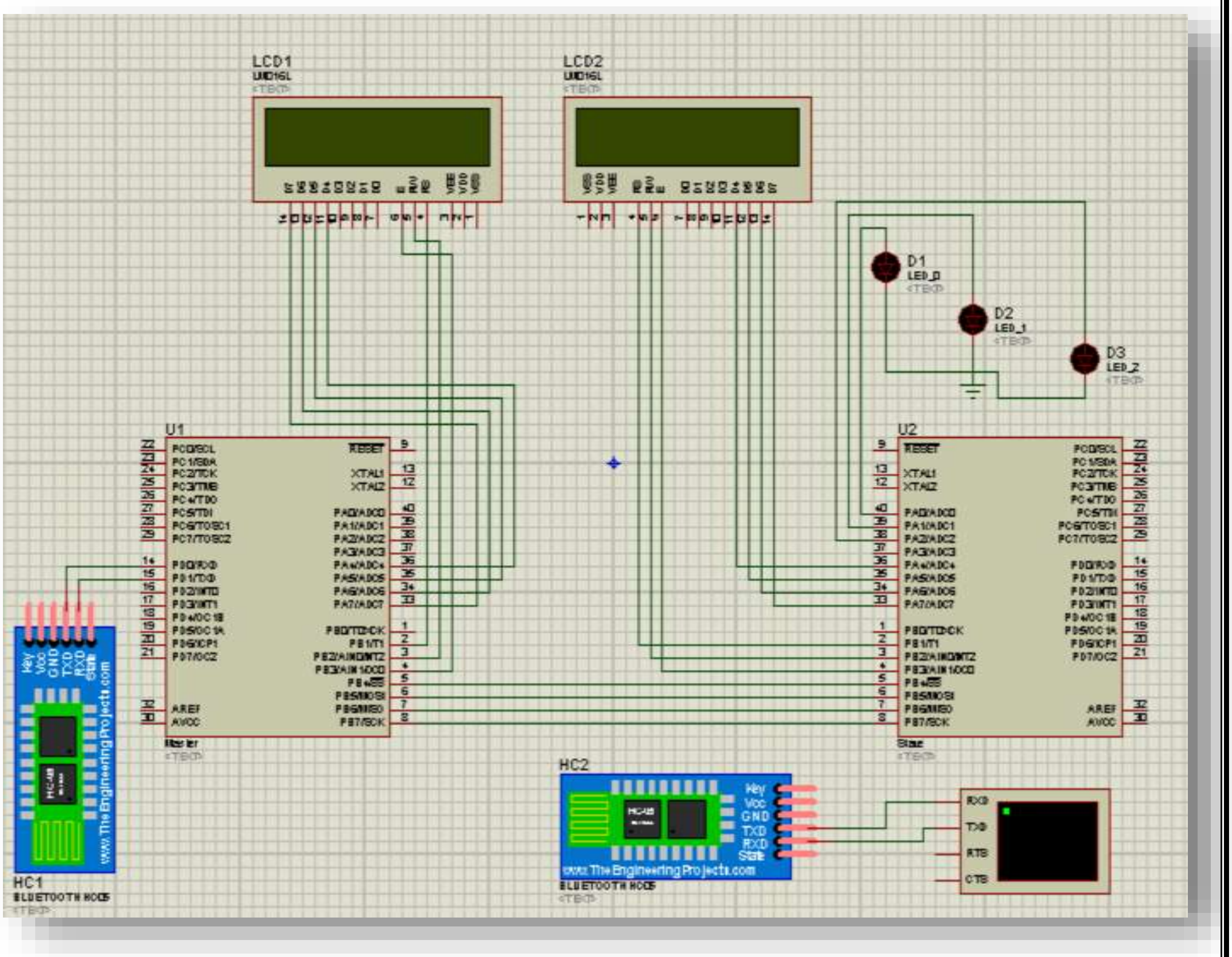
1. Initialize ATmega32 USART communication.
2. Initialize SPI communication.
3. Receive data from the HC-05 Bluetooth module.
4. Show the data received from HC-05 on LCD
5. Check whether it is '0' , '1' , '2' , '3' and '4 'and take respective controlling action on the Slave.

Slave:

1. Initialize SPI communication.
2. Receive data from The Master.
3. Show the data received from The Master on LCD.
4. Check whether the received data take respective controlling action on the LEDs.

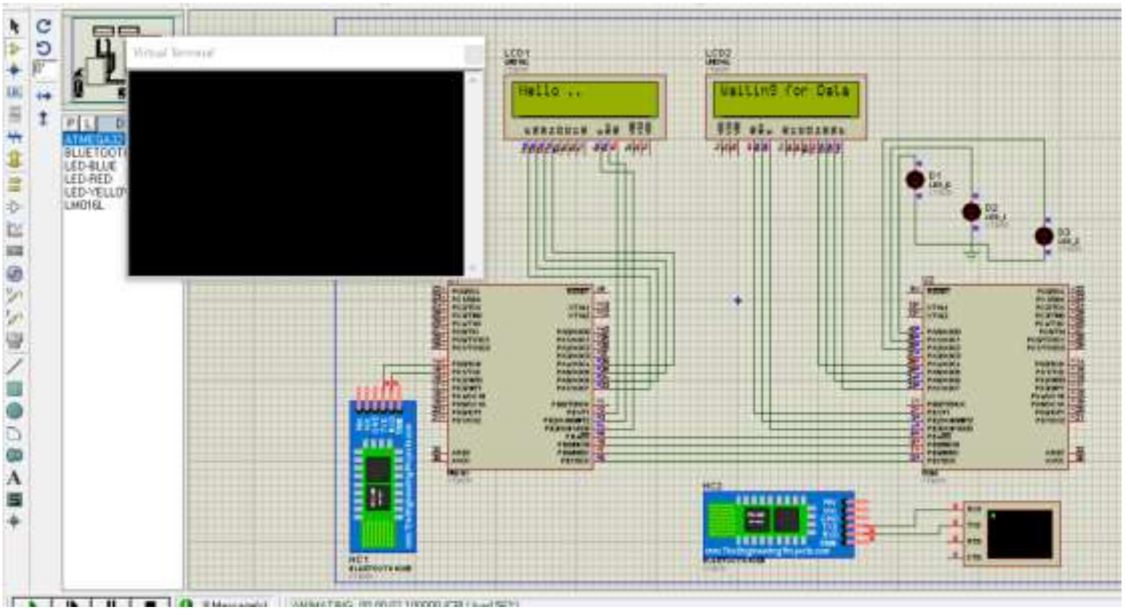
Schematic:

- Using proteus ..

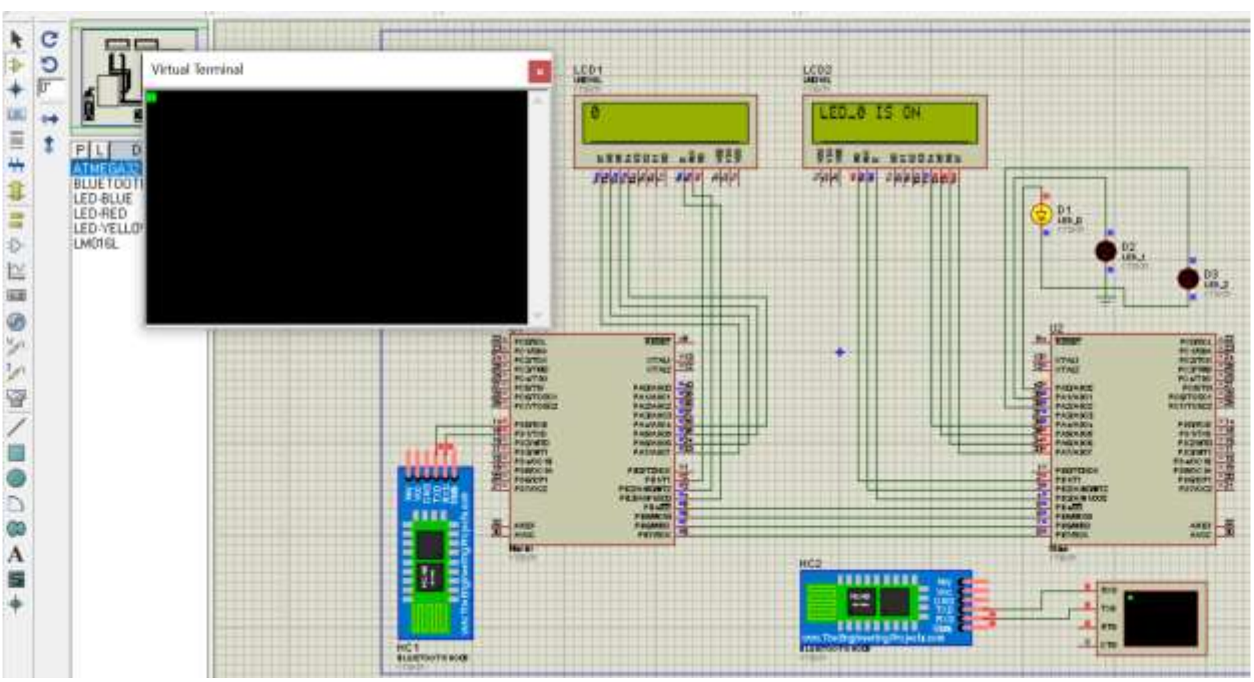


➢ brief description of the Schematic

1- Start of the program ..



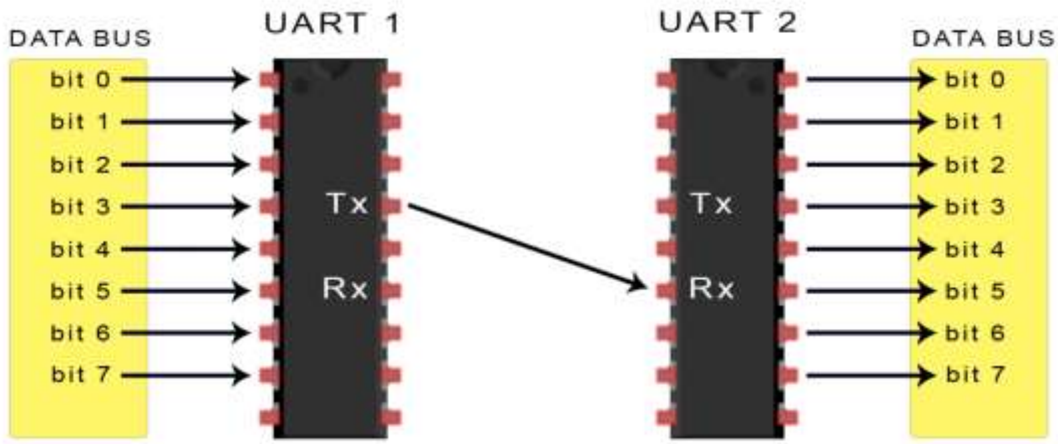
For example when we input (0) in the virtual terminal the first led will be ON as shown in this figure:



Communication protocol used:

UART

UART stands for Universal Asynchronous Receiver/Transmitter. It's not a communication protocol like SPI and I2C, but a physical circuit in a microcontroller, or a stand-alone IC. A UART's main purpose is to transmit and receive serial data.



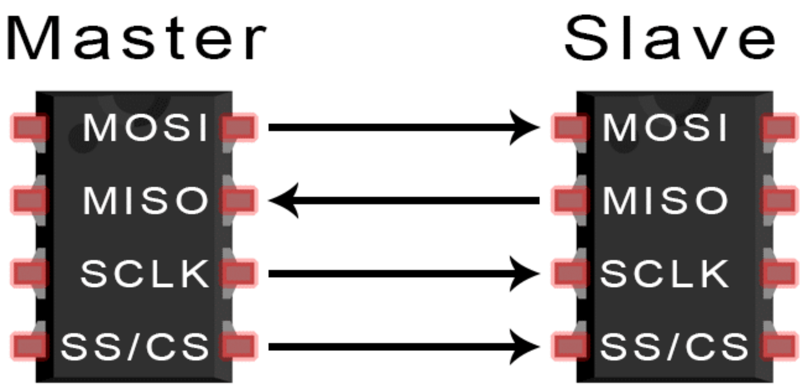
In UART communication, two UARTs communicate directly with each other. The transmitting UART converts parallel data from a controlling device like a CPU into serial form, transmits it in serial to the receiving UART, which then converts the serial data back into parallel data for the receiving device. Only two wires are needed to transmit data between two UARTs. Data flows from the Tx pin of the transmitting UART to the Rx pin of the receiving UART.

Steps of UART transmission:

1- The transmitting UART receives data in parallel from the data bus.
2- The transmitting UART adds the start bit, parity bit, and the stop bit(s) to the data frame.
3- The entire packet is sent serially from the transmitting UART to the receiving UART. The receiving UART samples the data line at the pre-configured baud rate
4- The receiving UART discards the start bit, parity bit, and stop bit from the data frame.

Serial Peripheral Interface (SPI):

Serial Peripheral Interface (SPI) is an interface bus commonly used to send data between microcontrollers and small peripherals such as shift registers, sensors, and SD cards. It uses separate clock and data lines, along with a select line to choose the device you wish to talk to.



MOSI (Master Output/Slave Input) –> Line for the master to send data to the slave.

MISO (Master Input/Slave Output) –> Line for the slave to send data to the master.

SCLK (Clock) –> Line for the clock signal.

SS/CS (Slave Select/Chip Select) –> Line for the master to select which slave to send data to.

Steps of SPI data transmission:

1- The master outputs the clock signal.
2- The master switches the SS/CS pin to a low voltage state, which activates the slave.
3- The master sends the data one bit at a time to the slave along the MOSI line. The slave reads the bits as they are received.
4- If a response is needed, the slave returns data one bit at a time to the master along the MISO line. The master reads the bits as they are received.

Bluetooth Module (Hc-05):

- HC-05 is a Bluetooth device used for wireless communication. It works on serial communication (USART).
- It is a 6 pin module.
- The device can be used in 2 modes; data mode and command mode.
- The data mode is used for data transfer between devices whereas command mode is used for changing the settings of the Bluetooth module.
- AT commands are required in command mode.
- The module works on 5V or 3.3V. It has an onboard 5V to 3.3V regulator.
- As the HC-05 Bluetooth module has a 3.3 V level for RX/TX and the microcontroller can detect 3.3 V level, so, no need to shift the transmit level of the HC-05 module. But we need to shift the transmit voltage level from the microcontroller to RX of the HC-05 module.

Set Bluetooth in AT mode

1. Upload the code to evive (DO NOT connect Bluetooth).
2. Turn off evive (Remove the cable or turn power switch OFF).
3. Plug Hc-05 in evive.
4. Press and hold the push button on Hc-05 module.
5. Switch evive ON.
6. Release the push button now if the led on Hc-05 starts blinking with a time difference of approx 2 seconds this means that Hc-05 successfully went into AT mode.
7. In AT mode bluetooth always communicates at baud of 38400 and with each command it is mandatory to send '\r' and '\n' while using HC-05 module. For example if you want to send command "AT+NAME=evive" then it should be sent like "AT+NAME=evive\r\n". This will be more clear from example given below.