AMIT-Learning

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Smart Home

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Project Description

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

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

Requirements

1. **Receive data from Bluetooth device (Master)**
2. **Display corresponding message to bluetooth data received on LCD (Master)**
3. **Send/Receive data between 2 ECUs**
4. **Turn on 2 LEDs or measure temperature according to request received(Slave)**
5. **Use Button as interrupt to shut down everything(Slave)**

Implementation

1. Receive data from Bluetooth device (Master)

   In Master, make necessary initializations for UART to start sending and receiving data from the bluetooth device using it. We can know the baud rate, no. of bits, parity bits and

all other configurations of this UART connection by right clicking on Bluetooth HC-05 and viewing its properties. Here, the baud rate was 9600 symbol/sec , no parity, 8 bit data.

In Simulation, I could not connect the mobile app (blueterm) to the Bluetooth HC-05 device in proteus, so instead I used another Bluetooth HC-05 device connected to a virtual terminal to simulate the action of the mobile app. A virtual serial port is made between the 2 Bluetooth devices. To send any data to the Master ECU, type your input in the virtual terminal. This terminal will send this data to the ECU using the bluetooth connection established between them.

2. Display corresponding message to bluetooth data received on LCD (Master)

   Throughout the program, we keep checking if data is received on the UART RX port from the bluetooth device. When data is found, we check its value. If received data = 1, this means turn led 1 on. This message is displayed on the LCD device connected to the ECU.

   Messages Displayed:

   data = 1 → LED 1 ON

   data = 2 → LED 1 OFF

   data = 3 → LED 2 ON

   data = 4 → LED 2 OFF

   data = 5 → Checking Temp

3. Send/Receive data between 2 ECUs

   Establish a SPI connection between the Master and the Slave. In Master, make necessary initializations and start the connection. Send the bluetooth data received to the Slave. In Slave, make the necessary initializations as well. Since the slave has nothing to send to the master and the fact that we have to send to the master data in order to receive from it (the way Shift Register works), the slave sends dummy data to the master (data = 1 always sent).

4. Turn on 2 LEDs or measure temperature according to request received(Slave)

According to the data received from the SPI port, the slave does the corresponding functionality.

Functionalities :

Spi data = 1 → Turn LED 1 ON

Spi data = 2 → Turn LED 1 OFF

Spi data = 3 → Turn LED 2 ON

Spi data = 4 → Turn LED 2 OFF

Spi data = 5 → Measure and display temperature value on LCD

In order to measure the temperature, we use ADC where the analogue value is received from the temperature sensor. It is then converted to digital and displayed on an LCD connected to the slave.

5. Use Button as interrupt to shut down everything (Slave)

   INT0 works on the rising edge, so whenever the button connected at port PD2 is pressed, LED 1 and LED 2 are switched off and the LCD displays “Resetting ALL”

Drivers

To have a layered architecture in the code, I used drivers implemented throughout the diploma.

Master:

- ➔ UART driver
- ➔ LCD driver
- ➔ DIO driver
- ➔ SPI driver

Slave:

- ➔ SPI driver

- LED driver
- DIO driver
- LCD driver
- ACD driver
- EXT_INT driver

Simulation

This is how the devices are set up in proteus: