Interfacing HC-05 Bluetooth module to LPC 1768 mbed board

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Introduction:

mbed LPC1768:

The mbed LPC1768 is a popular microcontroller board that is part of the mbed platform developed by ARM. It is based on the NXP LPC1768 microcontroller, which belongs to the ARM Cortex-M3 family. The mbed LPC1768 board is widely used by developers, hobbyists, and students for prototyping and creating various embedded systems and IOT applications.
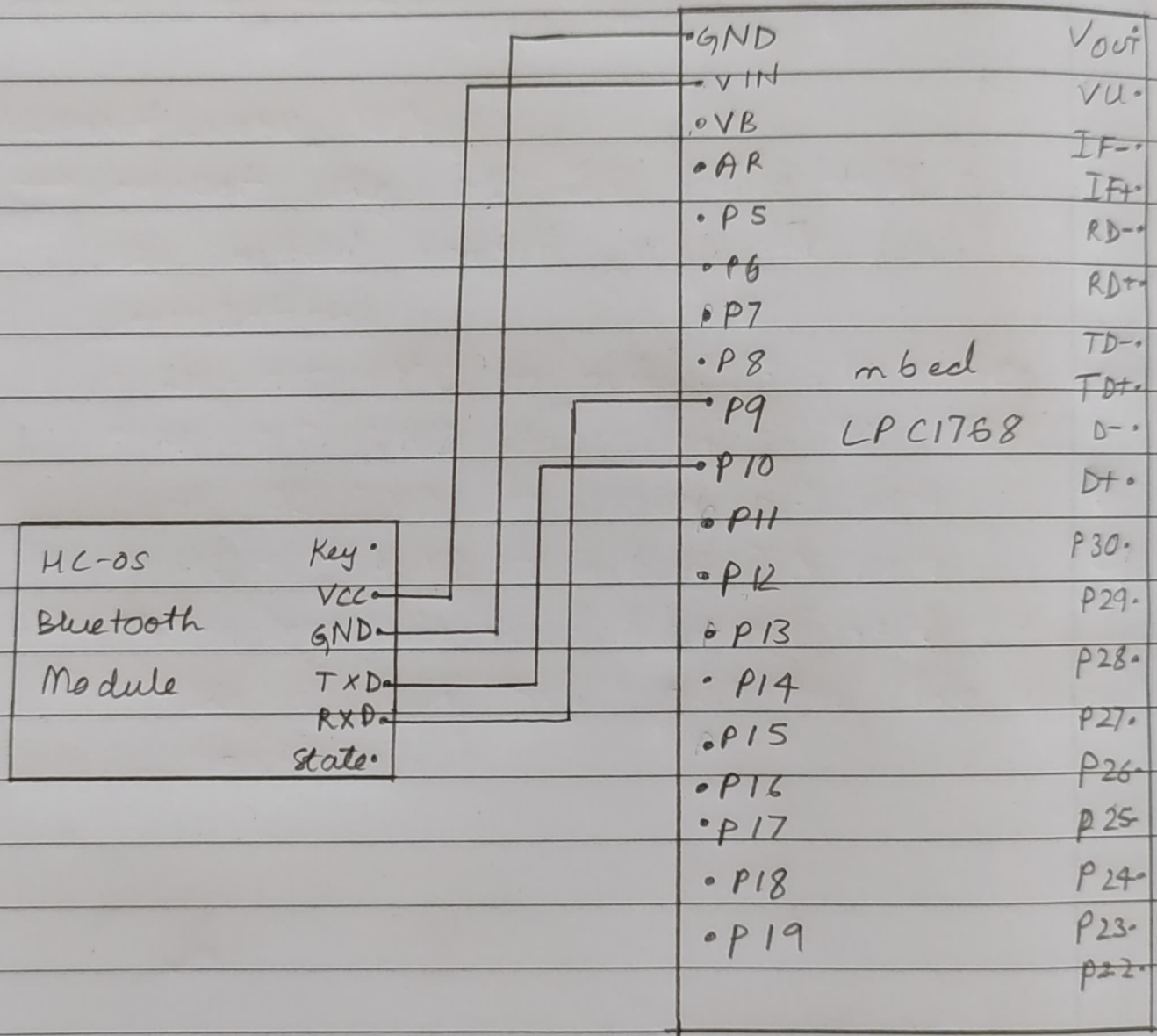
The LPC1768 microcontroller on the mbed LPC1768 board features a 32-bit ARM cortex-M3 core running at a clock speed of upto 96MHz. It has 512 kB of flash memory for program storage and 64 kB of RAM for data storage. The board also includes a range of peripheral interfaces, including digital I/O pins, analog inputs, UART, SPI, I2C, USB, Ethernet, and more.

One of the key advantages of the mbed LPC1768 board is its compatibility with the mbed development platform. The mbed platform provides a comprehensive ecosystem of software tools, libraries, and online resources that simplify the development process. It offers a user-friendly online Integrated Development Environment (IDE) that allows developers to write, compile, and program the LPC1768 board using the C programming language.

HC-05 bluetooth module:

HC-05 is a popular Bluetooth module that enables wireless communication between devices. It is a small, low-cost device that can be easily integrated into various electronic projects. The HC-05 module operates on the bluetooth 3.0 protocol and supports the Serial Port Profile (SPP), making it easy to use with micro controllers such as Arduino, Raspberry Pi, and other embedded systems. The module can communicate with other Bluetooth devices within a range of upto 10 meters and has a baud rate of upto 230400 bps. The HC-05 module is widely used in robotics, home automation, and other projects that require wireless communication between devices.

Circuit Diagram:

mbed LPC1768		
GND		Vout
VIN		VU
VB		IF-
AR		IF+
P5		RD-
P6		RD+
P7		
P8		TD-
P9		TD+
P10		D-
P11		D+
P12		P30
P13		P29
P14		P28
P15		P27
P16		P26
P17		P25
P18		P24
P19		P23
		P22

HC-05 Bluetooth Module

Key
VCC
GND
TXD
RXD
State

Materials and methods:

- The following components were used int this project:
  (i) LPC1768 mbed board.
  (ii) HC-05 Bluetooth module
  (iii) Switch
  (iv) Smartphone
  (v) LEDs (4)

- To interface the bluetooth module to the mbed board, the following steps were followed:

(1) Hardware setup:
→ Connect the HC-05 Bluetooth module to the mbed board using the following connections:
- HC-05 VCC to mbed 3-3V power supply
- HC-05 GND to mbed 3.3V GND
- HC-05 TXD to mbed RX pin (ex: p10)
- HC-05 RXD to mbed TX pin (ex: p9)
- Connect the suitable onboard LED to the desired GPIO pin on the mbed board.

CODE :

```
#include "mbed.h"
#include "Serial.h"

Serial bluetooth (p9, p10); // TX, Rx

DigitalOut led1 (LED1);
DigitalOut led2 (LED2);
DigitalOut led3 (LED3);
DigitalOut led4 (LED4);

int main ()
{
while (1) {
if (bluetooth . readable ()) {
char command [5];
bluetooth.read (command, sizeof (command)); // read up to 5 bytes
int led = command [3]-'0'; // extract the LED number from the command
if (command[0] == 'O' && command [1] == 'N' && led >= 1 && led <= 4) {
switch (led) {
case 1:
led1 = 1;
break;
case 2:
led2 = 1;
break;
case 3:
led3 = 1;
```

```
break;
case 4:
led 4 = 1;
break;
}
} else if (Command [0] == 'O' && command [1] == 'F' && command [2] == 'F' &&
led >= 1 && led <= 4) {
switch(led) {
case 1:
led 1 = 0;
break;
case 2:
led 2 = 0;
break;
case 3:
led 3 = 0;
break;
case 4:
led 4 = 0;
break;
}
}
}
}
}
}
```

Result:

Upon testing the code, it was observed that the HC-05 bluetooth module successfully interfaced with the LPC1768 mbed board. The suitable onboard LED turned on when the "ONL" command was received via Bluetooth, and it turned off when the "OFFL" command was received.

Conclusion:

The implementation of the HC-05 Bluetooth module with the LPC1768 mbed board proved to be successful in controlling the onboard LED based on message received from a smartphone. The code effectively processed the Bluetooth messages and triggered the appropriate LED state changes accordingly.

This project demonstrates the capability of the mbed platform and the flexibility of the LPC1768 microcontroller in communicating with external devices, in this case, a smartphone via Bluetooth. The integration of the HC-05 bluetooth module opens up possibilities for remote control and monitoring applications where wireless communication is required.

References:

→ HC-05 Bluetooth module Data Sheet

→ LPC 1768 mbed Board User Manual

→ ARM mbed Online Compiler Documentation

→ Dd Keil studio cloud.