

**BlueTooth Chat System: (Android App) talks to (Arduino + HC-06 + PC)**  
**A Presentation in the Senior Design Project Course**

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## 1. Objective

The objective of this example is to use the HC-06 Bluetooth module connected to the Arduino board to build a chat system between the laptop also connected to Arduino and an Android app. The communication between the laptop and the Android device is done via wireless Bluetooth of the Android device and the HC-06 module.

## 1. Introduction

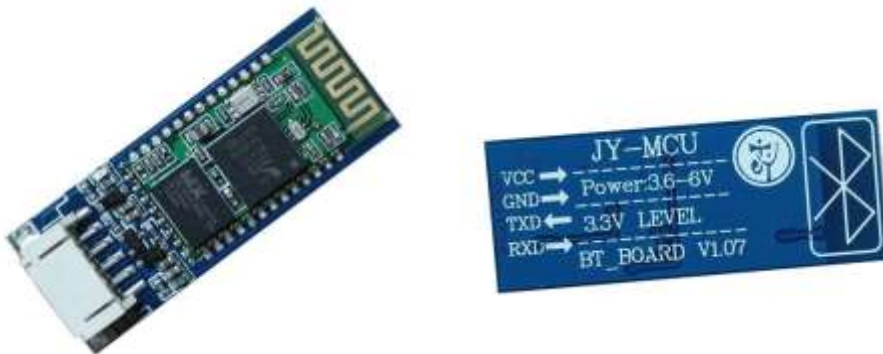
### *1.1. Background on Bluetooth Wireless Technology*

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization [1]. In short, Bluetooth is a standard for the short-range wireless interconnection of cellular phones, computers, and other electronic devices.

Please take some time and read through the pointers included in reference [1] to read more about Bluetooth. It is outside the scope of this lab to teach details about it. However, you are encouraged to look into it more on your own.

### *1.2. HC-06 Bluetooth Module*

In this project, we will use the JY-MCU BT\_BOARD V1.07 (also referred to as HC-06): Arduino Wireless Bluetooth Transceiver Module [2,3], which is shown in Fig.1.



*Figure 1: Photographs of the "JY-MCU BT\_BOARD V1.07" Bluetooth module.*

This is a popular serial Bluetooth module, which uses the Bluetooth Specification v2.0. It can work either as a master or a slave. It is built around the BC417 Bluetooth to Serial chip, which is a single chip radio and baseband IC for Bluetooth 2.4 GHz systems including enhanced data rates (EDR) to 3Mbps [4]. This chip is loaded with features, including UART interface with programmable baud rate up to 3Mbaud with an optional bypass mode. By default, it works as a Slave, 9600 baudrate, N, 8, 1, and Pincode 1234.

While very popular (there are several other versions, such as HC-03, HC-04, and HC-05 among others) and easy to use, it somewhat lacks in up to date documentation. Nevertheless, the manual of version 1.05 is a good starting point to read and find out more about this module. Please take some time to briefly read the manual available for download at [3].

Some of the features of the HC-06 Bluetooth module include [3]:

- Serial port operation voltage 3.3V
- Baudrate set at 9600, but you can change it using AT commands
- Operation current, pairing at 30mA, after pairing 8mA during communication
- Can pair and communicate with laptops, laptop Bluetooth adapters, Bluetooth Shields on Arduino, smart phones such as Android, etc.

The module has six pins:

- **VCC**: supply voltage with range 3.6 V to 6 V (BC417 chip needs 3.3V generated with the help of a voltage regulator on the same PCB).
- **GND**: ground.
- **RXD**: Serial RX. Note, this would be connected to the TX pin of the Arduino board.
- **TXD**: Serial TX. As you would expect, this this would be connected to the RX pin of the Arduino board.
- **KEY**: Not used.
- **STATE**: Not used.

## **2. Example #1: Chat System = (Android App) talks to (Arduino + HC-06 + PC)**

This is a simple Arduino project which basically uses the Bluetooth module connected to the Arduino board to talk to an Android device. The app on the Android device can send messages that are received by the Arduino's HC-06 and passed to the local PC via Arduino's HW Serial connection. On the local PC, a terminal (such as Termit or Putty) displays what the Arduino received from the Android device. The user can also send from within the terminal on PC messages that Arduino takes and transmits wirelessly via Bluetooth back to the Android device. The Android device receives that and displays the received message. This project effectively implements a simple Chat system between the Android device and the host PC.

Assemble the experimental setup described by the block diagram in the figure below. Note that we use digital pins 11,10 as RX,TX for the software serial connected to HC-06 Bluetooth module. Use the provided Arduino sketch to program the Arduino. Use the Android app code to program an

Android device. Currently, the Arduino sketch renames the HC-06 module as “CRIS-HC06”, but you can change that. See the sketch itself and the comments therein to see how it is done. Read also comments in the Android source code for a better understanding.

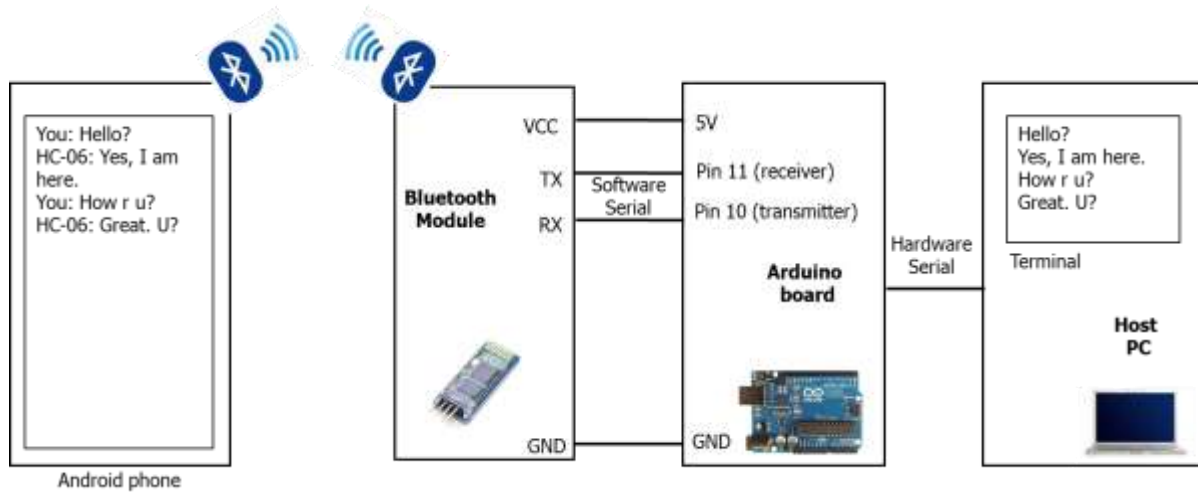


Figure 2: Block diagram of the chat system.

Once you created all connections, you should have something like in the figure below.

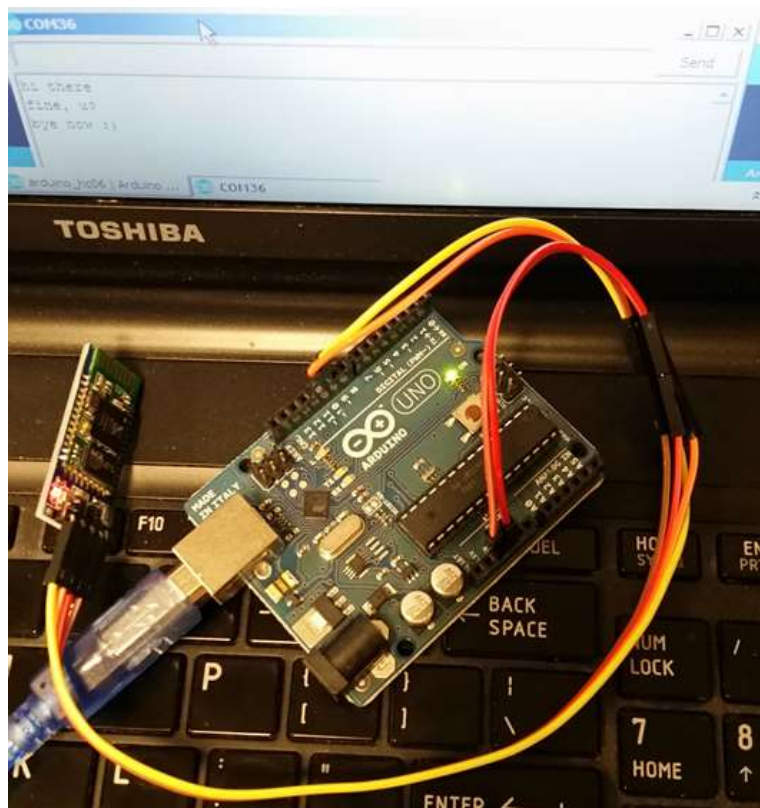


Figure 3: Complete experimental setup.

The UI of the custom app looks like in the figure below.

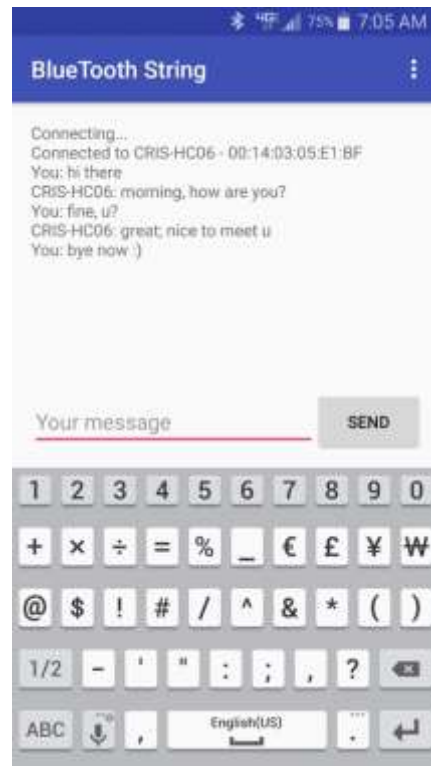


Figure 4: UI of the custom Android app.

Power up, open the Serial terminal of the Arduino IDE, launch the app, pair the Bluetooth of the smart phone with CRIS-HC06, and chat! Observe operation and comment.

## References and Credits

[1] Bluetooth information;

<https://en.wikipedia.org/wiki/Bluetooth>

<https://www.bluetooth.com/what-is-bluetooth-technology/bluetooth-technology-basics>

<http://www.wirelessdevnet.com/channels/bluetooth/features/bluetooth.html>

[http://www.radio-electronics.com/info/wireless/bluetooth/bluetooth\\_overview.php](http://www.radio-electronics.com/info/wireless/bluetooth/bluetooth_overview.php)

[2] JY-MCU BT\_BOARD V1.07: Arduino Wireless Bluetooth Transceiver Module Slave 4 Pin Serial + DuPont Cable;

[https://www.amazon.com/gp/product/B00OLL9XH0/ref=oh\\_aui\\_detailpage\\_o06\\_s00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B00OLL9XH0/ref=oh_aui_detailpage_o06_s00?ie=UTF8&psc=1)

[3] Bluetooth Transceiver RF Module Wireless Serial TTL V1.05 Manual; [http://www.ram-e-shop.com/ds/general/Bluetooth\\_TRx\\_Module\\_New.pdf](http://www.ram-e-shop.com/ds/general/Bluetooth_TRx_Module_New.pdf)

- [4] BC417 Bluetooth to Serial chip Datasheet by CSR;  
<https://cdn.sparkfun.com/datasheets/Wireless/Bluetooth/CSR-BC417-datasheet.pdf>  
<http://www.csr.com/products/29/bluecore4-ext>
- [5] Temperature measurement using diodes/transistors  
<http://www.cypress.com/file/128126/download>  
<http://cds.linear.com/docs/en/application-note/an137f.pdf>
- [6] This project in example #1 was created by adapting the ideas and source code from the projects described in following sources:  
<https://causeyourestuck.io/2015/12/14/communication-between-android-and-hc-06-module/>