Lab 6: Android Arduino Integration

Introduction: Android Arduino Integration

Android Arduino Integration bridges the gap between hardware and software, allowing smartphones to control and communicate with physical components connected to an Arduino. This integration is typically achieved through Bluetooth communication, enabling the smartphone to interact with external hardware like sensors and LEDs. The aim is to harness the power of mobile applications to control physical devices or gather sensor data for real-time monitoring.

In this manual, you will perform hands-on activities that showcase how to:

- Control an LED using an Android app via Bluetooth.
- Display sensor data on an Android app.
- Develop a simple Android game using MIT App Inventor or Android Studio.

Activity A: Changing the SSID of the HC-05 Bluetooth Module

Before starting with any integration, we need to ensure the Bluetooth module is correctly set up and configured. This activity involves changing the default SSID of the HC-05 Bluetooth module to ensure unique identification. Follow the detailed steps provided in the supplementary document for this configuration on Moodle named ***"Changing SSID of HC-05 Bluetooth Module"***

Activity B: Setting up MIT App Inventor and MIT AI2 Companion

You need to do this setup to control your Arduino using your Android Phone.

1. **Set Up MIT App Inventor**

- Go to ai2.appinventor.mit.edu and log in with your Google account.

2. **Import the .aia File**
   - Download the .aia file from this link, then import it in MIT App Inventor by selecting **"Projects" → "Import project (.aia) from my computer"**.
3. **Review and Modify**
   - Explore the components, screens, and blocks. Modify the app if needed using the visual blocks editor.
4. **Test the App**
   - Install **MIT AI Companion** on your Android device, connect your device to the ***same Wi-Fi as your laptop***, and scan the QR code to test the app live.

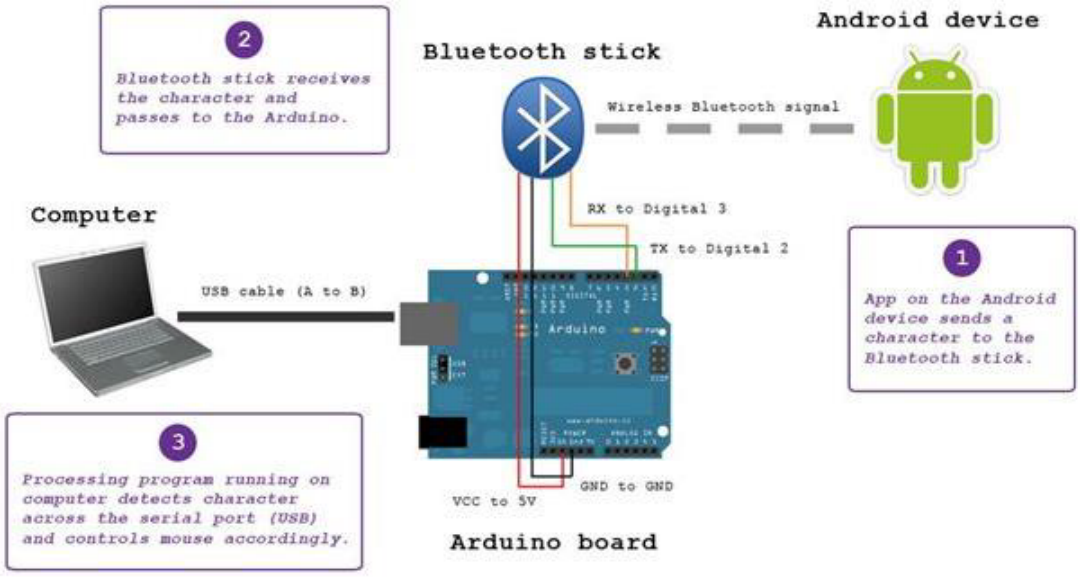
For a detailed explanation, refer to the full guide uploaded on Moodle.

Activity 1: Control LED on Arduino Uno using MIT App Inventor and Bluetooth Module

Objective: Control an LED connected to the Arduino Uno using an Android app created in MIT App Inventor, through the HC-05 Bluetooth module.

Signal Flow Diagram

1. The Android app sends commands via Bluetooth to the HC-05 module.
2. The HC-05 module transmits the data to the Arduino Uno.
3. Based on the received command, the Arduino controls the LED (turning it on or off).

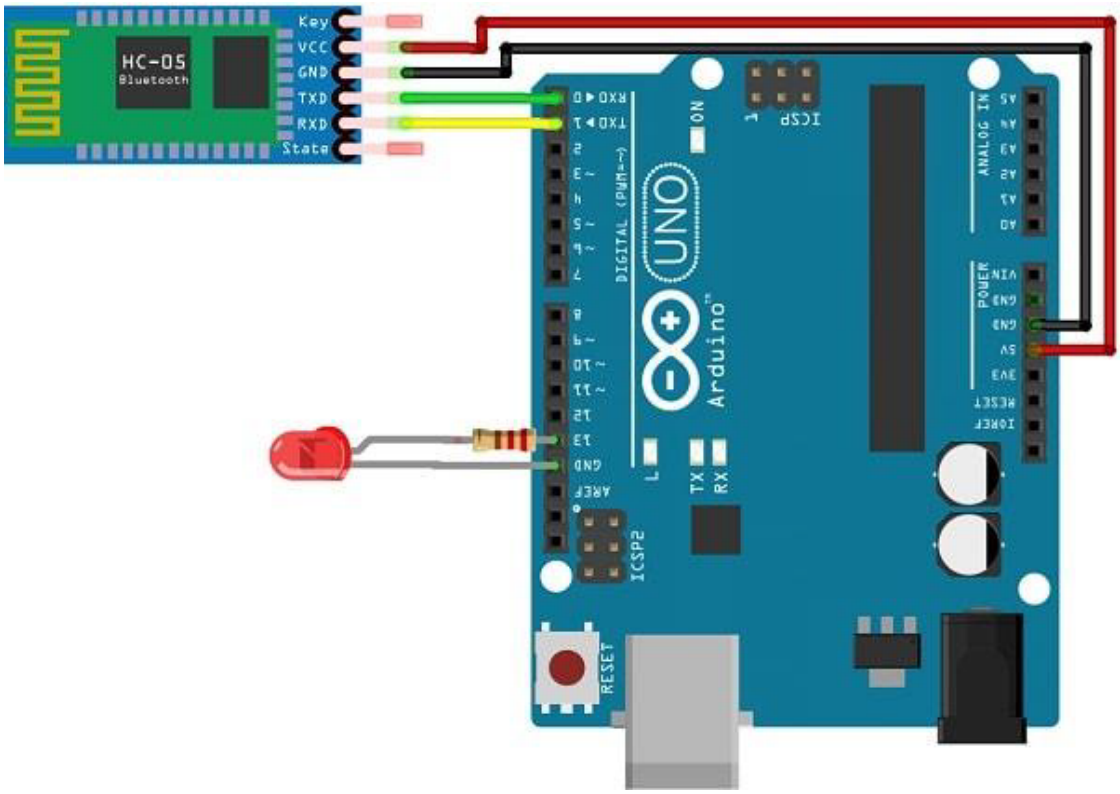


Materials Needed

- Computer with Internet access
- Android smartphone or tablet
- Arduino Uno
- HC-05 Bluetooth module (SSID: NilgiriXXXYY, Passkey: 1234)
- LED, Breadboard, Wires, Potentiometer

Circuit Diagram

Connect the LED to pin 13 of the Arduino, and set up the HC-05 Bluetooth module on the appropriate serial pins.



Arduino Code

```
#include <SoftwareSerial.h>
SoftwareSerial mySerial(10, 11); // 10 - Rx, 11 - Tx
int ledpin = 13; // LED connected to pin 13
int Data;

void setup() {
  mySerial.begin(9600);
  pinMode(ledpin, OUTPUT);
}

void loop() {
  if (mySerial.available()) {
    Data = mySerial.read();
    if (Data == '1') {
      digitalWrite(ledpin, HIGH);
      mySerial.println("LED On!");
```

```
    } else if (Data == '0') {
      digitalWrite(ledpin, LOW);
      mySerial.println("LED Off!");
    }
  }
  delay(100);
}
```

App download link

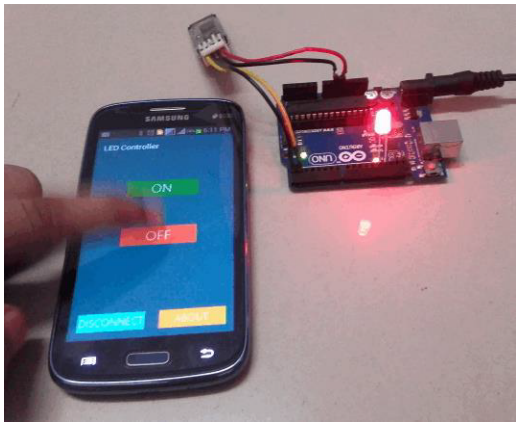
https://goo.gl/eVYvh3

App Development Steps

1. Create a new project in MIT App Inventor.
2. Add Bluetooth Client and Button components.
3. Set the app to send '1' when the button to turn the LED on is pressed, and '0' when the button to turn it off is pressed.
4. Pair the smartphone with the HC-05 Bluetooth module, and test the app to control the LED.

Expected Output

The LED connected to pin 13 of the Arduino will turn on and off as per the commands sent from the Android app.



Activity 2: Display Sensor Values on Android App Using MIT App Inventor

Objective: Read values from a sensor connected to the Arduino Uno and display the readings on an Android app through the HC-05 Bluetooth module.

> Take any sensor you want and interface it following similar steps that you used for LED.

Expected Output

The sensor readings will be displayed on the Android app, updating in real-time as the Arduino transmits the data.

Activity 3: Develop an Android Game App

Objective: Develop an Android game app using MIT App Inventor or Android Studio, utilizing sensors available on the smartphone.

Task Description

For this activity, you will develop a simple game app and explain its programming in the next lab session (4th October).

Marking Criteria

1. Knowledge and understanding of the code.
2. Interactivity of the game.
3. Number of sensors used (at least 2 required).
4. Game complexity and features (e.g., multiplayer, score visibility, game levels).

Components Needed

- Laptop with any OS
- Android phone

Resource Links

1. MIT App Inventor Sensor Palette
2. Android Sensors Documentation

General Rules

- Ensure your game has at least one or two of the following features: multiplayer option, instructions, score visibility, automatic restart, or game levels.
- No plagiarism is allowed; originality is crucial.

Assignment Due Date

- Activity 1 and 2
  - Checking circuit and Working by TAs - 24th October (In Lab)
  - Report Submission - 27th October, 2024
- Activity 3
  - You are required to present your Android game app on **4th November in Lab**. Make sure the game includes at least two sensors and meets the requirements outlined above.
