



**CNRLAB**

**CIM&ROBOTICS LABORATORY**

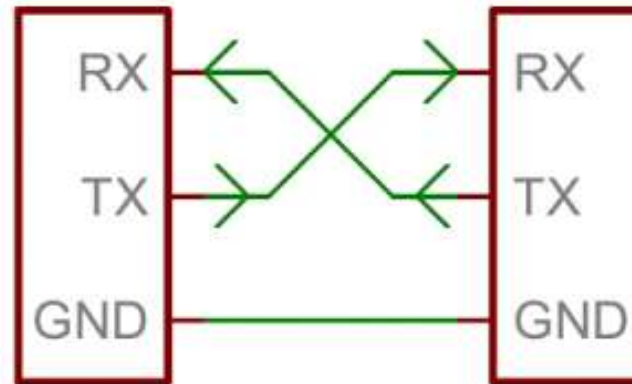
# 로봇공학입문설계

10주차 모바일 로봇(4)

로봇공학과

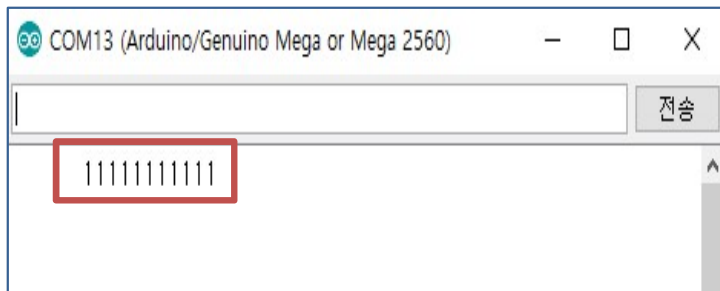
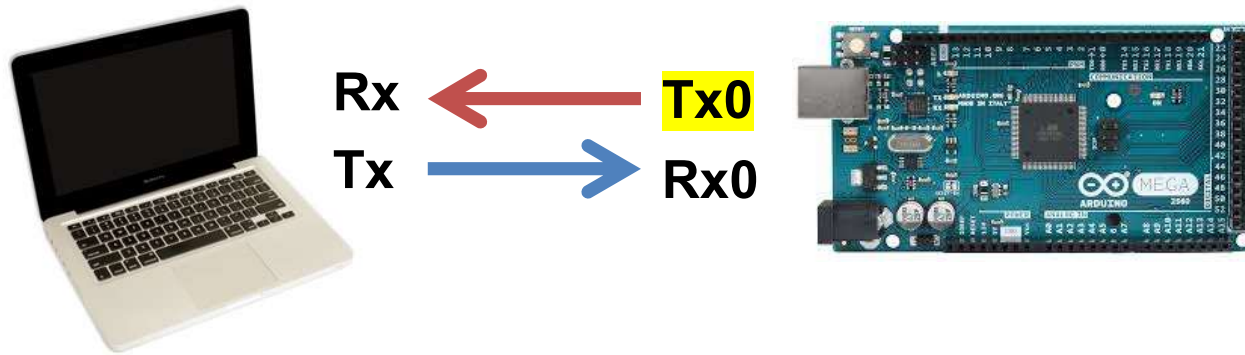
## □ 연결방법

- 시리얼 모듈은 각각 Tx(송신), RX(수신), GND의 세가지 라인으로 구성
- RX와 TX라인을 이용하여 두 모듈사이에 통신이 이루어짐
- RX, TX라는 이름은 각 장치 자신의 입장에서 바라봤을 때 라인이 담당하는 역할이므로 두 모듈을 연결할 때에는 RX와 TX를 서로 엇갈리게 연결



# 시리얼 통신

## □ Arduino ↔ PC

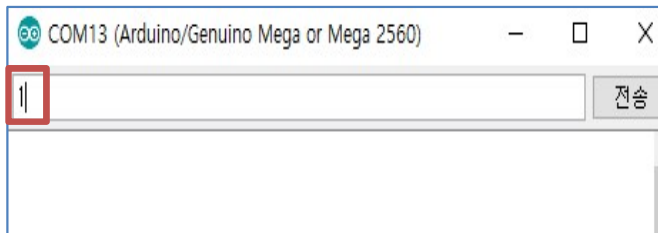
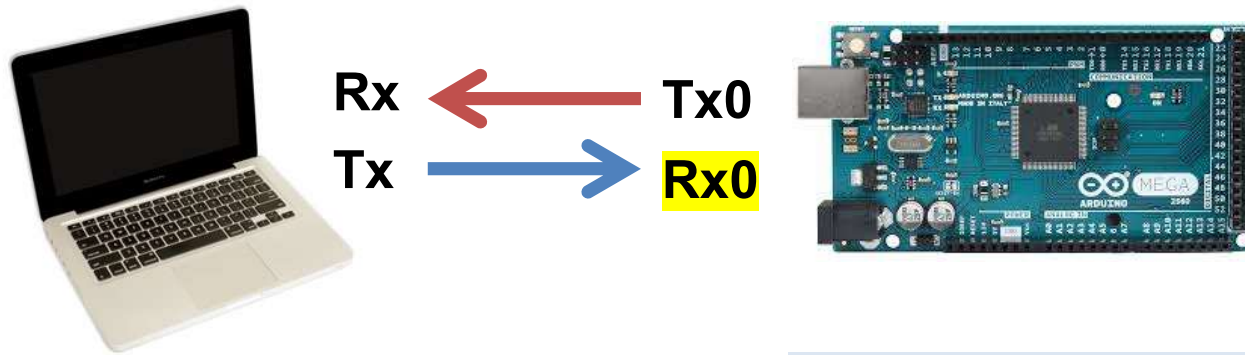


```
void setup() {  
  Serial.begin(9600);  
}
```

```
void loop() {  
  Serial.print(1);  
  delay(1000);  
}
```

# 시리얼 통신

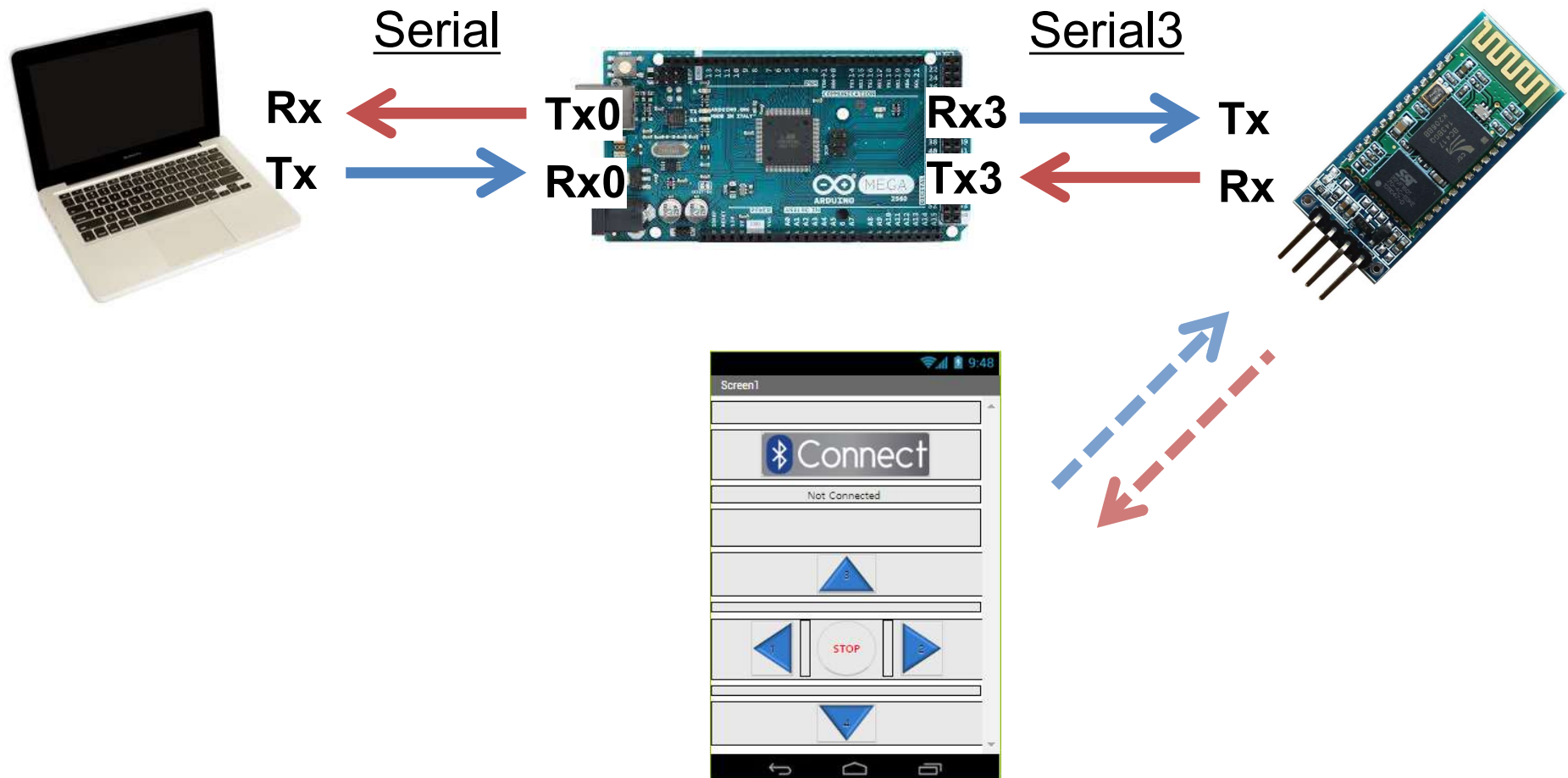
## □ Arduino ↔ PC



```
void setup() {  
    Serial.begin(9600);  
}  
  
void loop() {  
    int val = Serial.read();  
}
```

# 블루투스 통신

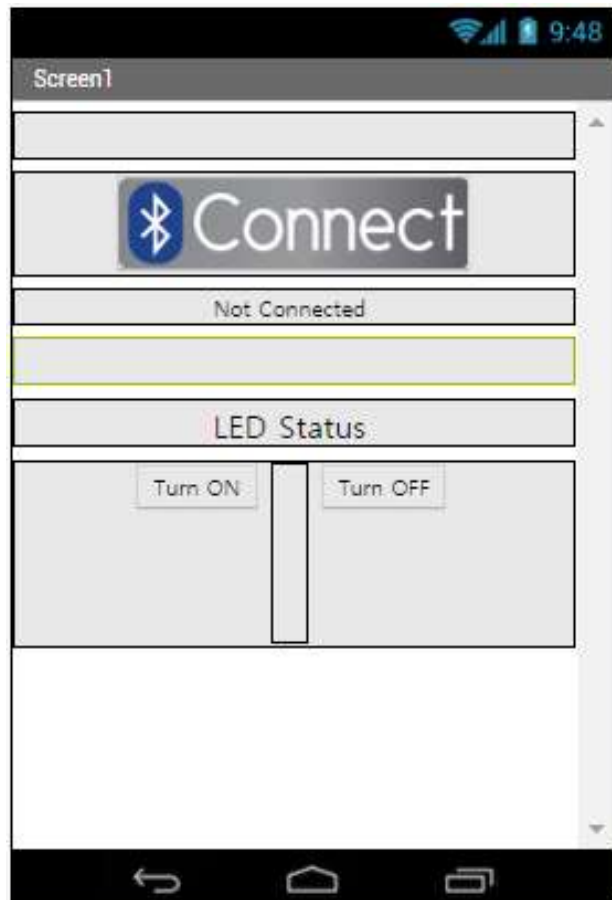
## □ 블루투스 통신 구조



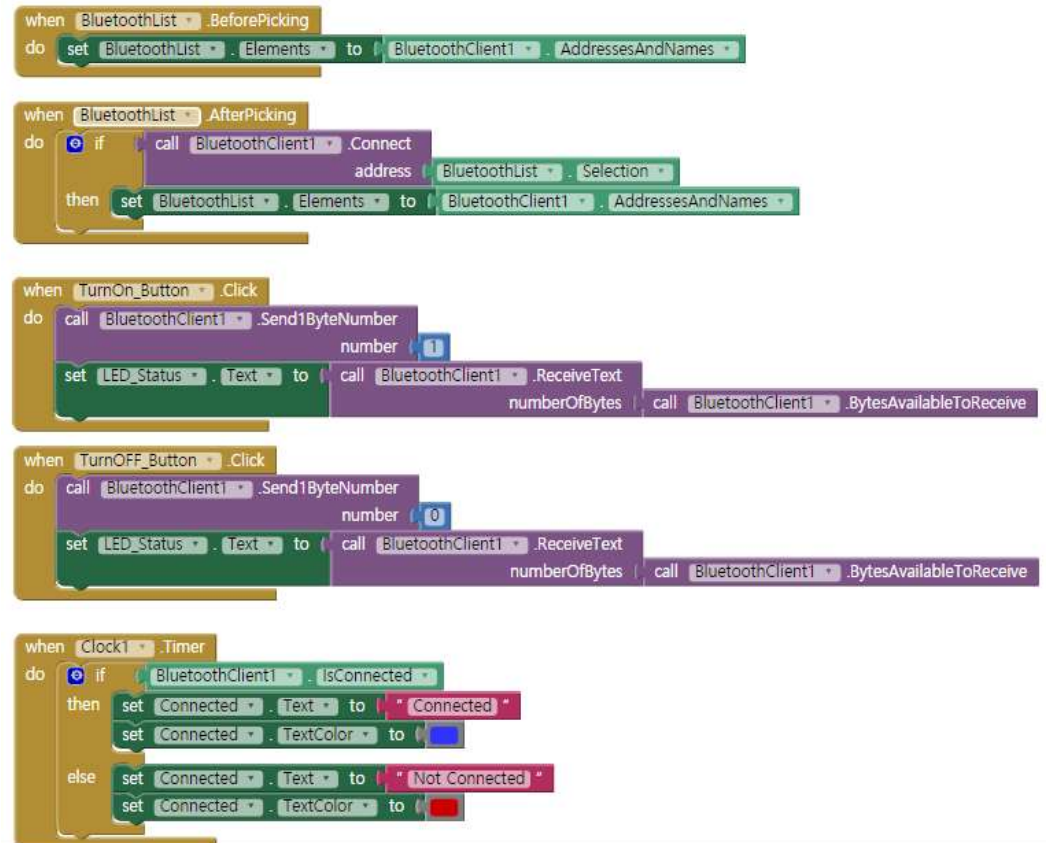
# MIT App Inventor

## □ 프로그램 구성

### Designer



### Blocks



# MIT App Inventor

## □ Designer

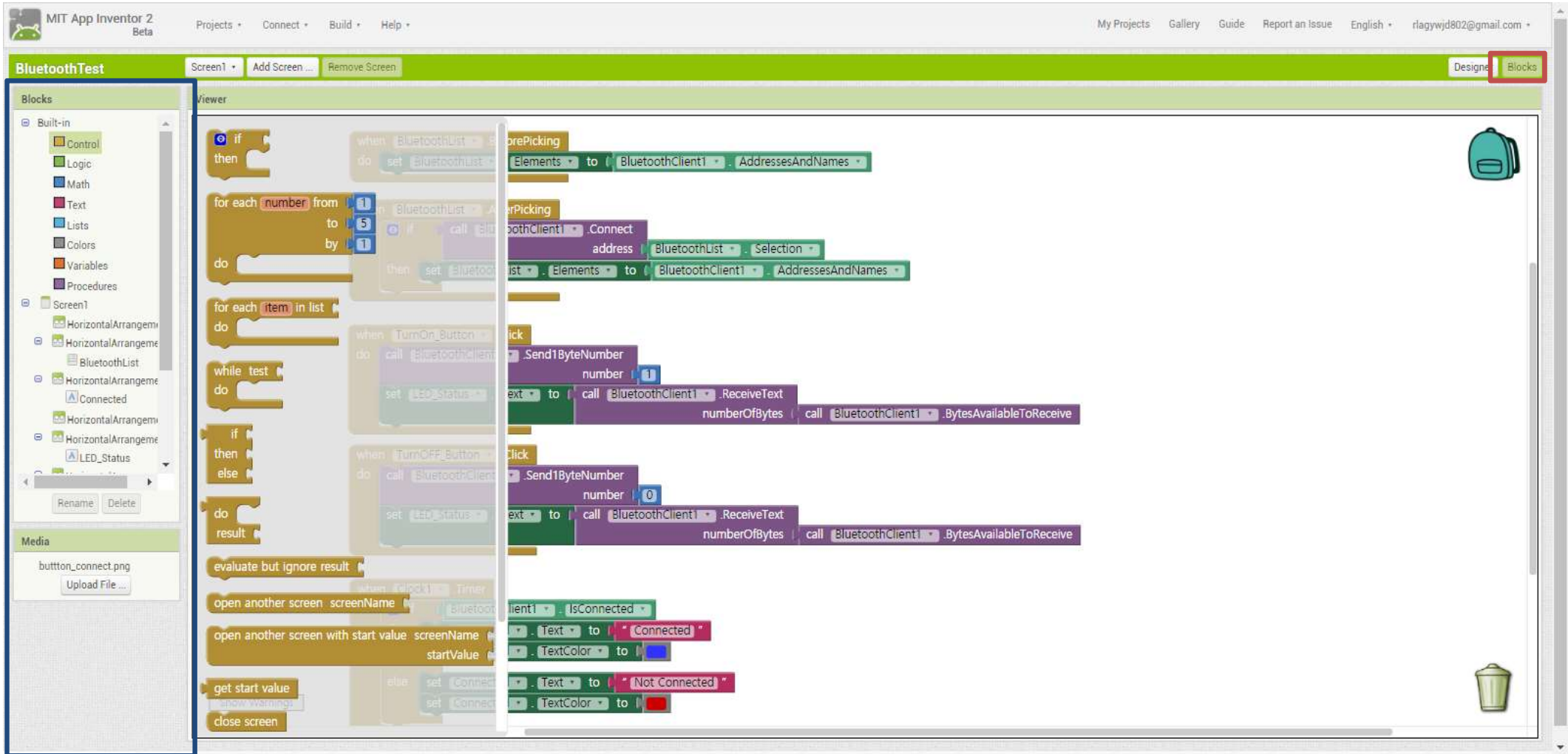
The screenshot displays the MIT App Inventor 2 Beta web interface. The top navigation bar includes 'My Projects', 'Gallery', 'Guide', 'Report an Issue', 'English', and a user email. The project name 'BluetoothTest' is shown in the top left. The interface is divided into several panels:

- Palette:** Located on the left, it contains categories like 'User Interface' (with components like Button, CheckBox, DatePicker, etc.), 'Layout', 'Media', 'Drawing and Animation', 'Sensors', 'Social', 'Storage', 'Connectivity', 'LEGO® MINDSTORMS®', and 'Experimental'.
- Viewer:** The central workspace showing a mobile app preview. It includes a status bar at the top with 'Screen1', 'Add Screen...', and 'Remove Screen' buttons. The app preview shows a 'Connect' button, a 'Not Connected' status, an 'LED Status' label, and 'Turn ON'/'Turn OFF' buttons. A blue arrow points from the 'LED Status' label in the app preview to the 'LED\_Status' component in the Components panel.
- Components:** A list of components currently on the screen, including 'Screen1', 'HorizontalArrangement1', 'HorizontalArrangement2', 'BluetoothList', 'HorizontalArrangement3', 'Connected', 'HorizontalArrangement4', 'HorizontalArrangement5', 'LED\_Status', 'HorizontalArrangement6', 'TurnOn\_Button', 'VerticalArrangement1', 'TurnOff\_Button', 'BluetoothClient1', and 'Clock1'.
- Properties:** A panel on the right showing the properties for the selected 'LED\_Status' component. It includes fields for 'LED\_Status', 'BackgroundColor', 'FontBold', 'FontItalic', 'FontSize' (set to 20), 'FontTypeface' (set to default), 'HTMLFormat', 'HasMargins', 'Height' (set to Automatic), 'Width' (set to Automatic), 'Text' (set to 'LED Status'), 'TextAlignment' (set to left), 'TextColor' (set to Black), and 'Visible' (checked).



# MIT App Inventor

## Blocks



The screenshot displays the MIT App Inventor 2 Beta web interface. The top navigation bar includes links for Projects, Connect, Build, and Help. The main workspace is divided into three sections: a left-hand palette, a central workspace, and a right-hand viewer.

The left-hand palette is titled "Blocks" and contains several categories of code blocks:

- Built-in:** Control, Logic, Math, Text, Lists, Colors, Variables, Procedures.
- Screen1:** HorizontalArrangement, BluetoothList, HorizontalArrangement, Connected, HorizontalArrangement, LED\_Status.
- Media:** A section for uploading images, currently showing "button\_connect.png".

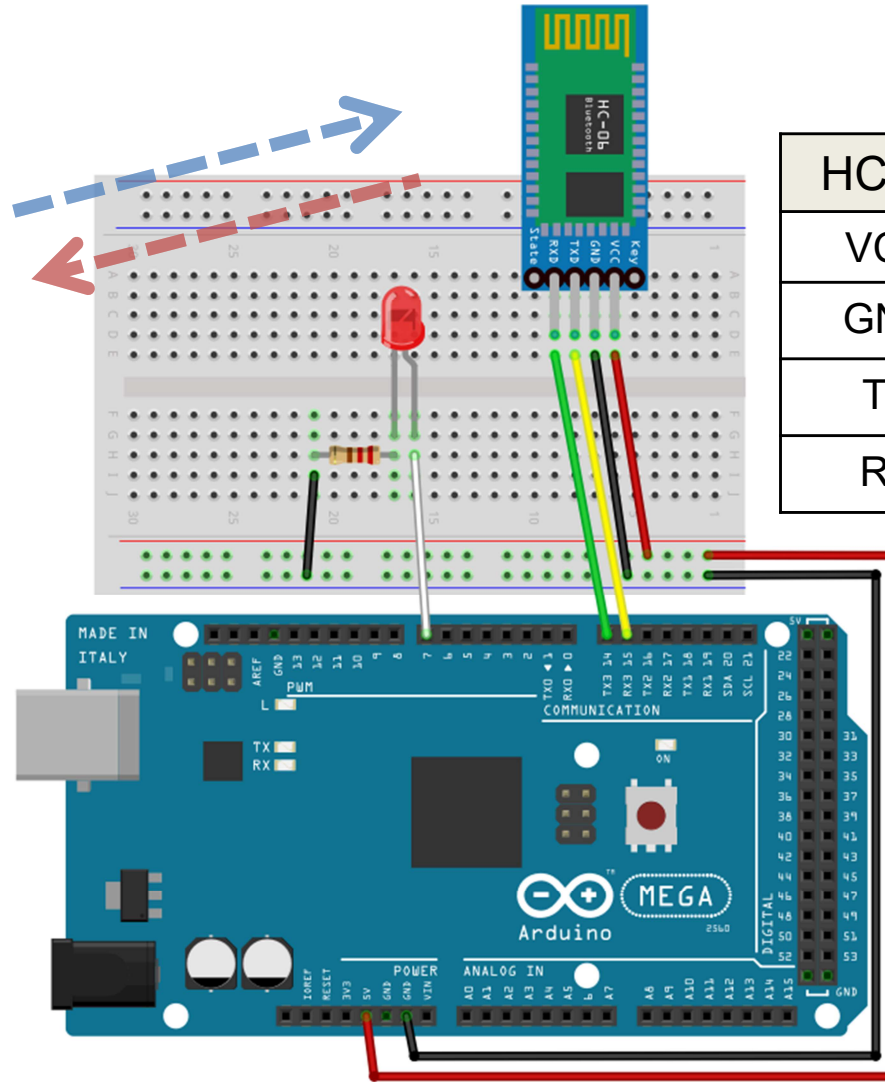
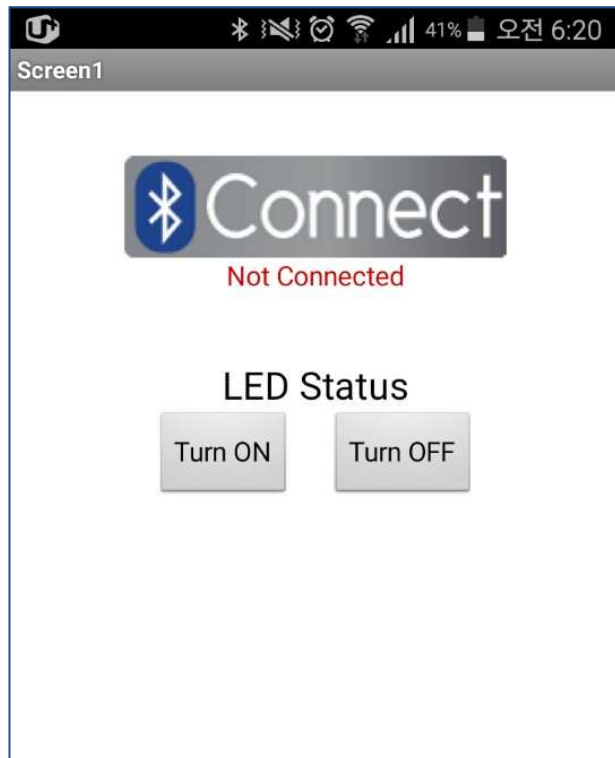
The central workspace shows a code block for a "BluetoothTest" application. The code is organized into several sections:

- Initialization:** A "when BluetoothList" block that sets the "BluetoothList" to the "AddressesAndNames" of the "BluetoothClient1".
- Event Handling:** A "when TurnOn\_Button" block that calls "BluetoothClient1.Connect" and sets the "BluetoothList" to the "AddressesAndNames" of "BluetoothClient1".
- Looping:** A "for each (item) in list" block that iterates through the "BluetoothList" and performs actions for each item.
- Conditional Logic:** An "if" block that checks if the "BluetoothClient1" is connected. If connected, it sets the "LED\_Status" to "On". If not connected, it sets the "LED\_Status" to "Off".
- Text Handling:** A "when TurnOff\_Button" block that calls "BluetoothClient1.Disconnect" and sets the "LED\_Status" to "Off".
- Screen Management:** A "when Click" block that calls "open another screen" with the screen name "BluetoothTest" and a start value of "0".
- Final Actions:** A "when Click" block that calls "close screen" and sets the "LED\_Status" to "Off".

The right-hand viewer shows the visual representation of the application, including a "BluetoothTest" screen with a "TurnOn\_Button", a "TurnOff\_Button", and a "LED\_Status" indicator.

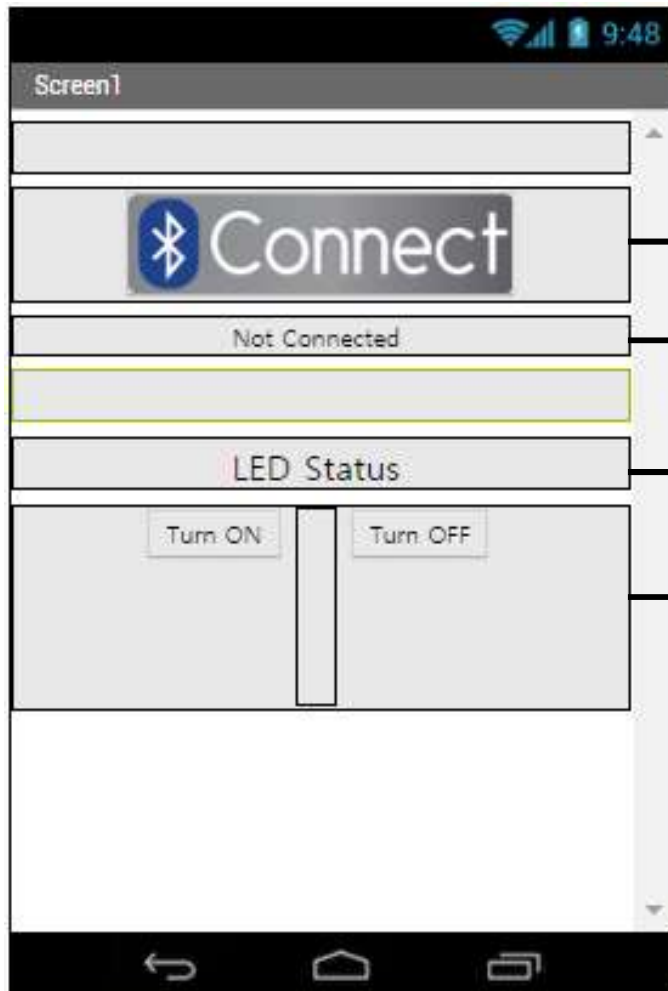


## [예제1] Bluetooth로 LED키기



HC-06	Arduino
VCC	5V
GND	GND
TX	RX3(15)
RX	TX3(16)

## □ MIT App Inventor



블루투스 연결부

블루투스 통신 연결상태 표시

LED 상태 표시

LED 점멸 조작 버튼

```
when BluetoothList ▾ .BeforePicking
do set BluetoothList ▾ .Elements ▾ to BluetoothClient1 ▾ .AddressesAndNames ▾

when BluetoothList ▾ .AfterPicking
do if call BluetoothClient1 ▾ .Connect
    address BluetoothList ▾ .Selection ▾
then set BluetoothList ▾ .Elements ▾ to BluetoothClient1 ▾ .AddressesAndNames ▾
```

블루투스 연결부

```
when TurnOn_Button ▾ .Click
do call BluetoothClient1 ▾ .Send1ByteNumber
    number 1
set LED_Status ▾ .Text ▾ to call BluetoothClient1 ▾ .ReceiveText
    numberOfBytes call BluetoothClient1 ▾ .BytesAvailableToReceive

when TurnOFF_Button ▾ .Click
do call BluetoothClient1 ▾ .Send1ByteNumber
    number 0
set LED_Status ▾ .Text ▾ to call BluetoothClient1 ▾ .ReceiveText
    numberOfBytes call BluetoothClient1 ▾ .BytesAvailableToReceive
```

버튼 조작부

```
when Clock1 ▾ .Timer
do if BluetoothClient1 ▾ .IsConnected ▾
then set Connected ▾ .Text ▾ to "Connected"
    set Connected ▾ .TextColor ▾ to blue
else set Connected ▾ .Text ▾ to "Not Connected"
    set Connected ▾ .TextColor ▾ to red
```

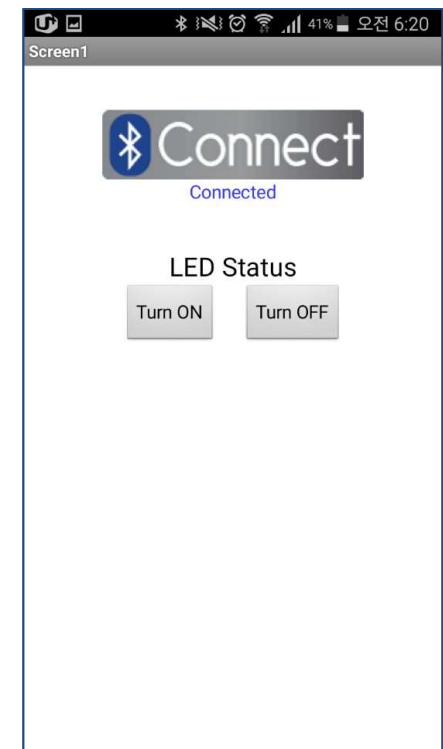
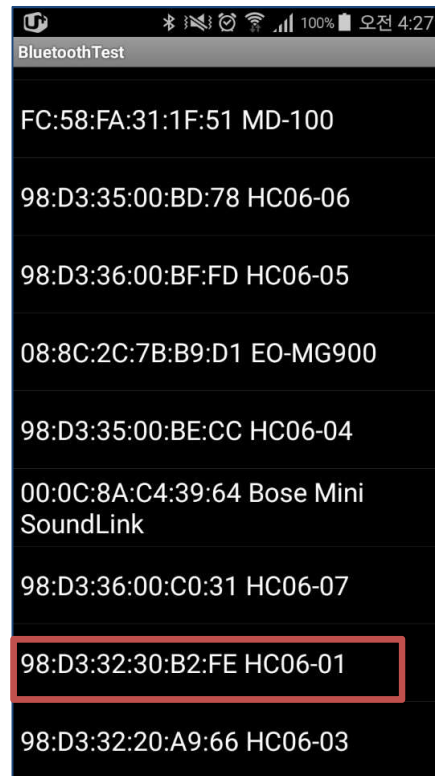
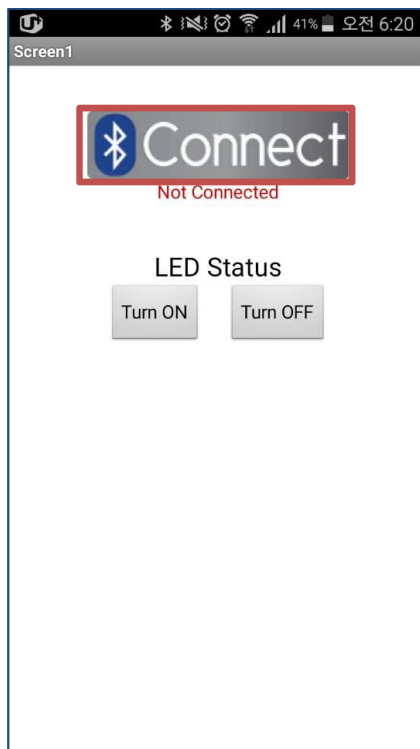
타이머

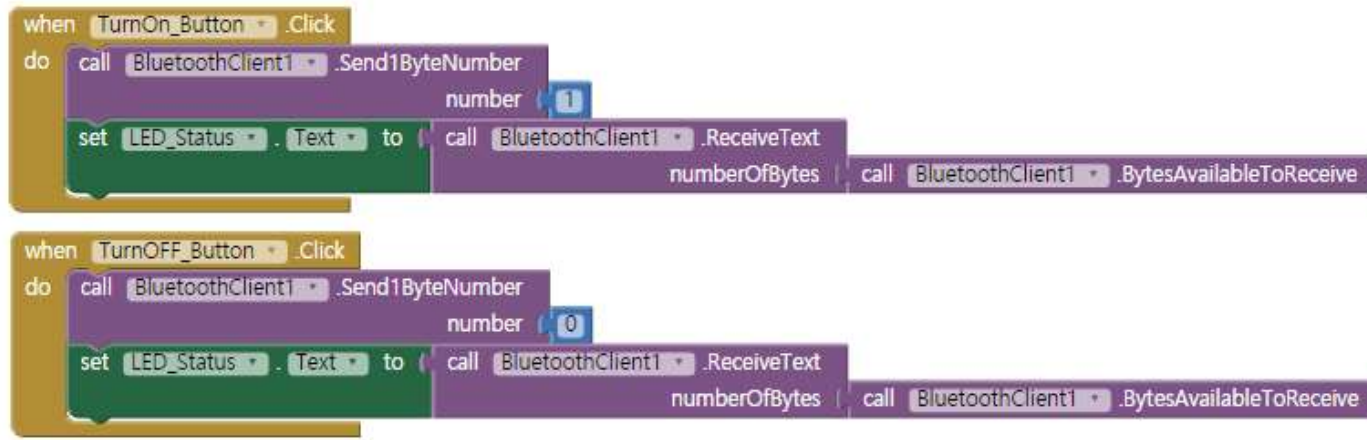
# 블루투스 통신

```
when BluetoothList .BeforePicking
do set BluetoothList .Elements to BluetoothClient1 .AddressesAndNames

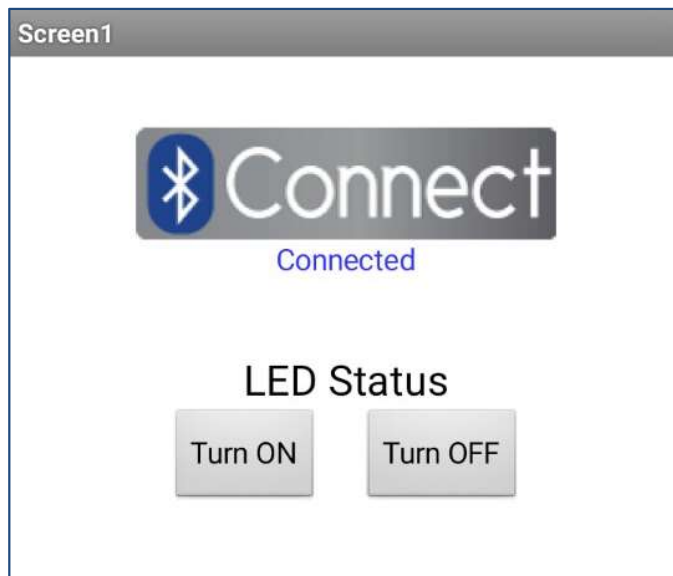
when BluetoothList .AfterPicking
do if call BluetoothClient1 .Connect
    address BluetoothList .Selection
then set BluetoothList .Elements to BluetoothClient1 .AddressesAndNames
```

블루투스 연결부

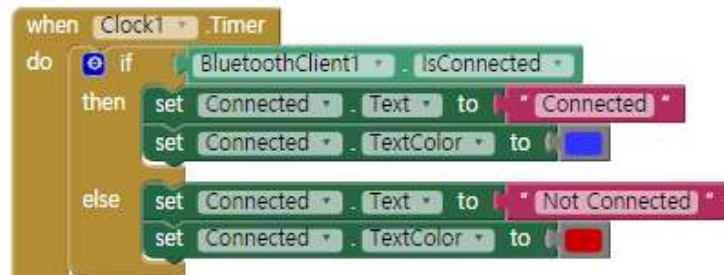




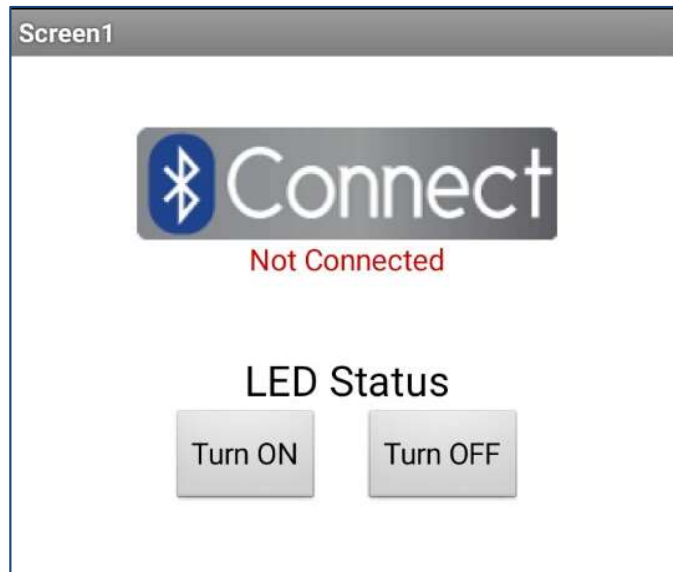
버튼 조작부



```
void loop() {  
  if(Serial3.available()){  
    indata = Serial3.read();  
  
    if(indata == 0){  
      digitalWrite(ledPin, LOW);  
      Serial.println("LED:OFF");  
    }  
    else if(indata == 1){  
      digitalWrite(ledPin, HIGH);  
      Serial.println("LED:ON");  
    }  
    else{  
      Serial.println("Error");  
      Serial.println(indata);  
    }  
  }  
}
```



} 타이머



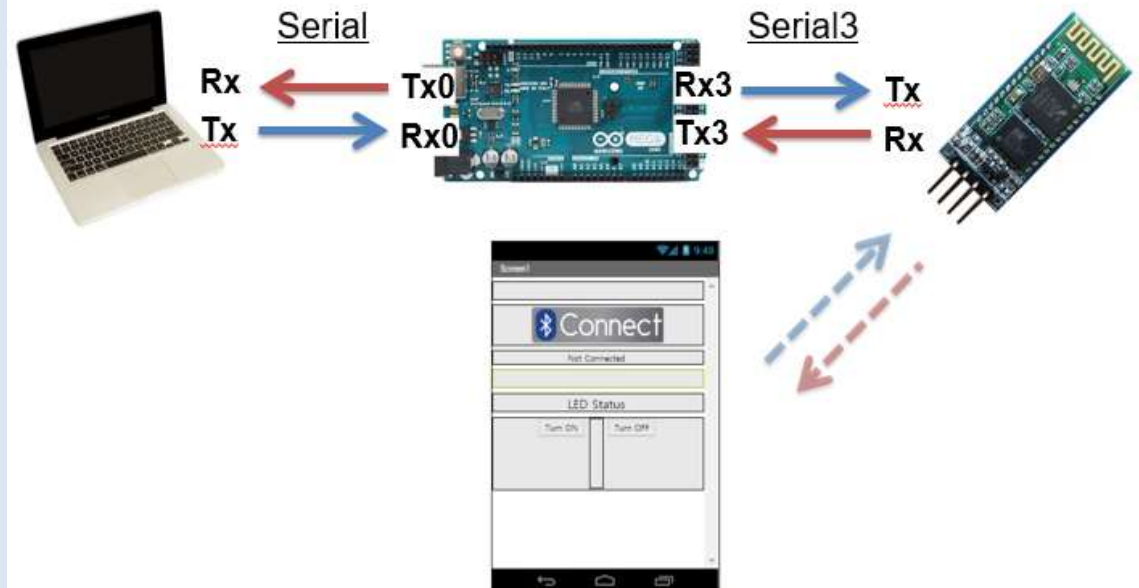
## □ Arduino

```
#define ledPin 7
unsigned char indata; // 1Byte Number

void setup() {
  pinMode(ledPin, OUTPUT);
  digitalWrite(ledPin, LOW);
  Serial.begin(9600);
  Serial3.begin(9600); // Default baud rate of the Bluetooth
}

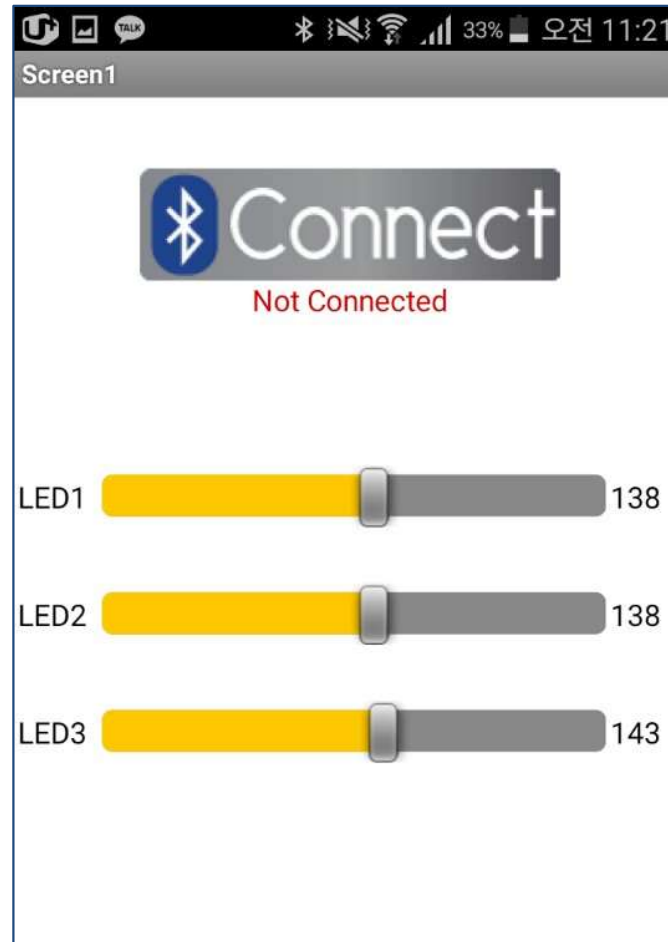
void loop() {
  if(Serial3.available()){
    indata = Serial3.read();

    if(indata == 0){
      digitalWrite(ledPin, LOW);
      Serial.println("LED:OFF");
    }
    else if(indata == 1){
      digitalWrite(ledPin, HIGH);
      Serial.println("LED:ON");
    }
    else{
      Serial3.println("Error");
      Serial.println(indata);
    }
  }
}
```

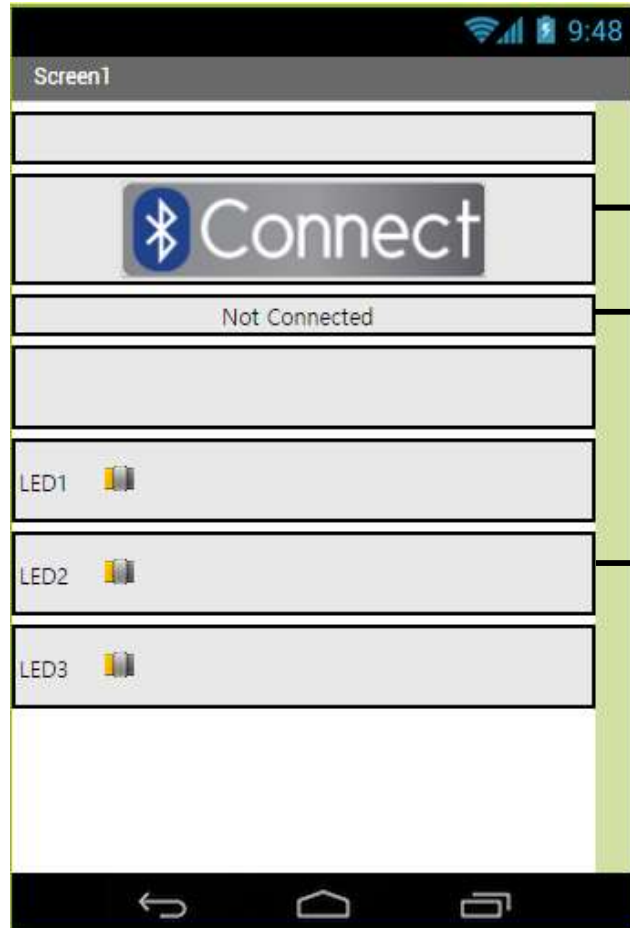




## [예제2] Bluetooth로 여러 개 LED 밝기조절



## □ MIT App Inventor

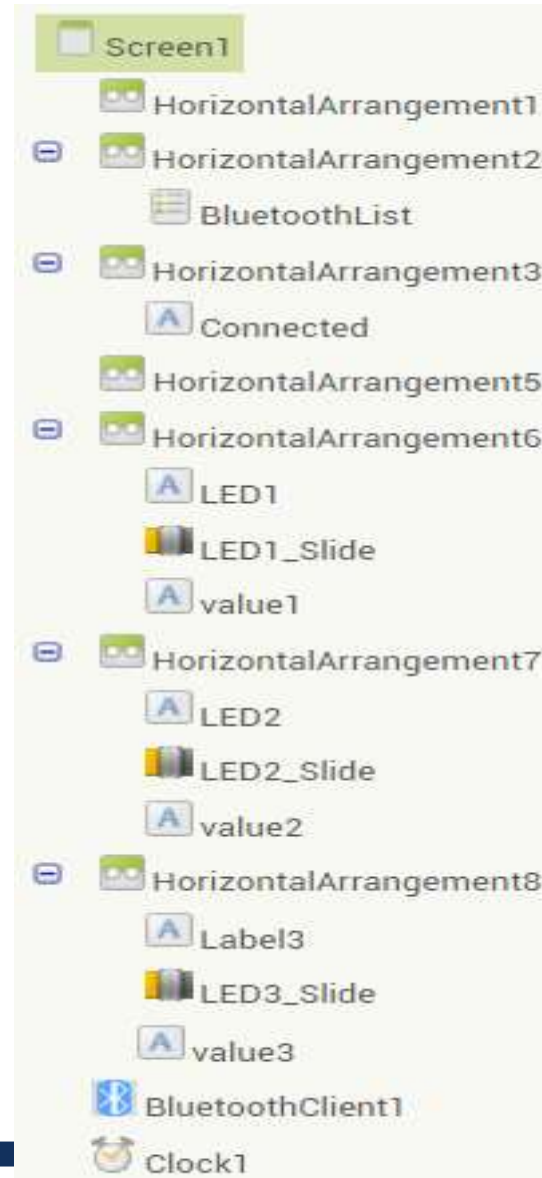
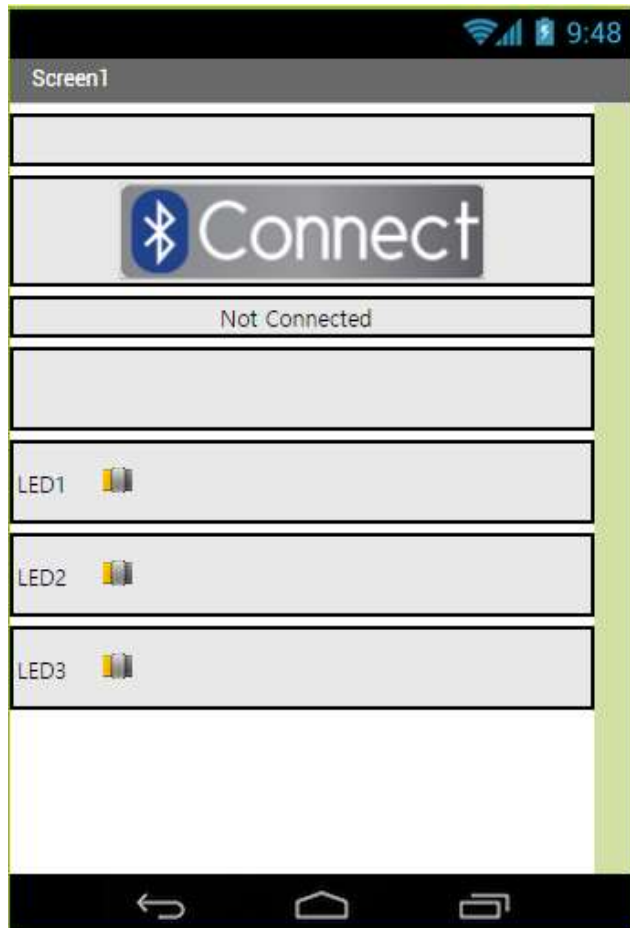


블루투스 연결부

블루투스 통신 연결상태 표시

LED 밝기 조절 및 표시

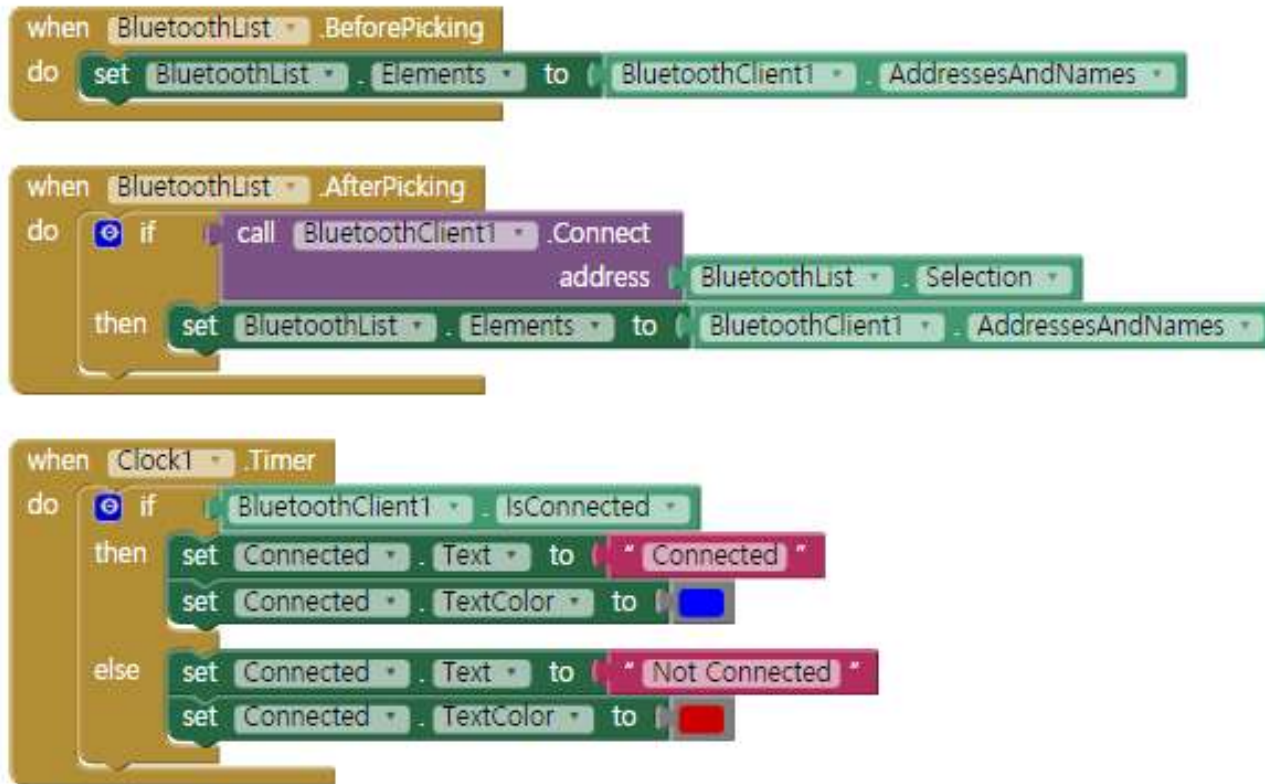
## MIT App Inventor



- Components 부분을 사진과 같이 구성

- Properties 부분은 임의로 구성

## □ MIT App Inventor



블루투스 연결부

타이머

```
when LED1_Slide .PositionChanged
  thumbPosition
do
  if BluetoothClient1 .IsConnected
  then call SendText
  set value1 .Text to round LED1_Slide .ThumbPosition
```

```
when LED2_Slide .PositionChanged
  thumbPosition
do
  if BluetoothClient1 .IsConnected
  then call SendText
  set value2 .Text to round LED2_Slide .ThumbPosition
```

```
when LED3_Slide .PositionChanged
  thumbPosition
do
  if BluetoothClient1 .IsConnected
  then call SendText
  set value3 .Text to round LED3_Slide .ThumbPosition
```

```
to SendText
do
  call BluetoothClient1 .SendText
  text join round LED1_Slide .ThumbPosition
  "0"
  call BluetoothClient1 .SendText
  text join round LED2_Slide .ThumbPosition
  "0"
  call BluetoothClient1 .SendText
  text join round LED3_Slide .ThumbPosition
  "0"
```

슬라이드 조작부

함수부

## □ Arduino

```
#define ledPin1 7
#define ledPin2 8
#define ledPin3 9

void setup() {
  pinMode(ledPin1, OUTPUT);
  pinMode(ledPin2, OUTPUT);
  pinMode(ledPin3, OUTPUT);
  Serial3.begin(9600);
}

void loop() {
  if(Serial3.available()){
    int val1 = Serial3.parseInt();
    int val2 = Serial3.parseInt();
    int val3 = Serial3.parseInt();
    if(Serial3.read() == '\n'){
      analogWrite(ledPin1, val1);
      analogWrite(ledPin2, val2);
      analogWrite(ledPin3, val3);
    }
  }
}
```