# Garmin Aero

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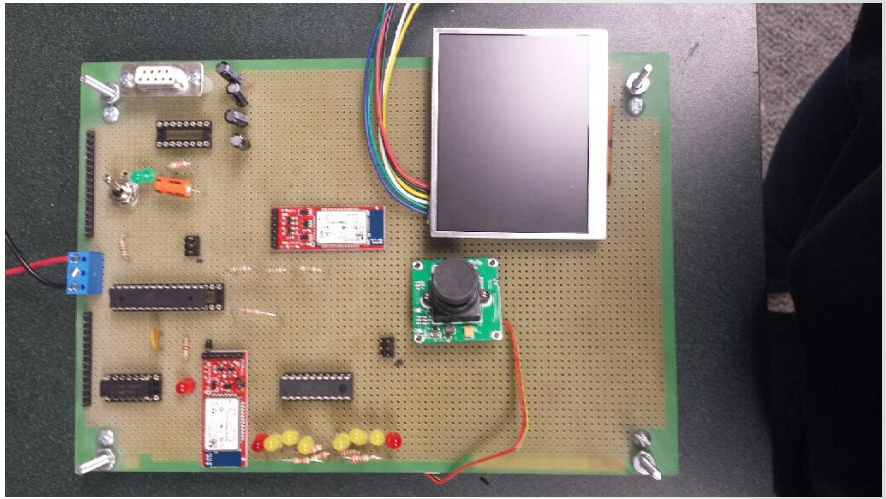
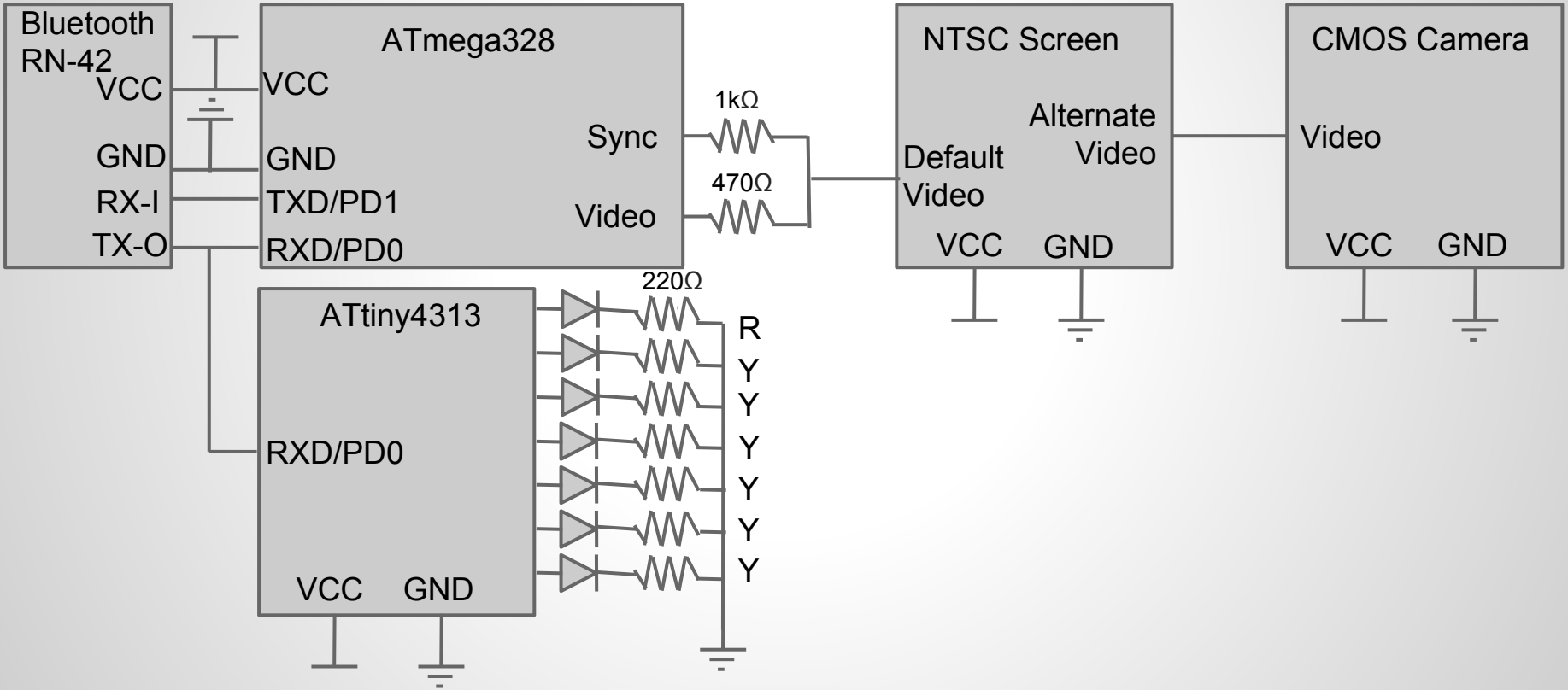
# Helmet Core

- Inputs
  - Bluetooth module
  - Camera
- Outputs
  - LEDs
  - Screen module



# Helmet Core Schematic



# TVout Library

- Interrupt-driven library for producing composite video
- NSTC or PAL output
- Compatible with ATmega328P

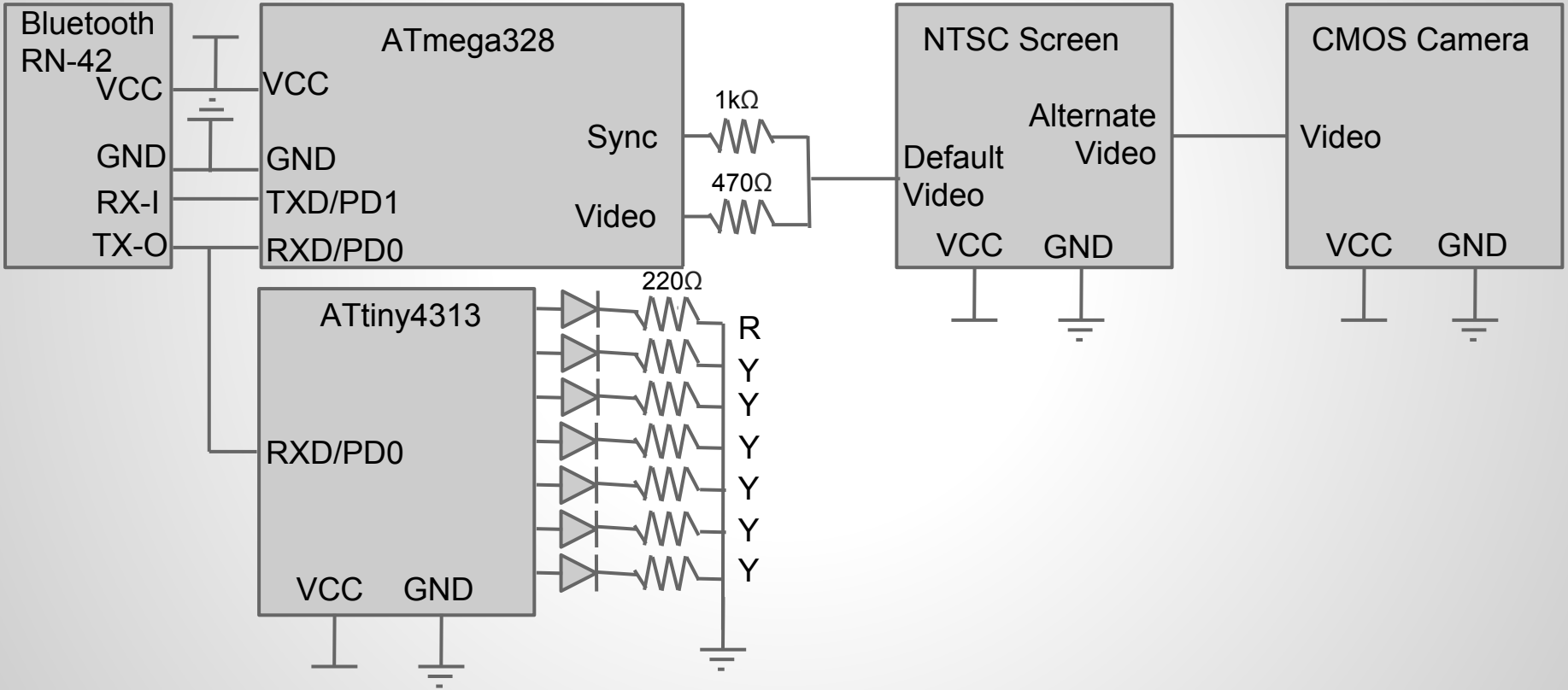
# TVout Library

```
TVout TV;
TV.println(“Hello World”);
TV.delay(1000);
TV.clear_screen();
```

# Issue: TVout is greedy with pins!

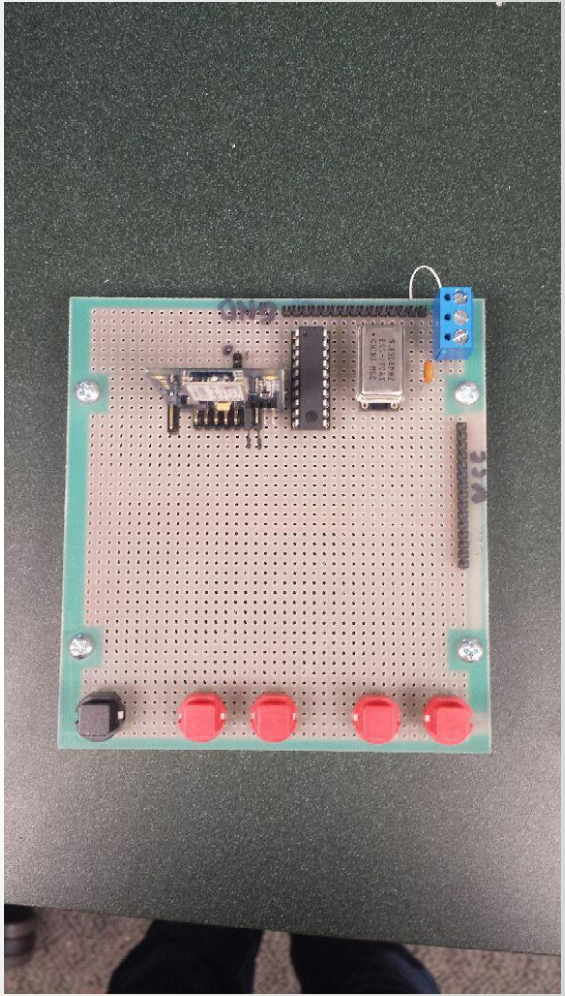
- TVout library uses the output pins on our ATmega328P
- Solution: add **ATtiny4313** to helmet board

# Helmet Core Schematic

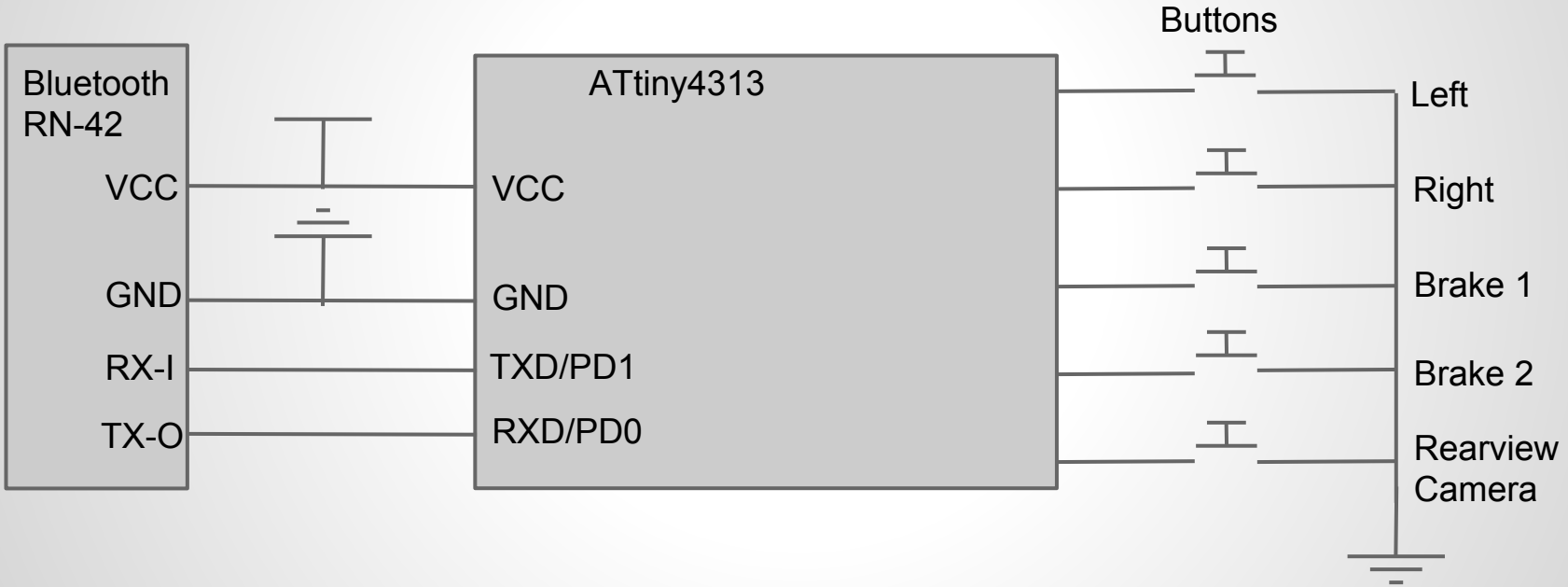


# Handlebar Board

- Inputs
  - 5 pushbuttons
- Outputs
  - Bluetooth module

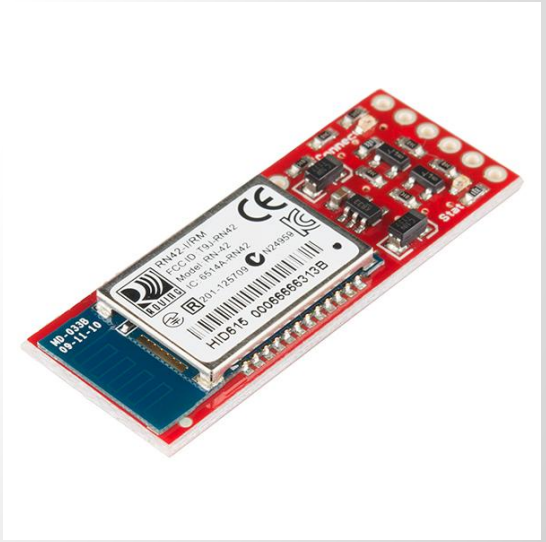


# Handlebar Schematic

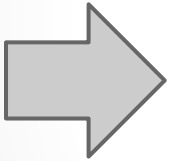


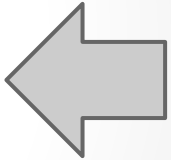
# Bluetooth Issues

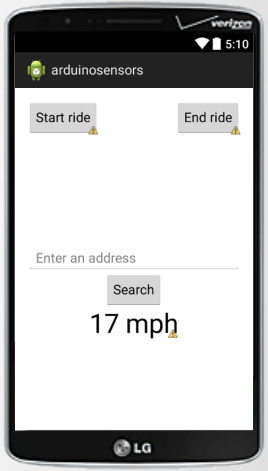
- Bluetooth modules use Serial Port Profile
- Difficulty maintaining multiple active connections
- Making two Bluetooth modules “find each other”



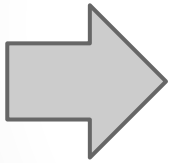
# Original Bluetooth Plan

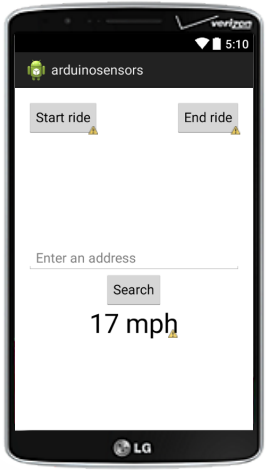


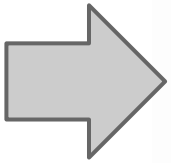





# New Bluetooth Communication Flow





# Bluetooth on Android

- Capable of multiple connections by using multiple threads

# `BluetoothAdapter`

- Manages device's fundamental bluetooth functions:
  - Initial device discovery
  - Track paired devices
- Member functions:
  - `Set<BluetoothDevice> getBondedDevices()`
  - `BluetoothDevice getRemoteDevice(byte[] address)`

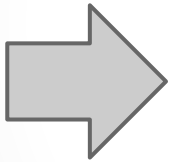
# `BluetoothSocket`

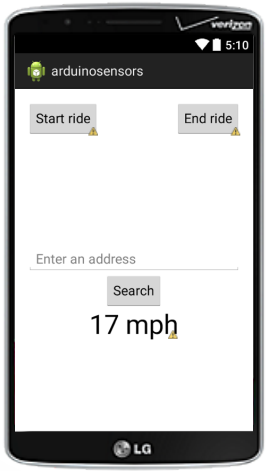
- Manages connection with a device
- Member functions
  - `void connect()`
  - `InputStream getInputStream()`
  - `OutputStream getOutputStream()`
- Thread safe!!!!!

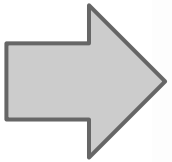
# `class ConnectedThread`

- `class ConnectedThread extends Thread`
- Member functions
  - `write()`
    - Write bytes to output stream
  - `run()`
    - Infinite loop reading bytes from input stream

# Bluetooth Communication Flow





# Handlebar Board: Sending Buttons

Send a byte based on which buttons are pressed.

```
while(1)
{
   buttons = PINB;
   sci_out(~buttons & BUTTONMASK);
  _delay_ms(100);
}
```

# Android App: Sending & Receiving

- Handler function receives message from handlebar `ConnectedThread` object
- Take first byte of message String
- If byte is not null, send to helmet `ConnectedThread` object
  - Send ‘#’ first
  - Then send the info byte

# Helmet Board: Displaying on LEDs

- Runs on ATtiny4313
- `char received = sci_in()`
- If `received == ‘#’`, grab another byte
- Display LED output based on info byte
  - `blink_left()`
  - `off_left()`
  - `blink_right`
  - `off_right`

# TVout Library: pollserial

- Allows us to access serial communication on ATmega328P while displaying video
- Member functions:
  - int read()

# Moving Forward

- Work out kinks with multiplexing video output to display
- Improve Android app
  - Improve user interface
  - GPS location
  - Speedometer
  - Odometer
  - Navigation?

# Demo