PKI-IEEE Fall 2021 Project #2

Simple Wireless (RF) Communication Board

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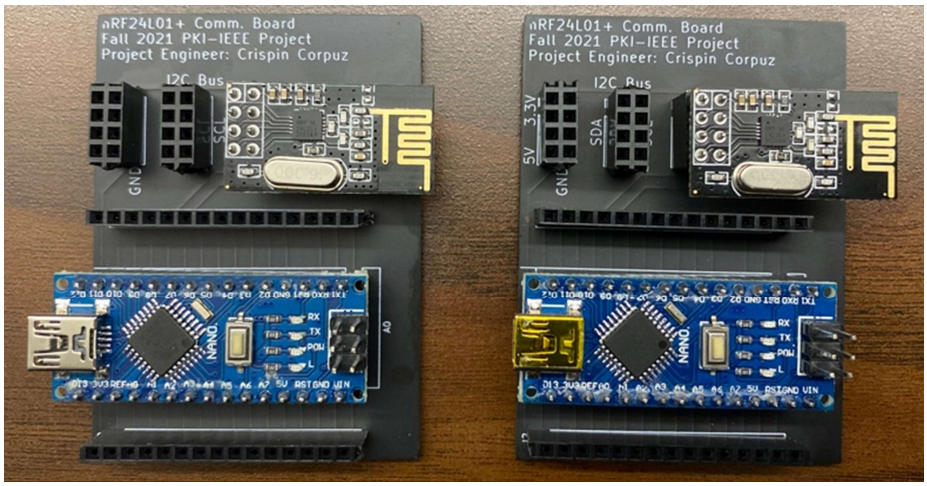

Background/Design:

From a pure design standpoint, the PCB schematic is simple—there are seven connections from the Arduino Nano to the nRF24L01+ module, two connections from the Arduino Nano to the I^2C bus (for easy serial communication with LCD, sensors, etc. of end user's choice), and two connections from the Arduino Nano to +5V and +3.3V rails and ground. However, this allows for great flexibility in what the user can do with the wireless communications link.

The nRF24L01+ module is a breakout board widely produced for the nRF24L01+ integrated circuit produced by Nordic Semiconductor. It uses Gaussian frequency shift keying modulation in order to communicate with others of the same module (which is similar to Bluetooth 4 and Bluetooth Low Energy [BLE]—this project can be extended to communicate between a microcontroller and an Android device). It can communicate on up to 125 channels,

Construction: (NOTE: when storing nRF24 module, please keep in ESD protected places, can be damaged easily by simple static discharge.)

1. Cut female headers into the following quantities:
    a. NOTE: remove the gold pin at the bottom between portions of header and cut in that place!
    b. 2x4 holes—4 pieces
    c. 1x4 holes—2 pieces (used for GND/5V/3V3 instead of 2x4)
    d. 1x15 holes—8 pieces
2. Solder all pins into respective holes on board
3. Solder I2C backpack behind LCD so that its main body is underneath the LCD when the LCD is viewed from above/front.
4. Download Arduino IDE if you do not have it yet on your machine.
5. Open the Arduino IDE and go to Tools > Manage Libraries and search for "RF24" and install the one actually called "RF24". (May need to scroll down a bit)
6. Download .zip files from here and follow the instructions from both:
    a. https://github.com/cccorpuz/wireless-comm-board
    b. https://github.com/fdebrabander/Arduino-LiquidCrystal-I2C-library
7. Plug in one Arduino into header pins on board with programming port facing the left when words are oriented at the top
8. Plug in LCD (you'll need female-to-male wires)
9. Upload ArduinoNano_nRF24_RX (receive side!)
10. Unplug the first Arduino Nano (and respective board) and plug in the other one in the same way as the first

11. Upload ArduinoNano_nRF24_TX (transmit side!)
12. You're done!
    a. If you plug in either side radio into just a normal phone charger brick (with USB-A into wall socket) and have the other plugged into your computer, go to Tools > Serial Monitor (make sure the selected COM port is to the Arduino Nano plugged into computer via USB cable) and watch as data is transmitted (or received, depending on which one you are monitoring).
    b. Future modifications are all up to your creativity!
    c. All Arduino Nano pins are broken out for your convenience, in addition to I2C, 5V, and 3.3V buses