AQUACOMM

UNDER WATER COMMUNICATION SYSTEM

PROBLEM STATEMENT:

To Design and implement a duplex underwater communication system using LED and Photodiode, where a transmitter takes input from a serial connection and encrypts, modulates and transmits the message using a static LED, while the receiver receives the message, decrypts, demodulates and prints it to the screen. Receiver also sends an acknowledgement and continuously checks for LOS. The system should use AES and Manchester libraries for encryption and modulation/demodulation respectively. The system should be implemented in Arduino and should be able to transmit and receive messages over a distance of at least 10 meters.

PROPOSED SYSTEM:

TRANSMITTER:

- Uses a static LED and photodiode to transmit messages
- Encrypts and modulates the messages using Manchester encoding and AES encryption
- Periodically sends dummy messages to check for line-of-sight (LOS) with the receiver
- Waits for acknowledgement from the receiver after transmitting a message
- Can accept a message from the receiver about high ambient light and alert the user

RECEIVER:

- Uses a dynamic LED and photodiode paired with servos in X and Y to receive messages
- Decrypts and demodulates the messages using AES decryption and Manchester decoding
- Prints the received message to the screen
- Sends an acknowledgement to the transmitter for successful transmission
- Periodically sends dummy signals to check for LOS with the transmitter
- Can send a message to the transmitter about high ambient light
- Uses a sweep algorithm to search for LOS if it is lost
- Can use an ambient light sensor to account for errors caused by high ambient light

The algorithm for both transmitter and receiver are using encryption and modulation to send message, and also keep track of line of sight and ambient light level.

MATERIALS REQUIRED:

- Arduino microcontroller board (such as Arduino UNO or Arduino Mega)
- LASERSs (1 for the transmitter and 1 for the receiver)
- Photodiodes (1 for the transmitter and 1 for the receiver)
- Servo motors (2 for the receiver)
- Ambient light sensor (for the receiver)
- Breadboard or PCB for circuit connections
- Jumper wires
- Power source (such as a 9V battery or USB power supply)
- Manchester and AES libraries for Arduino (to perform Manchester encoding/decoding and AES encryption/decryption)
- Software to program the Arduino (such as the Arduino IDE)

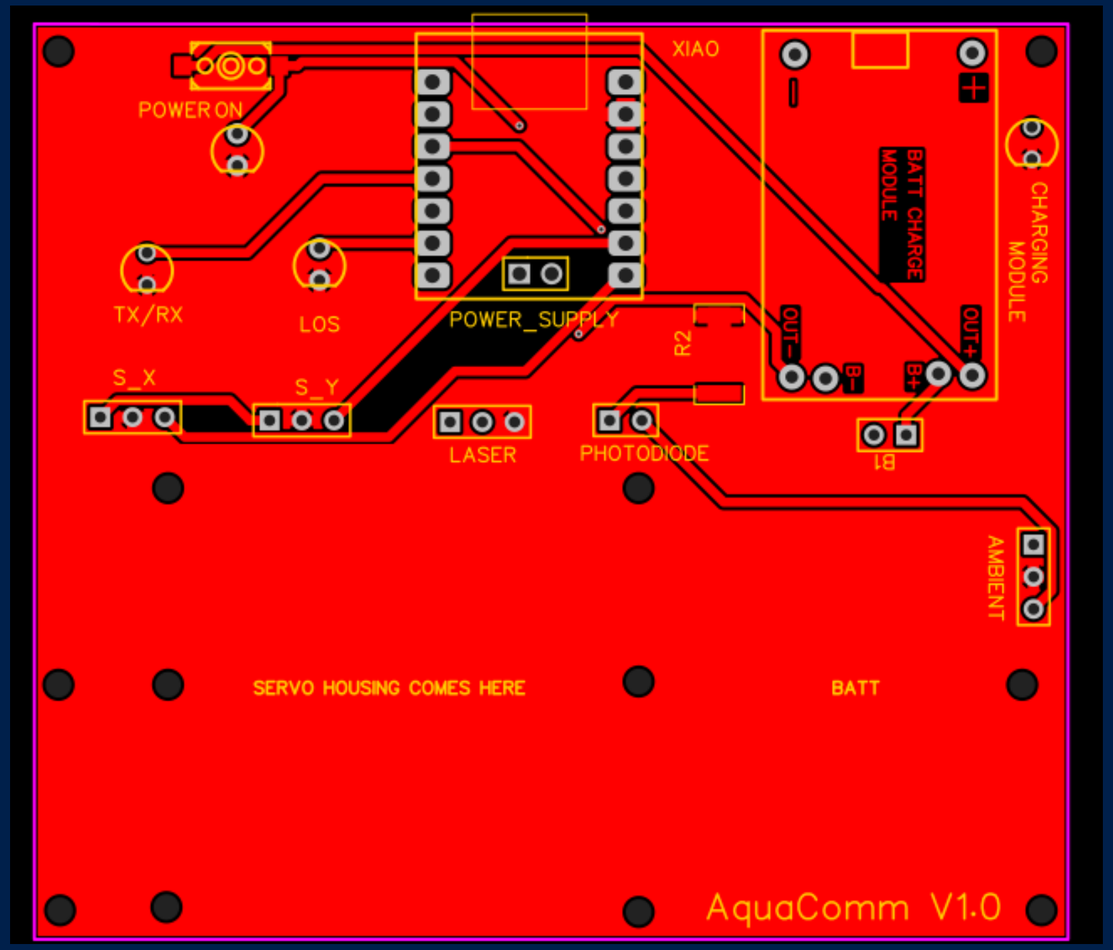
PSEUDO CODE FOR TX:

1. Include necessary libraries (SHA256, Manchester, AES)
2. Declare seed value known by both transmitter and receiver
3. Declare pin configurations for LED, photodiode, and ambient sensor
4. In the setup() function:
    a. Generate key from seed using SHA256 library
    b. Set up AES encryption using the generated key
    c. Set up Manchester modulation
    d. Set pinModes
5. In the loop() function:
    a. Send dummy message periodically to check for LOS
    b. Check for input from serial
    c. If input is received:
        i. Encrypt message using AES
        ii. Modulate message using Manchester
        iii. Transmit message
        iv. Wait for acknowledgement from receiver
    d. If input message is "ambient light high" print to screen
    e. If input message is too long print to screen
6. In the sendDummyMessage() function:
    a. Send dummy signal
    b. Wait for acknowledgement from receiver
    c. If acknowledgement is received, print "Transmitter and receiver are in LOS"
    d. If acknowledgement is not received, print "Transmitter and receiver are not in LOS"

PSEUDO CODE FOR RX:

1. Include necessary libraries (SHA256, Manchester, AES, Servo)
2. Declare seed value known by both transmitter and receiver
3. Declare pin configurations for LED, photodiode, servoX, servoY, and ambient sensor
4. In the setup() function:
    a. Generate key from seed using SHA256 library
    b. Set up AES decryption using the generated key
    c. Set up Manchester demodulation
    d. Set pinModes
    e. Attach Servos
    f. Perform a sweep algorithm to search for LOS
5. In the loop() function:
    a. Send dummy signal periodically to check for LOS
    b. Receive message
    c. Check ambient light level
    d. If ambient light level is high, send message to transmitter and send dummy signal
    e. If ambient light level is low:
        i. Demodulate message using Manchester
        ii. Decrypt message using AES
        iii. Print message to screen
        iv. Send acknowledgement to transmitter
6. In the sweep() function:
    a. Perform a sweep algorithm using servoX and servoY
7. In the sendDummySignal() function:
    a. Send dummy signal
    b. Wait for acknowledgement from transmitter
    c. If acknowledgement is received, print "Transmitter and receiver are in LOS"
    d. If acknowledgement is not received, print "Transmitter and receiver are not in LOS"

AQUACOMM V1.0



THANK YOU