

PROJECT 5

Part 1

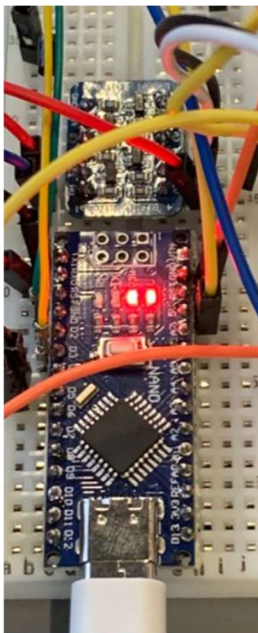
Theoretical max control rate:

$$\text{control rate} = \frac{\text{baudrate}}{\text{message length}} = \frac{9600 \text{ bit/s}}{8 * 8 \text{ bit}} = 150 \text{ Hz}$$

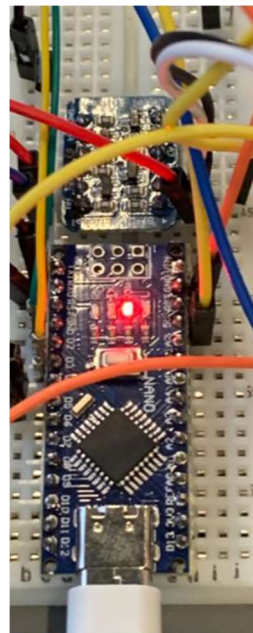
Part 2

Part 2.1

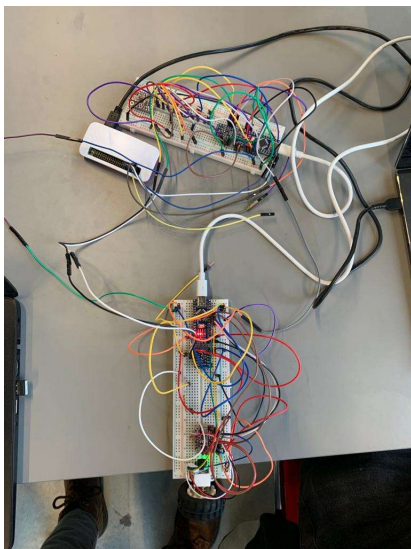
Using the intern Arduino LED to check, if the Arduino is sending Data:



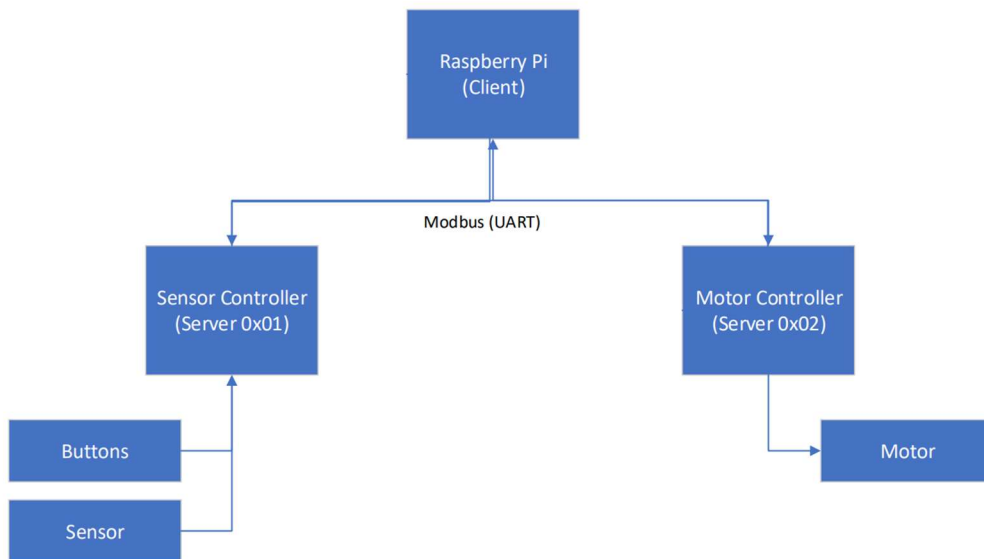
Arduino receiving Data



Arduino waiting for Data



Part 2.2



Screenshot terminal:

```
leona@leospi:~/projects/embe_prj_5 $ ./bin/modbus 1 3 0 1
Sent request: 01 03 00 00 00 01 0A 84
Received reply: 01 03 02 00 01 84 79
leona@leospi:~/projects/embe_prj_5 $ ./bin/modbus 2 6 1 255
Sent request: 02 06 00 01 00 FF 79 98
Received reply: 02 06 00 01 00 FF 79 98
leona@leospi:~/projects/embe_prj_5 $ ./bin/modbus 2 3 1 1
Sent request: 02 03 00 01 00 01 F9 D5
Received reply: 02 03 02 00 FF 04 BC
```

Part 3

Modbus Message Protocol:

| Control task | Register | |
|-----------------------|-------------------|--------------------------|
| State machine command | 0x0000 | |
| | Command specifier | Command description |
| | 01 | Set node operational |
| | 02 | Stop node |
| | 80 | Set node pre-operational |
| | 81 | Reset node |
| | 82 | Reset communications |
| OmegaRef | 0x0001 | |
| Omega | 0x0002 | |

Transmission log:

```
Received reply: 01 03 02 00 81 24 78
Sent request: 02 06 00 00 00 81 99 49
Received reply: 02 06 00 00 00 81 99 49
Sent request: 02 06 00 01 03 20 11 D9
Received reply: 02 06 00 01 03 20 11 D9
Sent request: 02 03 00 02 00 01 F9 25
Received reply: 02 03 02 00 00 44 FC
w_ref: 8.00, w: 0.00
Sent request: 01 03 00 00 00 01 0A 84
Received reply: 01 03 02 00 01 84 79
Sent request: 02 06 00 00 00 01 39 48
Received reply: 02 06 00 00 00 01 39 48
Sent request: 02 06 00 01 03 20 11 D9
Received reply: 02 06 00 01 03 20 11 D9
Sent request: 02 03 00 02 00 01 F9 25
Received reply: 02 03 02 02 D3 B9 BC
w_ref: 8.00, w: 7.23
```

Part 4

Delay in the Modbus:

send delay = read delay = 0.1 s delay

main method: after each read and write command: 0.001s

$$\sum 2 * (\text{send command} + \text{send} + \text{read command} + \text{read}) + \text{read command} = 0.4005 \text{ s}$$

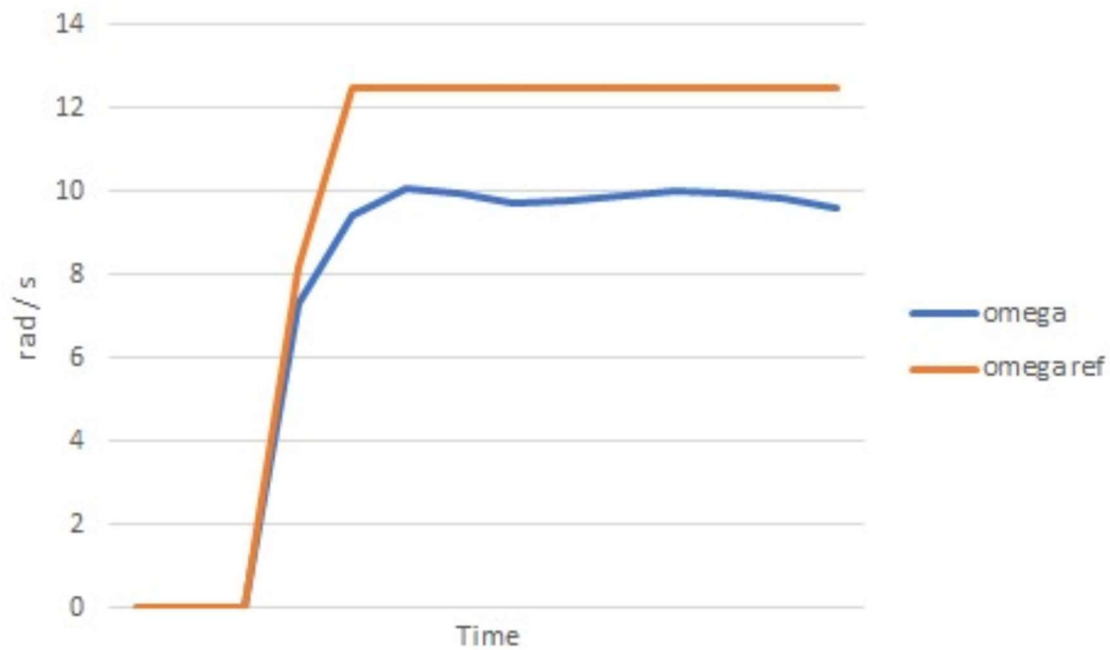
In Sum, we have 0.5004 s delays for one message cycle with the transmission of the state, ω and ω_{ref} .

Security of the transmission is only achieved if the delays are included.

The attempt to left out the O_NDELAY on the open()-command for a faster performance led to irregular communication errors.

Changed ω_{ref} with the potentiometer from 0 to 100 % in one turn.

Step response:



Youtube Link:

<https://youtu.be/YGK4oqPivml?si=8bXpEE4nel8VfcGW>

Github Link:

<https://github.com/Marlenexyz/EMBE-Group>