Pre Lab 5

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Introduction to Python programming on the Raspberry Pi

Javier Mondragon Martin del Campo

A01365137

Prof. Matías Vázquez Piñón
Tecnológico de Monterrey

1 Describe the I2C standard protocol. Include different aspects such as transfer speeds, handshake sequence, and a brief explanation of the two wires used for data transfer: SDA & SCL.

I2C stands for Inter-Integrated Circuit. It is a bus interface connection protocol incorporated into devices for serial communication. It uses only 2 bi-directional open-drain lines for data communication. Both these lines are pulled high. Those are called SDA and SCL:

- SDA: Stands for Serial Data and the transfer of data takes place through this pin.
- SCL: Stands for Serial Clock and it carries the clock signal

Data speed can be transferred at rates of up to 100 kbit/s in the Standard-mode, up to 400 kbit/s in the Fast-mode, up to 1 Mbit/s in Fast-mode Plus, or up to 3.4 Mbit/s in the High-speed mode.

The handshaking protocol represents two devices exchanging data values or packets in an effort to synchronize actions or events. The master sends a broadcast to all slaves to start listening, then write the address of the desired slave, the slave must reply with an acknowledge, then send the register to be read or write, then an acknowledge from the slave, then the data is exchanged and finally and acknowledge from the slave for the master to close connection.

2 Identify the I2C Addresses of the following sensors (do not confuse with internal register address):

- Real Time Clock (RTC) Module: 1101000b
- Temperature Serial Sensor: 1001101b

3 Draw a simple block diagram of the hardware setup for the I2C topology. Include the RPi (master), the DS1338 (slave), and the TC74 (slave). Also include the bidirectional Logic Level Converter (considering that the RPi works with 3.3 V and the optimal voltage for the sensors is 5 V).

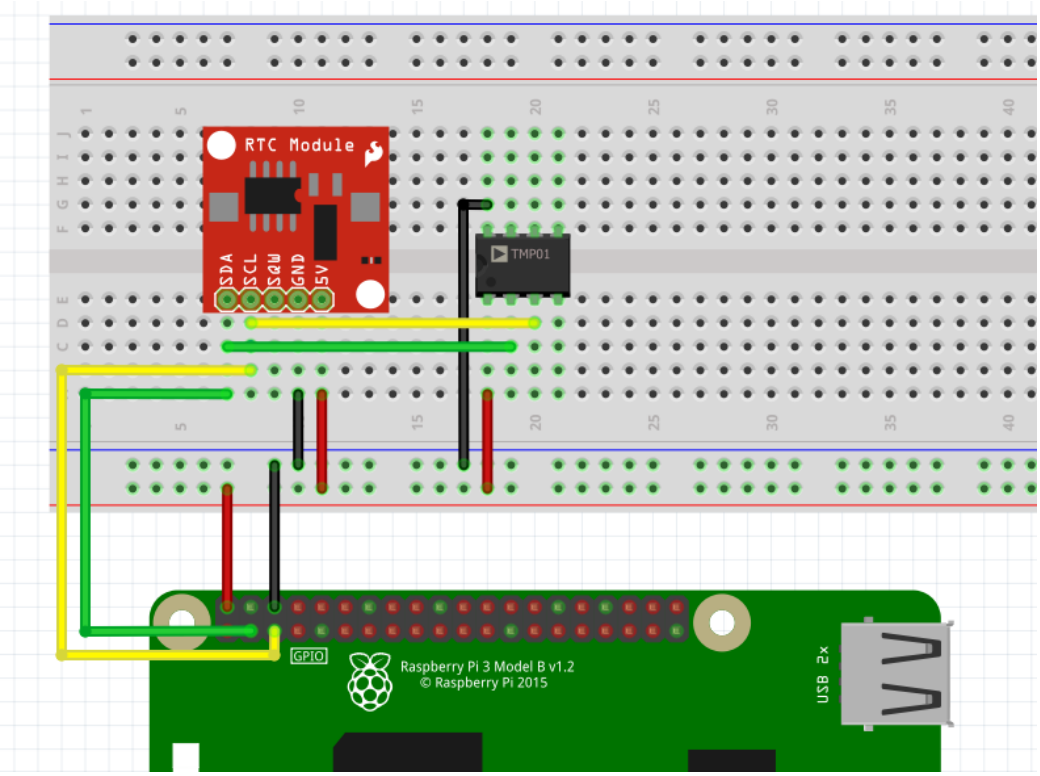
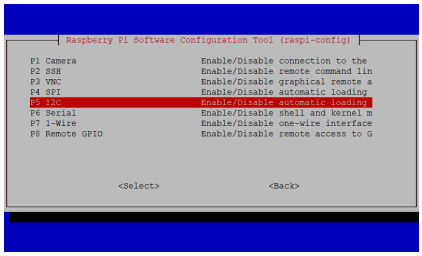


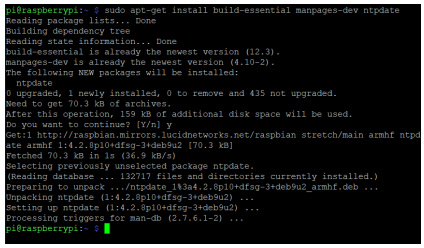
Figure 1: Circuit schematic

(a) Replace TMP01 for TC74

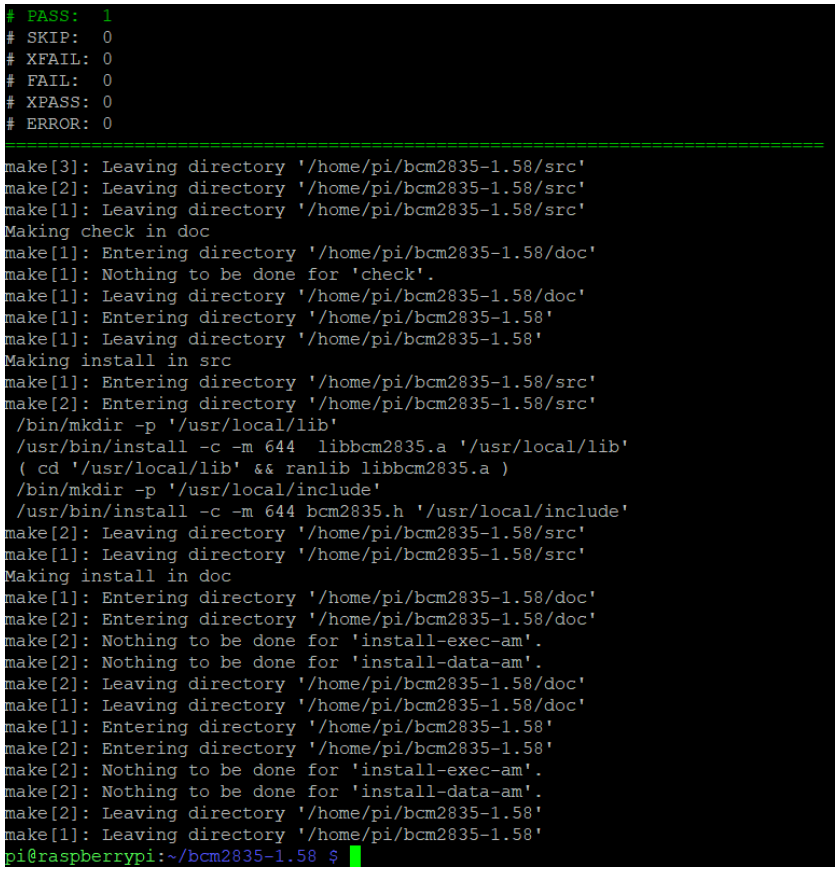
4 Screenshots of raspberry configuration



(a) Interfaces config.



(b) Packages installing



(c) bcm2835 Compiled

Figure 3: Configuration screenshots

5 Bibliography

1. https://github.com/matias-vazquez/SistemasEmbebidos
2. I2C-bus specification and user manual
3. I2C Communication Protocol
4. Handshaking Protocol in I2C
5. DS1307
6. TC74