



Title: Behavior analysis of a Hydraulic Circuit through a Low-Cost Data Acquisition System

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Introduction

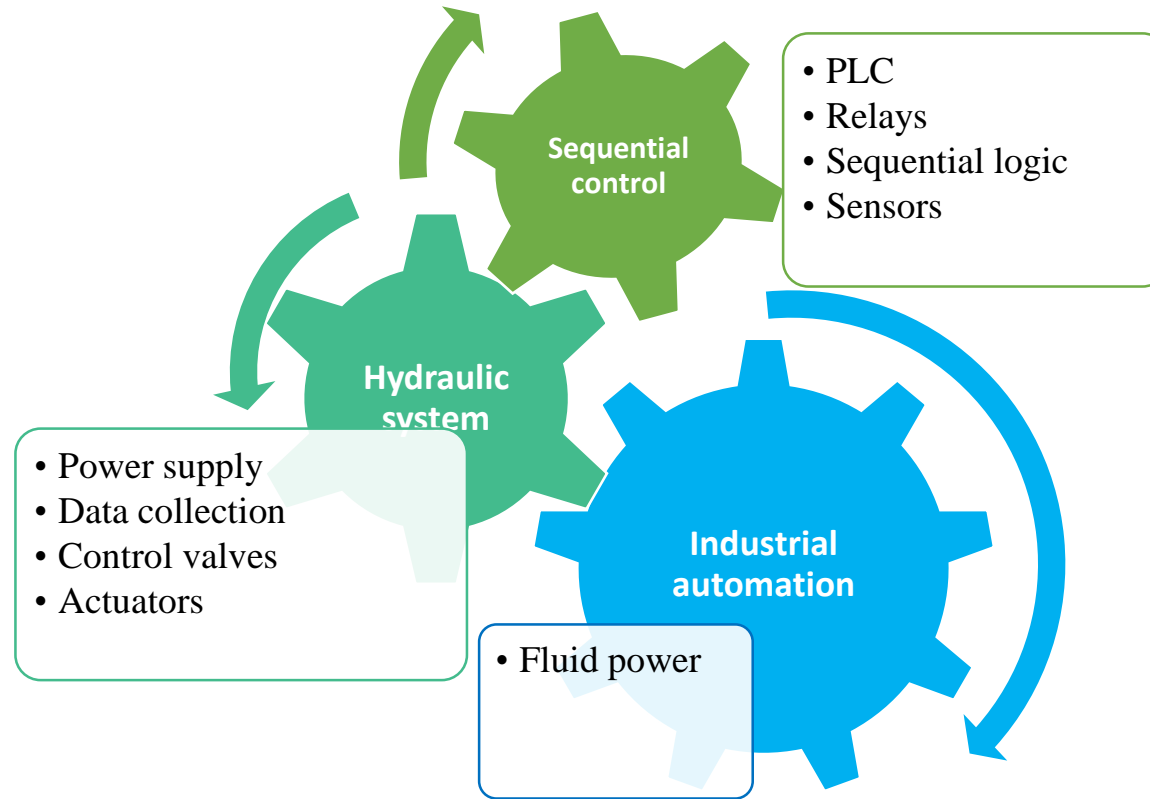
Methodology

Results

Conclusions

References

Introduction



Monitoring components

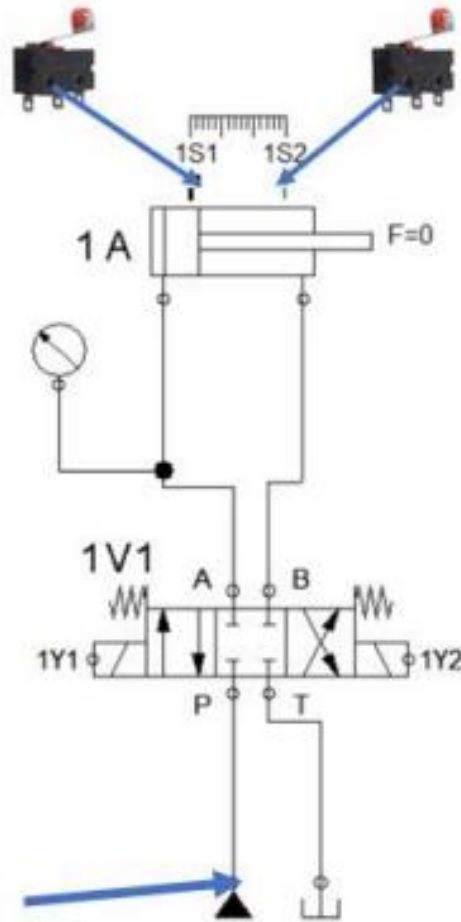


Raspberry Pi 2 B model



Temperature sensor

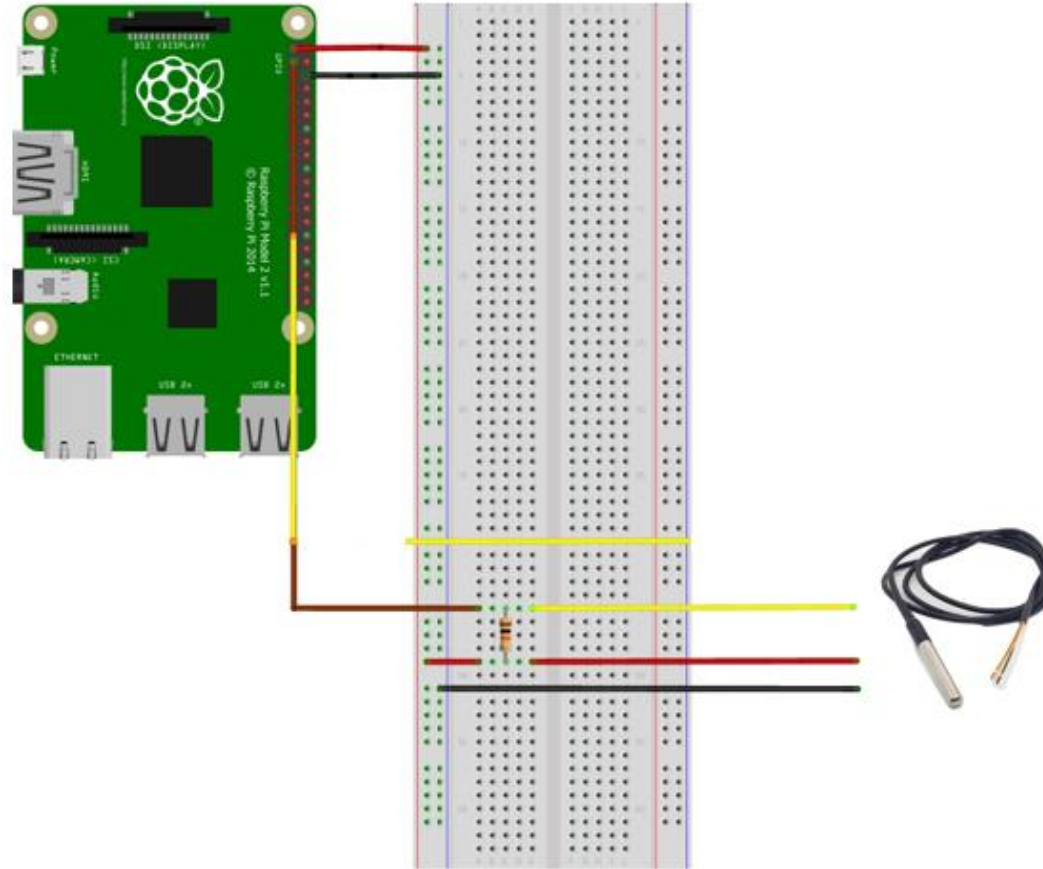
Monitoring system



Temperature sensor



Monitoring system



Temperature Sensor



sensor DS18B20

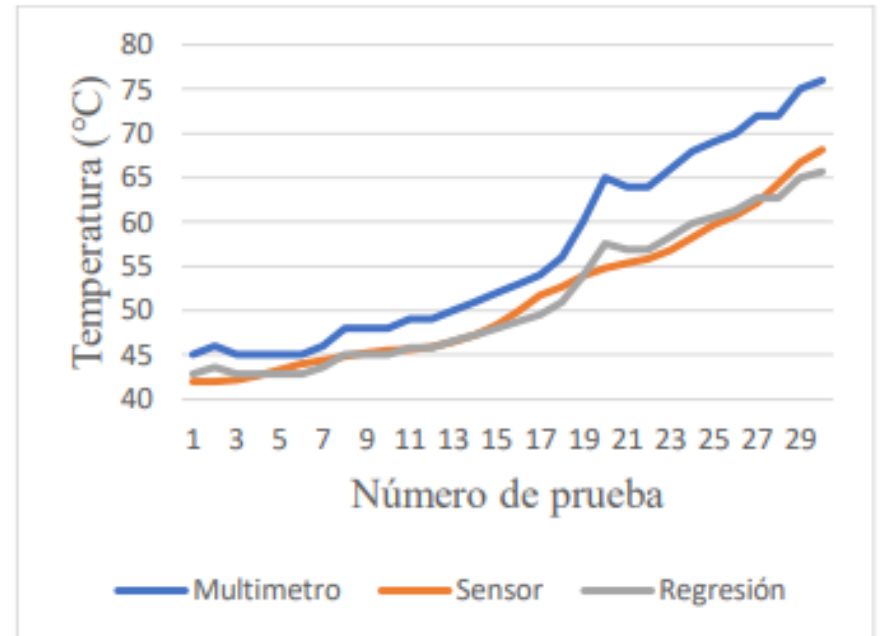
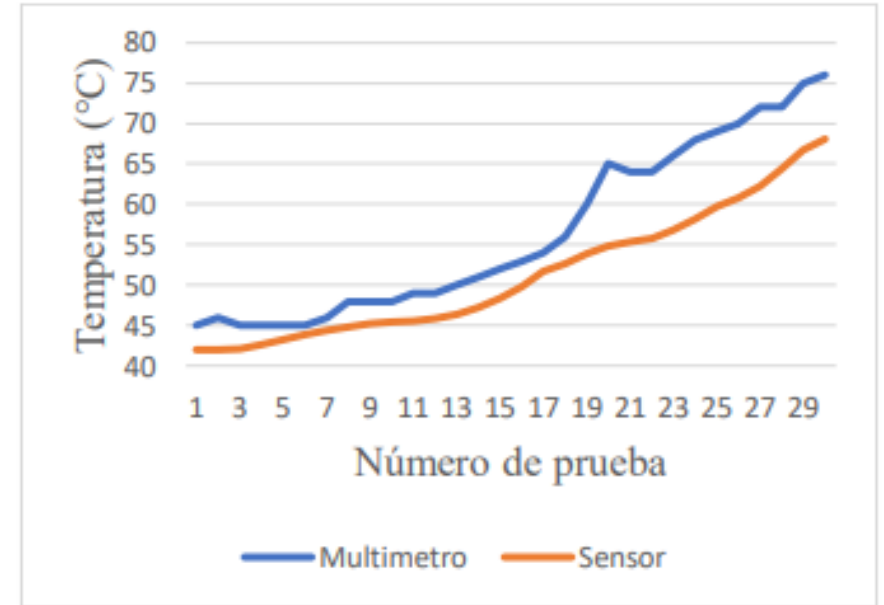
- One pin connection
- Voltage range: 3.0-5.0V
- Measurement range: -55°C to 125°C
- Connection with One Wire

Sensor characterization

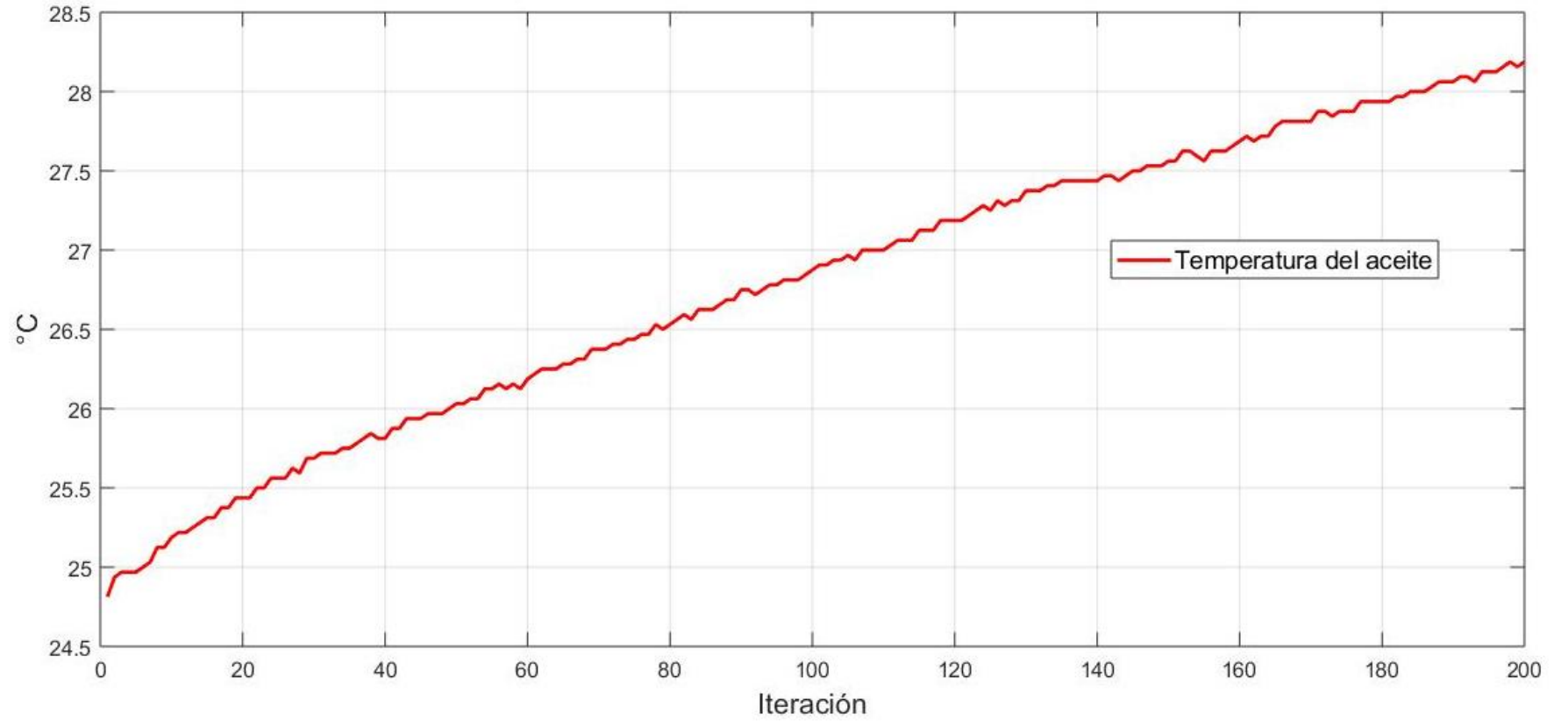


$$y = \hat{a} + \hat{b}x$$

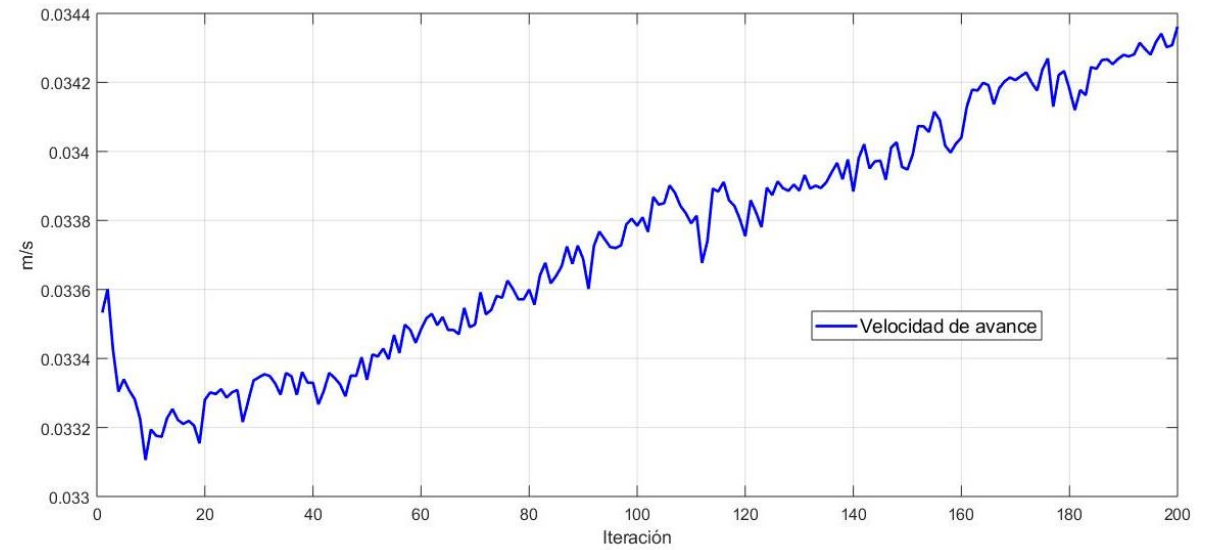
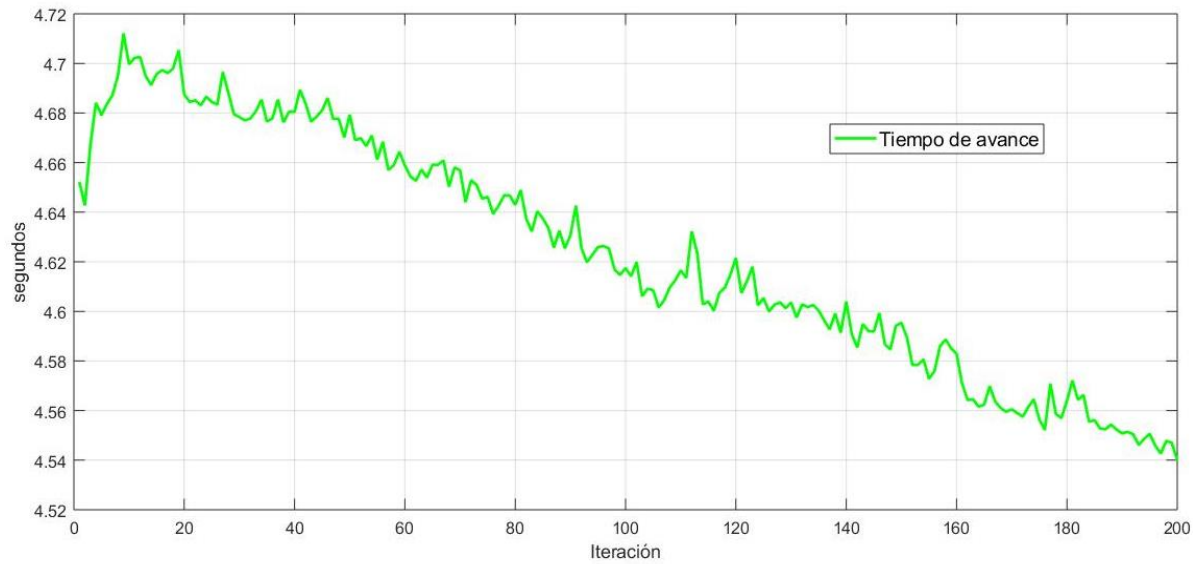
$$\hat{a} = \frac{\sum y_i - \hat{b} \sum x_i}{n} = y_m - \hat{b}x_m \quad \hat{b} = \frac{\sum x_i y_i - nx_m y_m}{\sum x_i^2 - nx_m^2}$$



Results



Results



Conclusions

- It has been possible to build a low-cost data acquisition system through an RPi minicomputer, in addition to obtaining a characterization of the DS18B20 temperature sensor with a percentage error between the regression model and the readings obtained by the temperature sensor of $\pm 1.8\%$
- The advance time of the double-acting cylinder in a real hydraulic circuit is also monitored.
- Experimental results let understand the behavior of the hydraulic oil to take actions in relation to hold the advance time for continuous processes.

Conclusions

- Experimental evidence yields data relevant to understand the behavior of the fluid in a continuous process of several iterations. The analysis of the data allows us to the importance of oil cooling for automation for sequential automation applications where constant cylinder advance times are guaranteed to be constant.
- Future work will consider including a greater number of sensors to measure other variables of interest that are related to the change in properties of the fluid such as flow rate.

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