Lab No 1

Smart Sensors and Actuators based in Arduino

2nd Part

Actuators

DCTI-ISCTE-IUL

2023-2024

Octavian Adrian Postolache

Lab No 1

Smart Sensors and Actuators based in Arduino

Objectives:

To obtain Knowledge regarding LabVIEW graphical programming applied to Arduino

- Develop programs for Arduino one using the MarkerHub Linx toolkit for LabVIEW.

- Develop a Smart Sensor using the Arduino Uno Platform and Actuators represented by DC motor and mini Servo, LEDs

- Use the PWM outputs of the Arduino to control the actuator

Theoretical Background

LabVIEW (Laboratory Virtual Instrument Engineering Workbench) represents a programming environment with applications being developed called virtual instruments. (Virtual Instruments - VI). The LabVIEW programming language is different from languages like Java, C ++, and MATLAB, where programming is done through text.

LabVIEW can be used in Windows, Mac OS X or Linux, and it can also create applications for real-time platform platforms such as FPGAs, DSPs and microcontrollers.

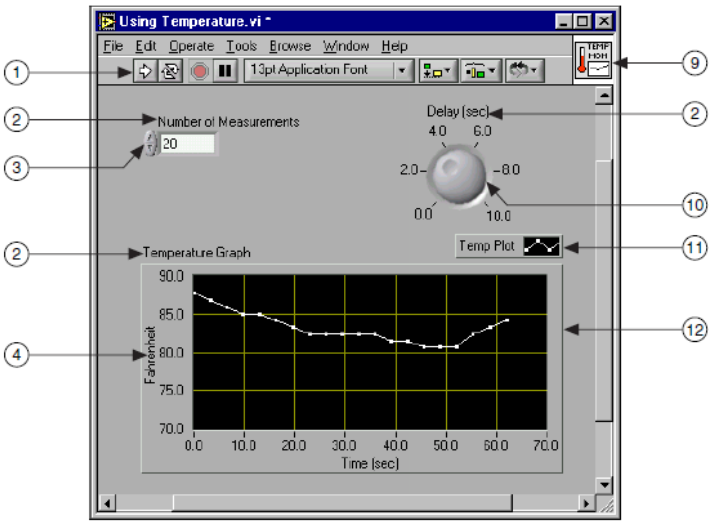
LabVIEW 2015 and LabVIEW Toolkit MarkerHub Linx will be used during lab classes. (Https://www.labviewmakerhub.com/doku.php?id=learn:tutorials:libraries:linx:getting_started)

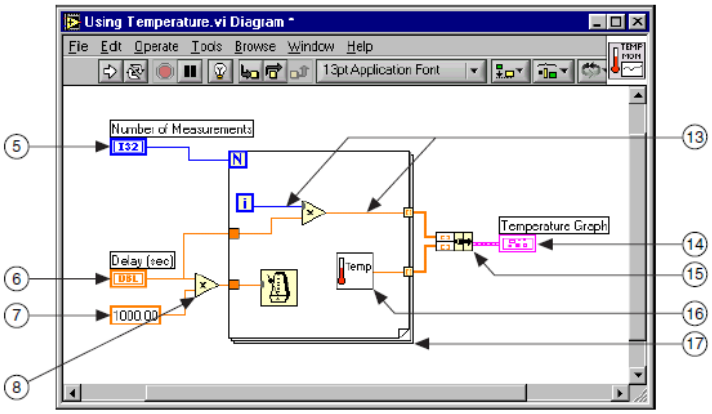
Each program (VI) has two distinct parts:

- the front panel, which are called controls (inputs) and indicators (results), and in turn is the view window processes or events,

• the block diagram, which represents the environment in which programming is carried out, which means connecting the elements of the front panel with functional elements.

Figures 1 and 2 show the appearance of the front panel and a block diagram:

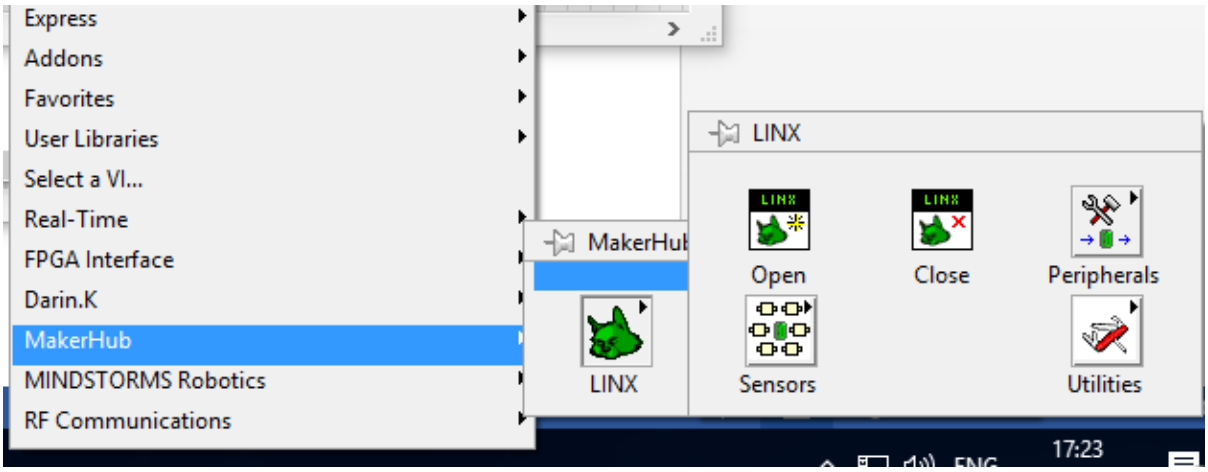




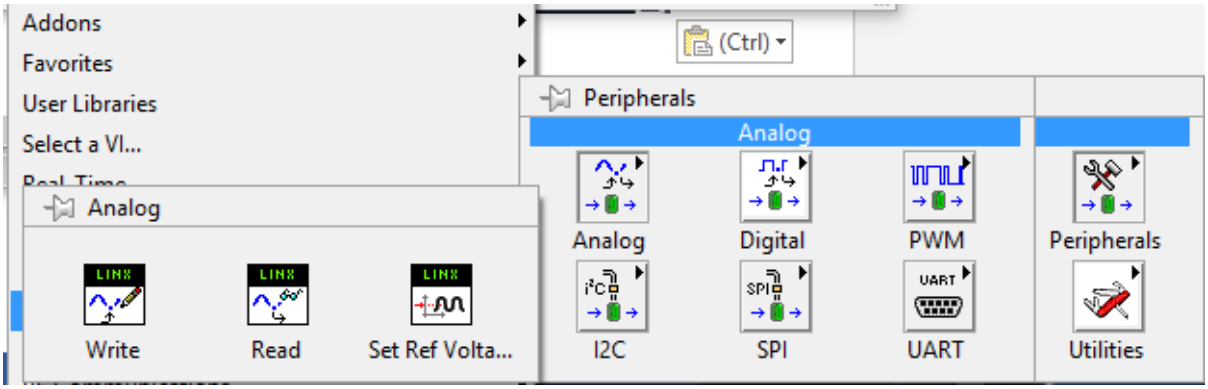
1	Barra de ferramentas	6	Terminal de controle numérico	12	Gráfico XY
2	Título do objeto	7	Constante numérica	13	Via de ligação de dados
3	Controle numérico digital	8	Função de multiplicação	14	Terminal do gráfico XY
4	Legenda livre	9	Ícone	15	Função de agrupamento
5	Terminal de controle numérico digital	10	Controle numérico deslizante	16	SubVI
		11	Legenda de plotagem	17	Estrutura de For Loop

The Marker Hub Linx Toolkit includes functions associated with the control of the Arduino platform.

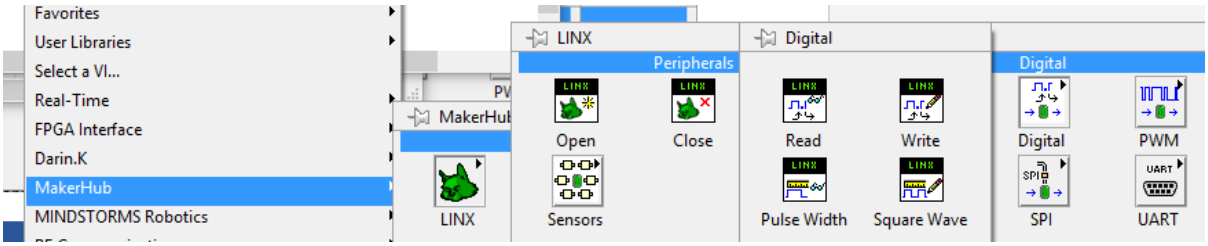
Thus the linx platform functions can be considered



Palete de controlo – open-close linx device



Control palette functions of "analog input"



Control palette functions of "digital input / output"

Before using the functions have to carry out programming of the Arduino Uno platform using the LINX firmware.

Select in LabVIEWTools>>LINX>>LabVIEW Marker HUB>>LINX FIRMWARE WIZARD>>[RUN]

Exercise I: Develop LabVIEW software to control a servo Tower Pro SG92R Servo 9g using PWM and consider a set of three LEDs to indicate the level of velocity

- Low velocity; one LEDs
- Medium velocity; two LEDs
- High velocity; three LEDs

Tower Pro Characteristics:

Details:

Size : 23x11x29 mm

Voltage : 3V to 6V DC

Weight: 9g / 0.32oz

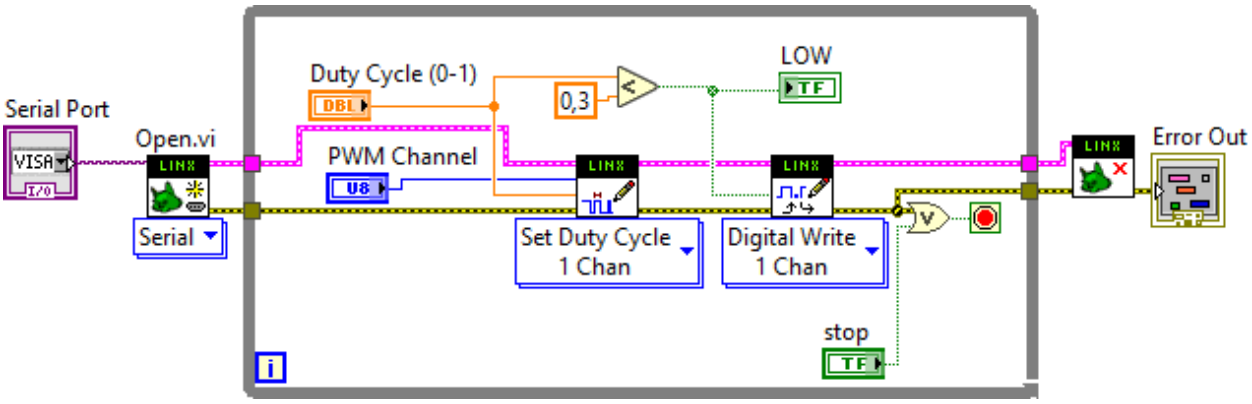
Speed : 0.12 sec/60 (at 4.8V)

Torque : 1.6 kg-cm

Working Temp : -30C~60C

Teflon Bushing, 19cm wire, coreless motor, servo arms & screw included

Help I – Single LED case

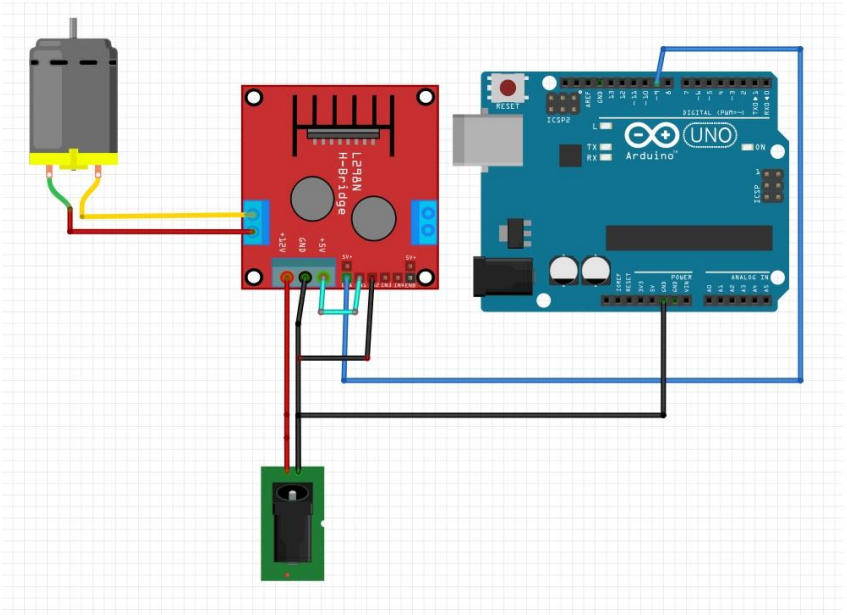


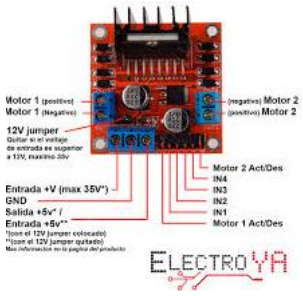
Exercises II:

Implement an Arduino-based smart sensing & actuator programmed using LabVIEW graphical programming language using DC motor and the H- Bridge (L298N) as so as a temperature sensor associated with environment temperature measurement. The level of

temperature will be signalized using a LED which receive the PWM signal associated with the measured temperature. According with the measured temperature (higher or lower) the speed of the DC motor will decrease or increase.

Help Ex II





O pin 9 é o PWM

Note: documentation:

Documentação LabVIEW basic encontra-se disponibilizada no E-learning

Linx tutorial https://www.labviewmakerhub.com/doku.php?id=learn:tutorials:libraries:linx:start

Arduíno PWM

https://www.arduino.cc/en/Tutorial/PW

http://unciarobotics.com/arduino/driving-dc-motor-with-arduino-using-l298n-and-controlling-its-speed-using-pwm/