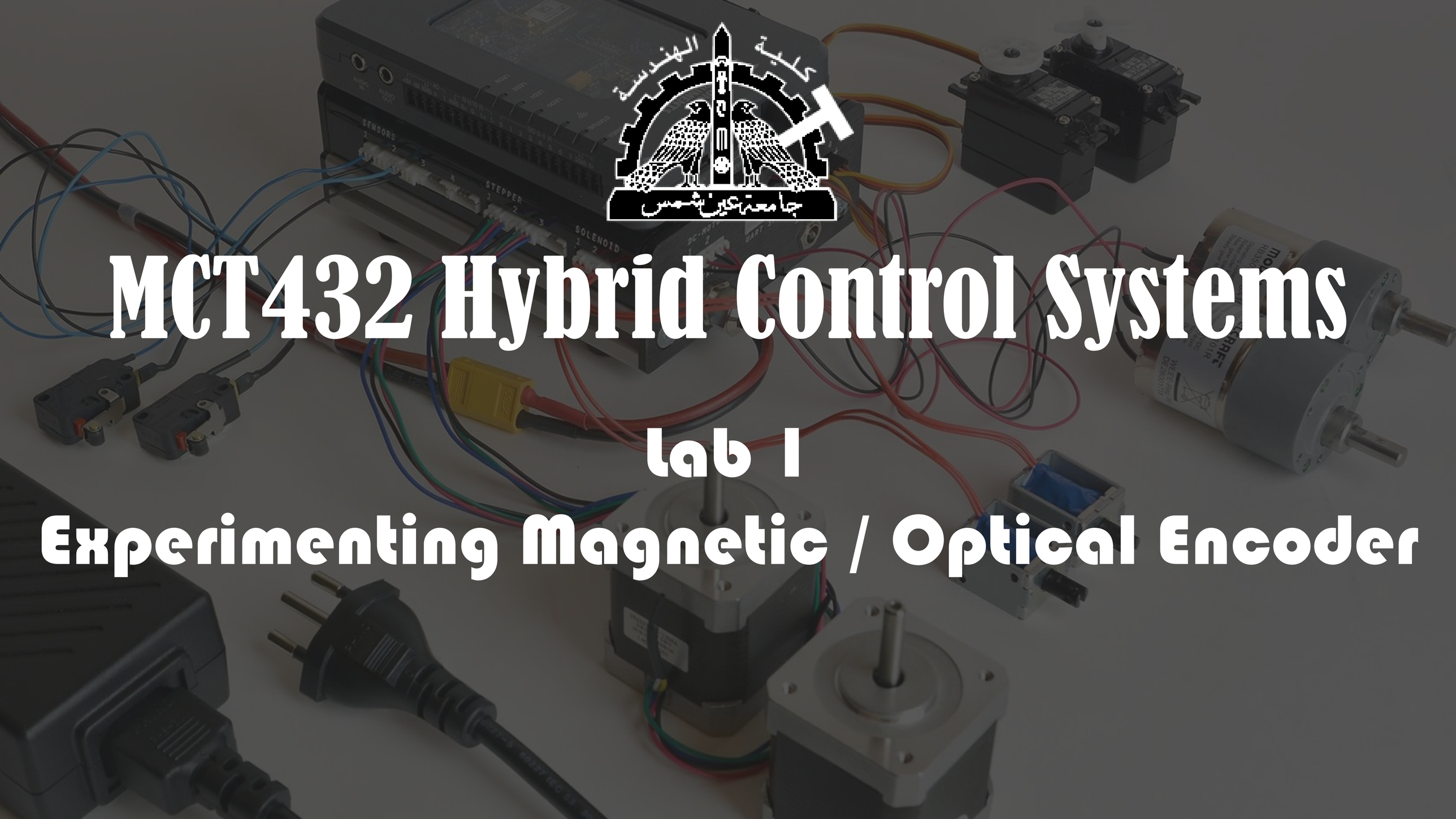


MCT432 Hybrid Control Systems

lab 1

Experimenting Magnetic / Optical Encoder

MEET OUR TEAM

MEET OUR TEAM

FARID TOLBAH

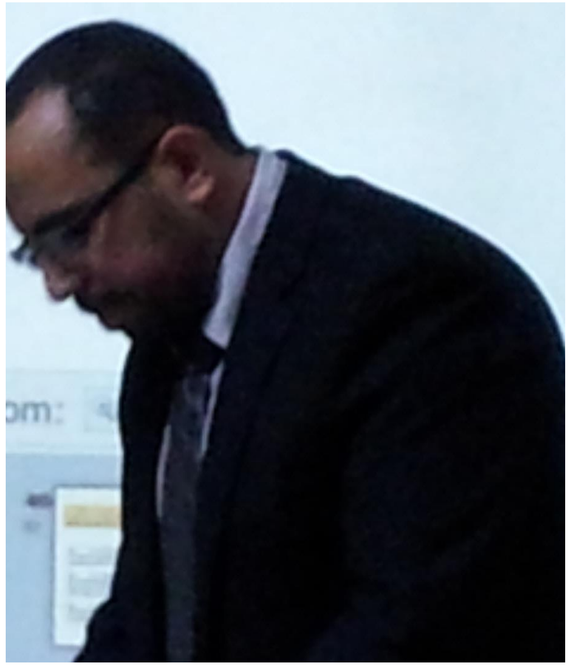
Professor

- Core curriculum.
- Lab orientation.
- Selection of tutorial exercises.

DIAA EMAD

Assistant Lecturer

- Tutorials and assignments.



WALEED EL-BADRY

Assistant Lecturer

- Design of lab experiments.

Lab Agenda

AGENDA

MONDAY
October 10,2016

- ☑ Importance of Encoders
- ☑ Types of Encoders
- ☑ Reading 2-Chammels Magnetic Encoder

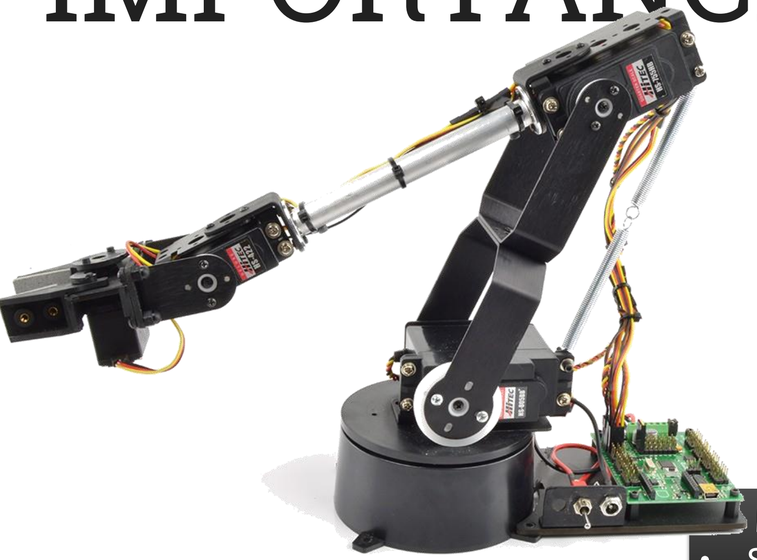
AGENDA

MONDAY
October 10,2016

- ☑ Importance of Encoders
- ☑ Types of Encoders
- ☑ Reading 2-Chammels Magnetic Encoder

Its rule in Mechatronics Design

IMPORTANCE OF ENCODERS



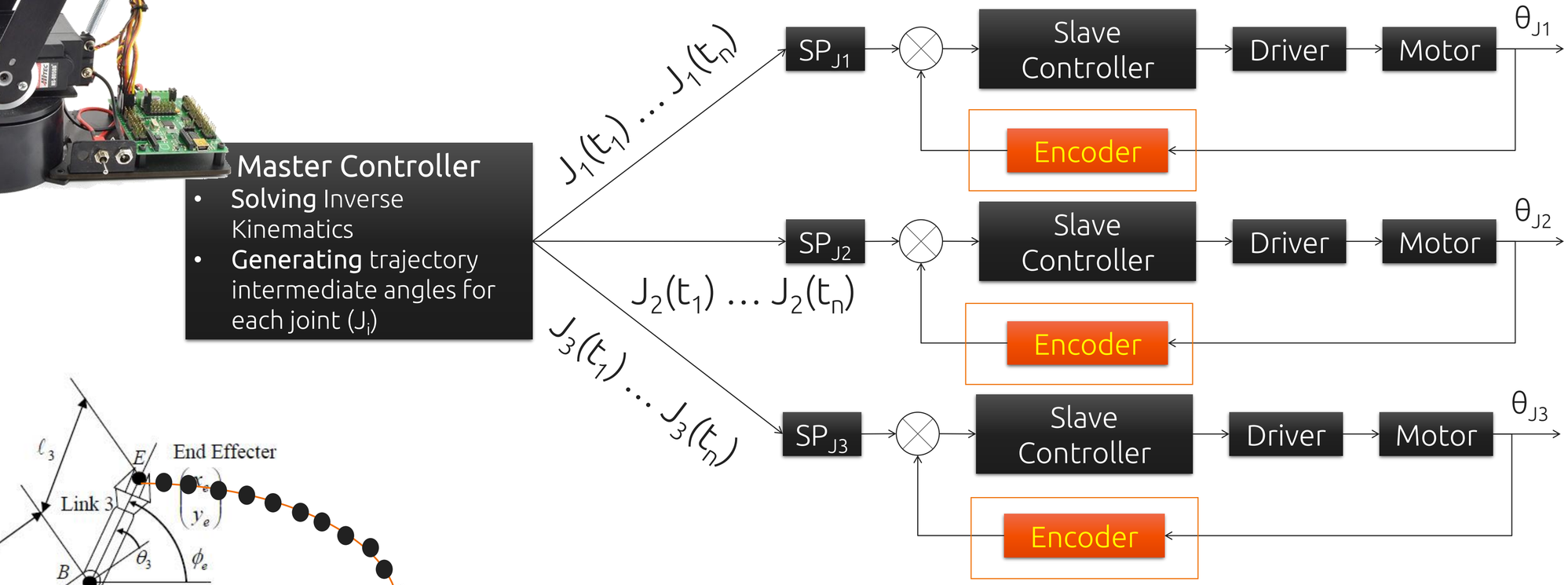
Master Controller

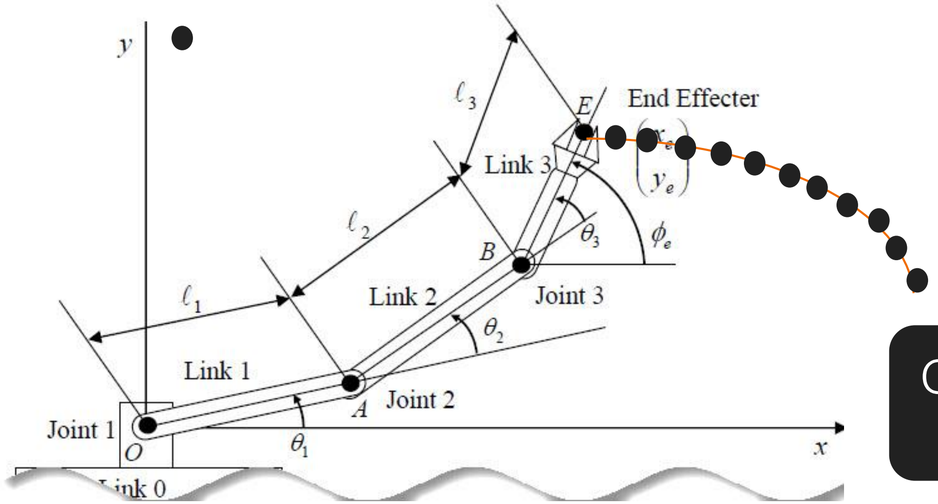
- **Solving** Inverse Kinematics
- **Generating** trajectory intermediate angles for each joint (J_i)

$J_1(t_1) \dots J_1(t_n)$

$J_2(t_1) \dots J_2(t_n)$

$J_3(t_1) \dots J_3(t_n)$





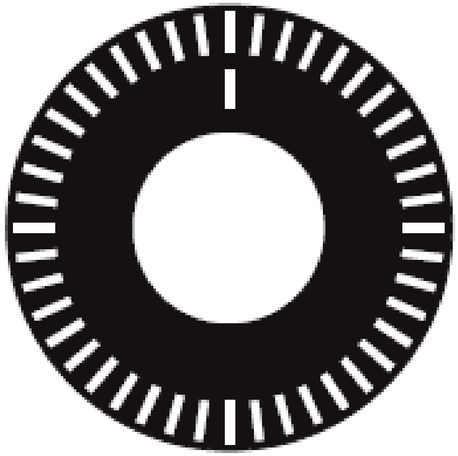
Generated trajectory points

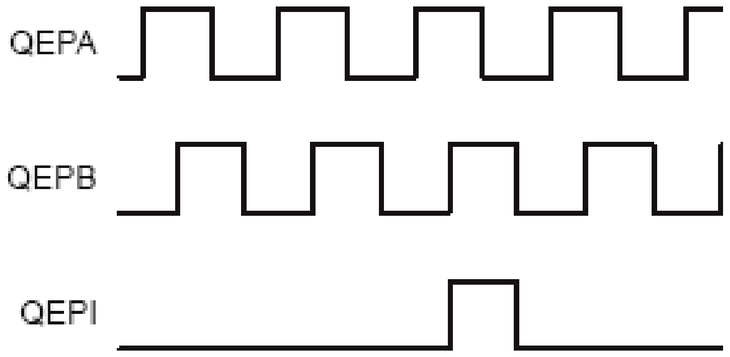
Why motion control for multiple axes is best to be carried in parallel?

Hint (time . scalability)

IMPORTANCE OF ENCODERS

Rotating Shaft → Rotary Encoder → Position / Velocity / Acceleration feedback





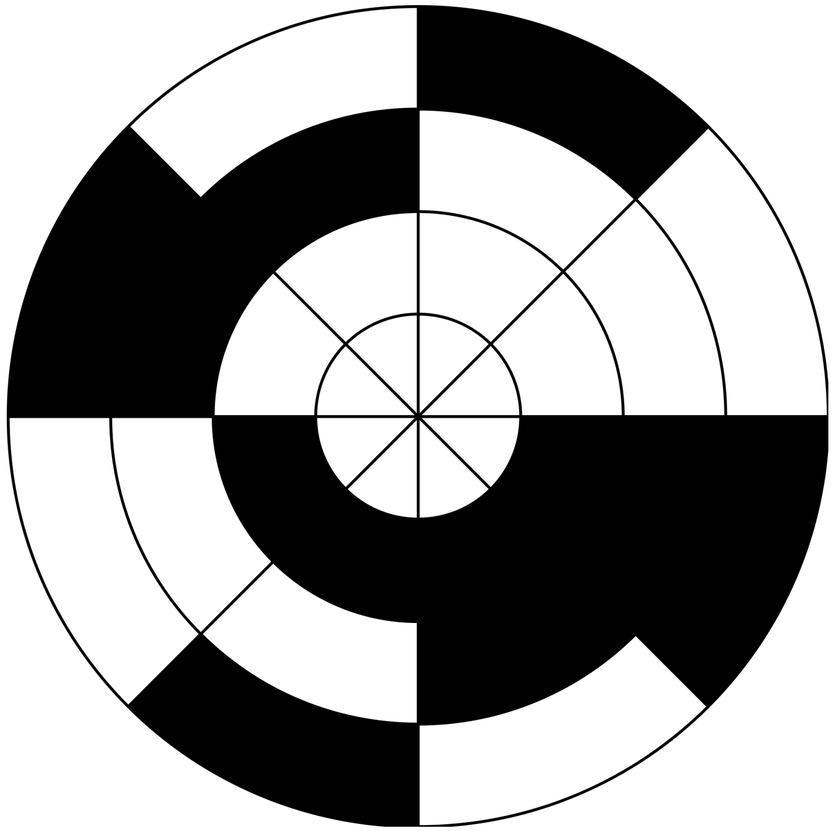
AGENDA

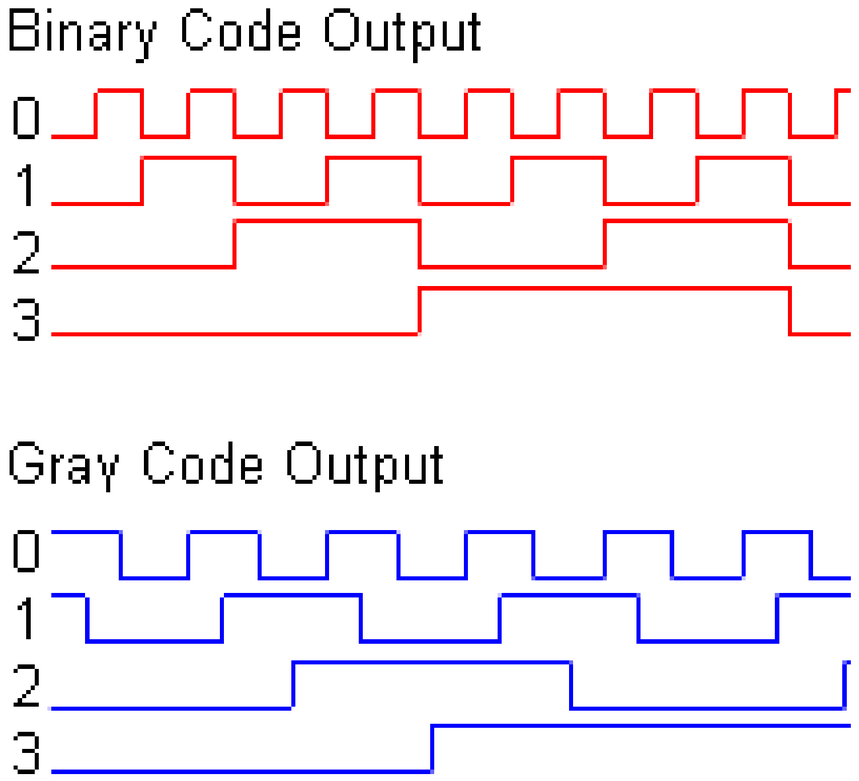
MONDAY
October 10,2016

- ☑ Importance of Encoders
- ☑ Types of Encoders
- ☑ Reading 2-Chammels Magnetic Encoder

How encoder works

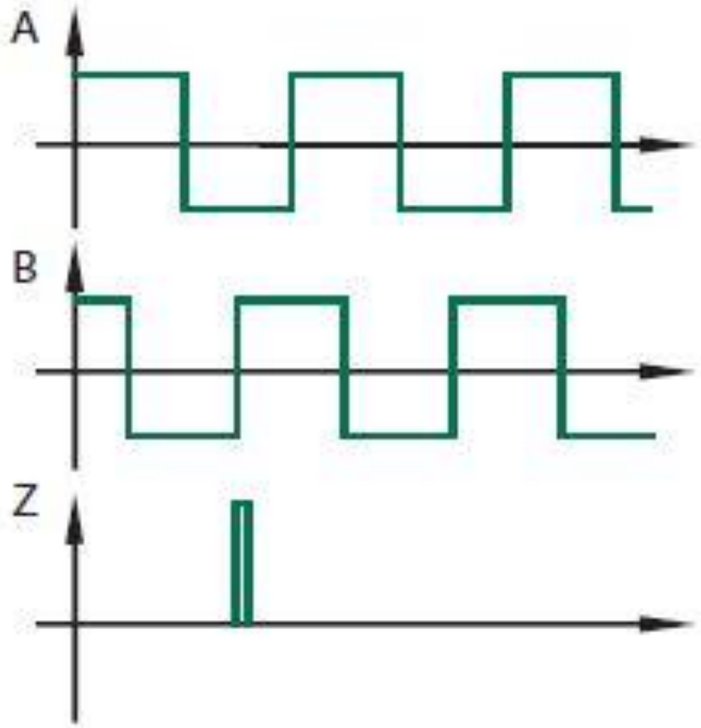
TYPES OF ROTARY ENCODERS





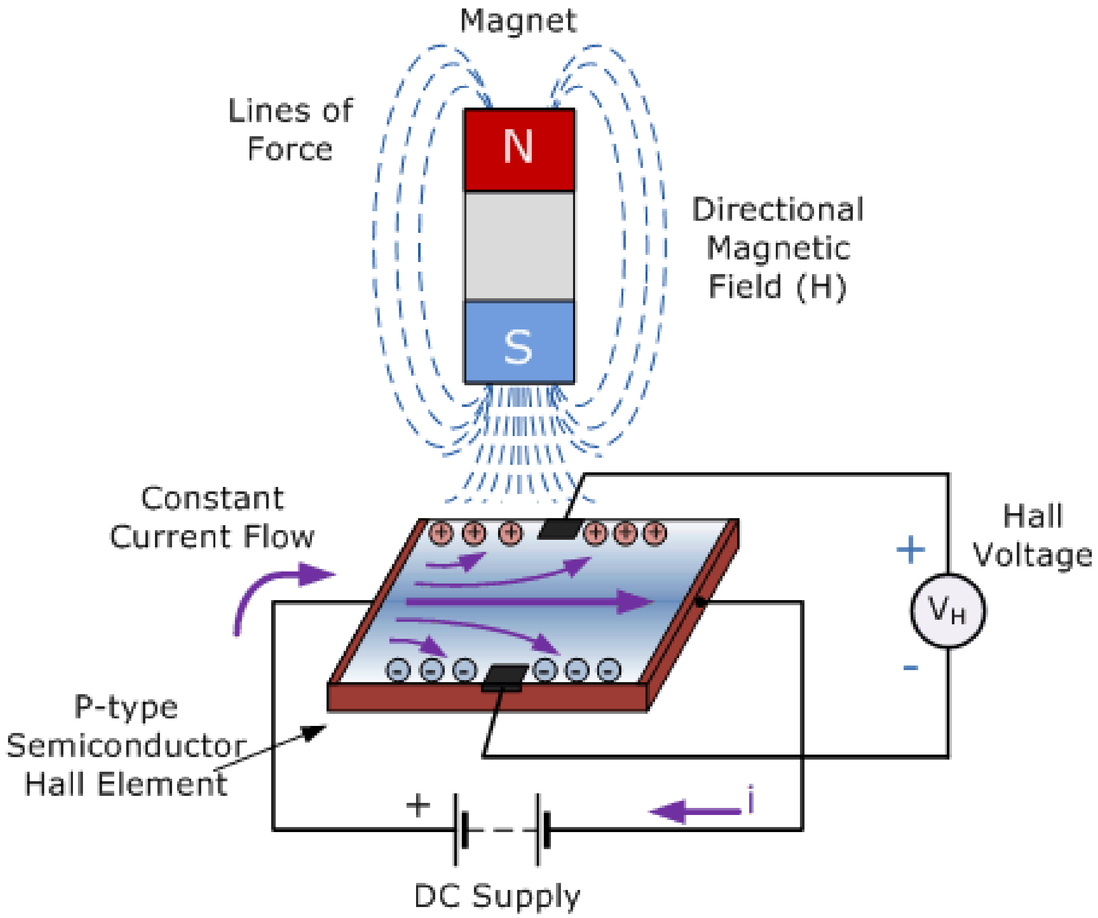
Absolute Encoder

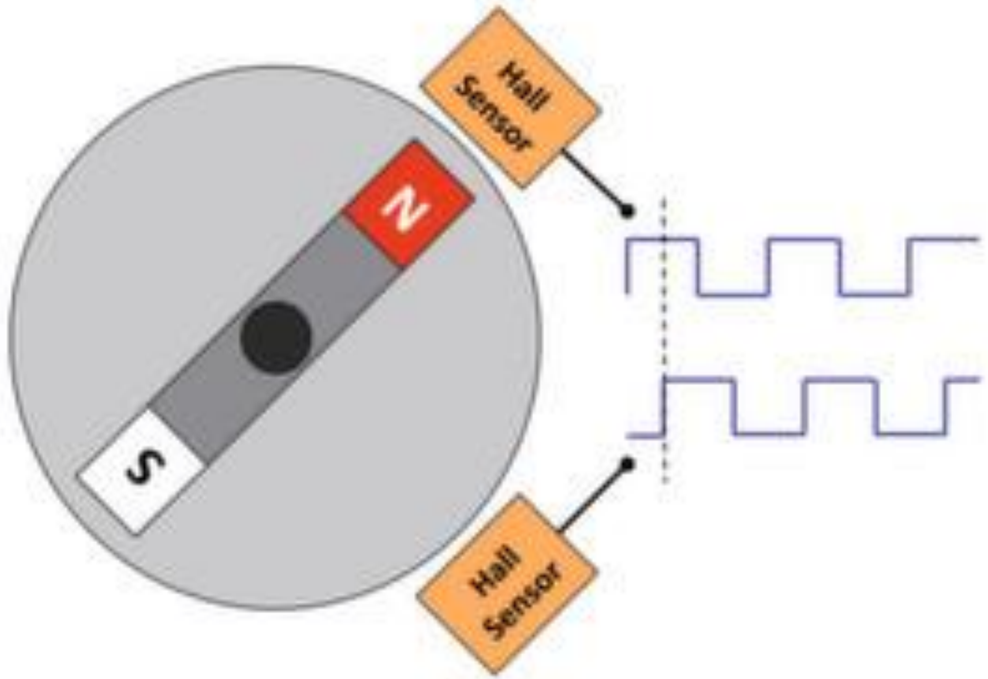
TYPES OF ROTARY ENCODERS



Incremental Encoder

TYPES OF ROTARY ENCODERS





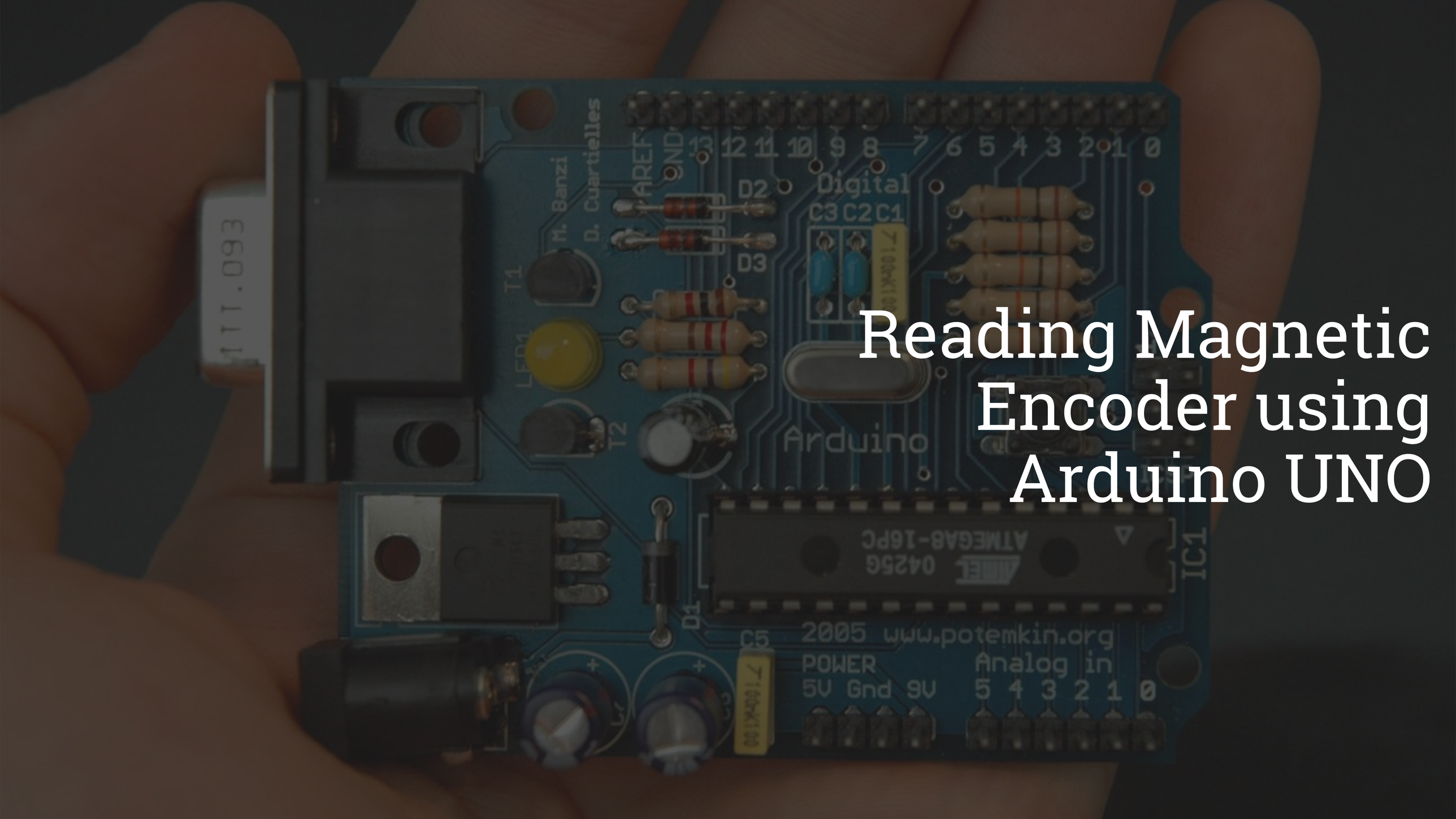
Hall / Magnetic Encoder

AGENDA

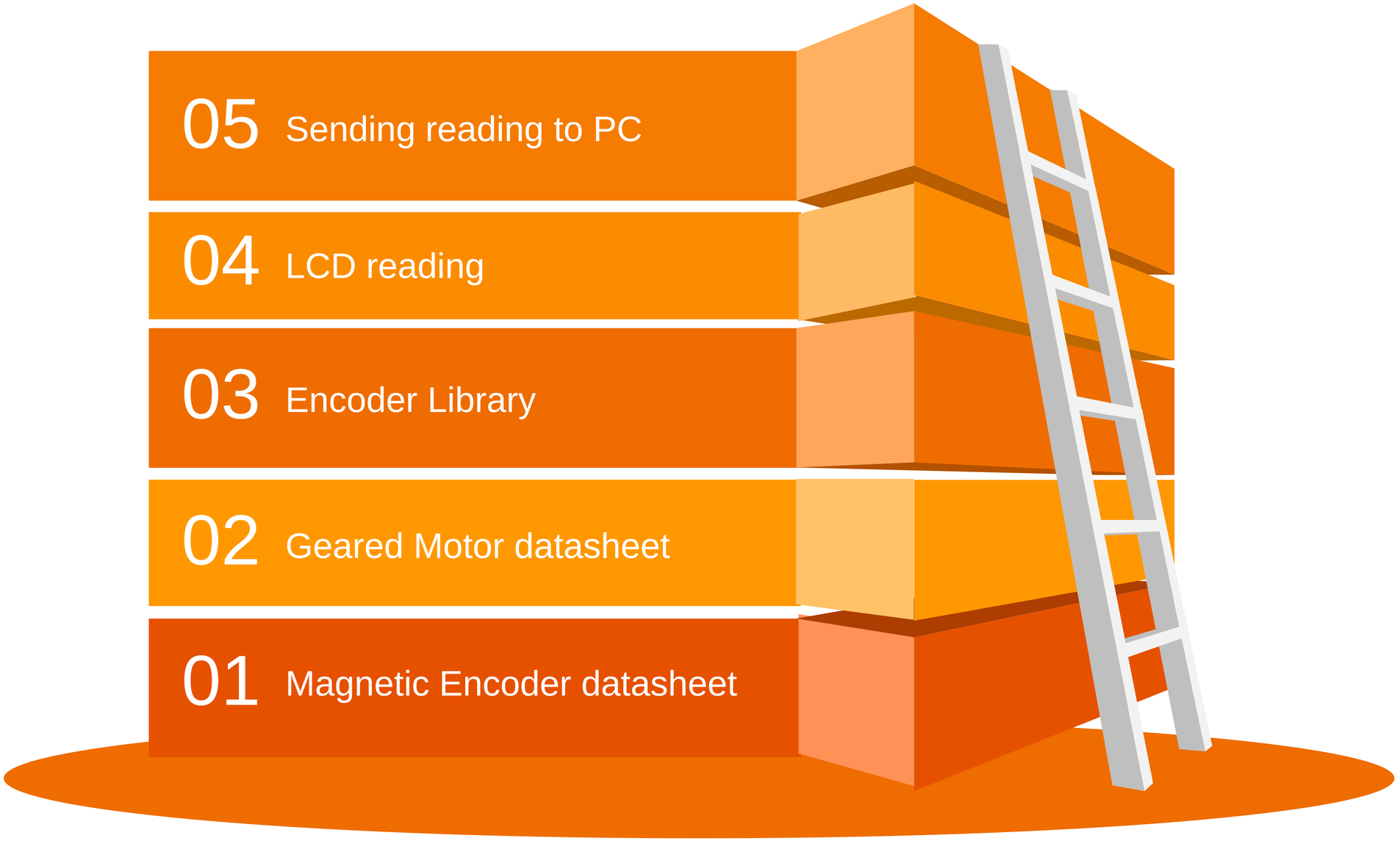
MONDAY
October 10,2016

- [x] Importance of Encoders
- [x] Types of Encoders
- [x] Reading 2-Chammels Magnetic Encoder

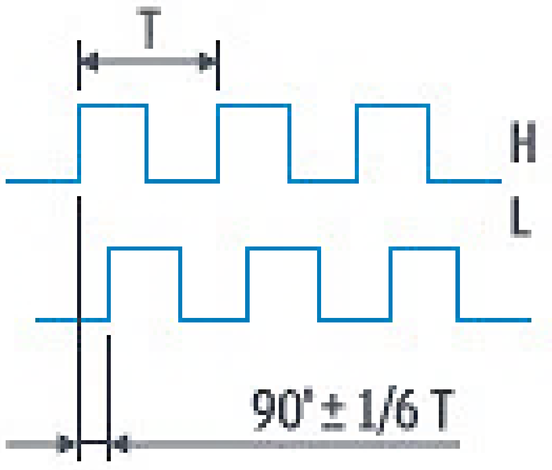
let's get into code


Reading Magnetic Encoder using Arduino UNO

LEARNING PLAN



MAGNETIC ENCODER



Two Channel Encoder Connections	
1. Black	: - Motor
2. Red	: + Motor
3. Brown	: Hall Sensor Vcc
4. Green	: Hall Sensor GND
5. Blue	: Hall Sensor A Vout
6. Purple	: Hall Sensor B Vout

Magnetic Encoder

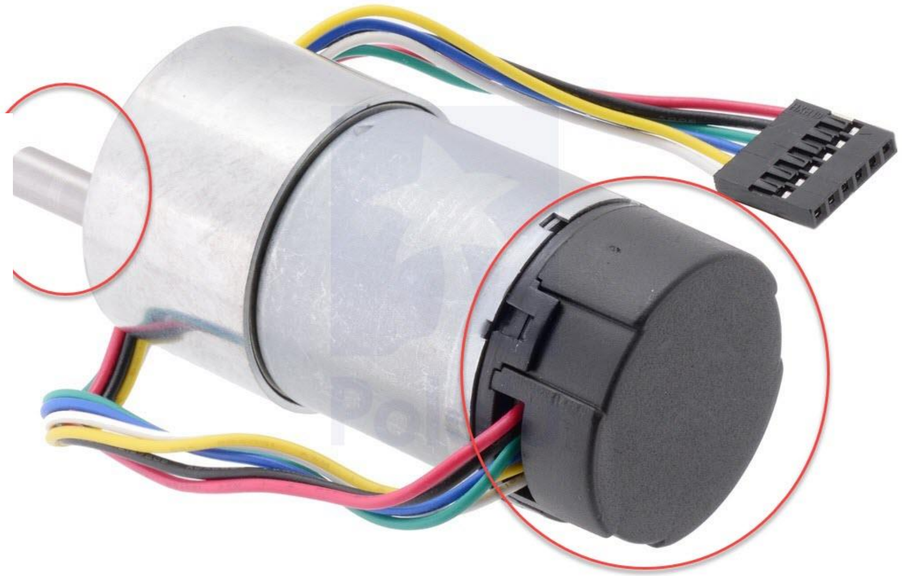
- 3.3 V – 20 V
- 2-Channels
- 6 poles

What’s the number of pulses per revolution / channel?

Can we increase the encoder resolution? XOR?

GEARED DC MOTOR

3.Mechanical characteristic	
3.1 Reduction ratio	1/19.225



Advantages of Gear Reduction

- Boosting torque.
- Enhancing encoder resolution

$Encoder\ (PPR) \cong \mathbf{231}$

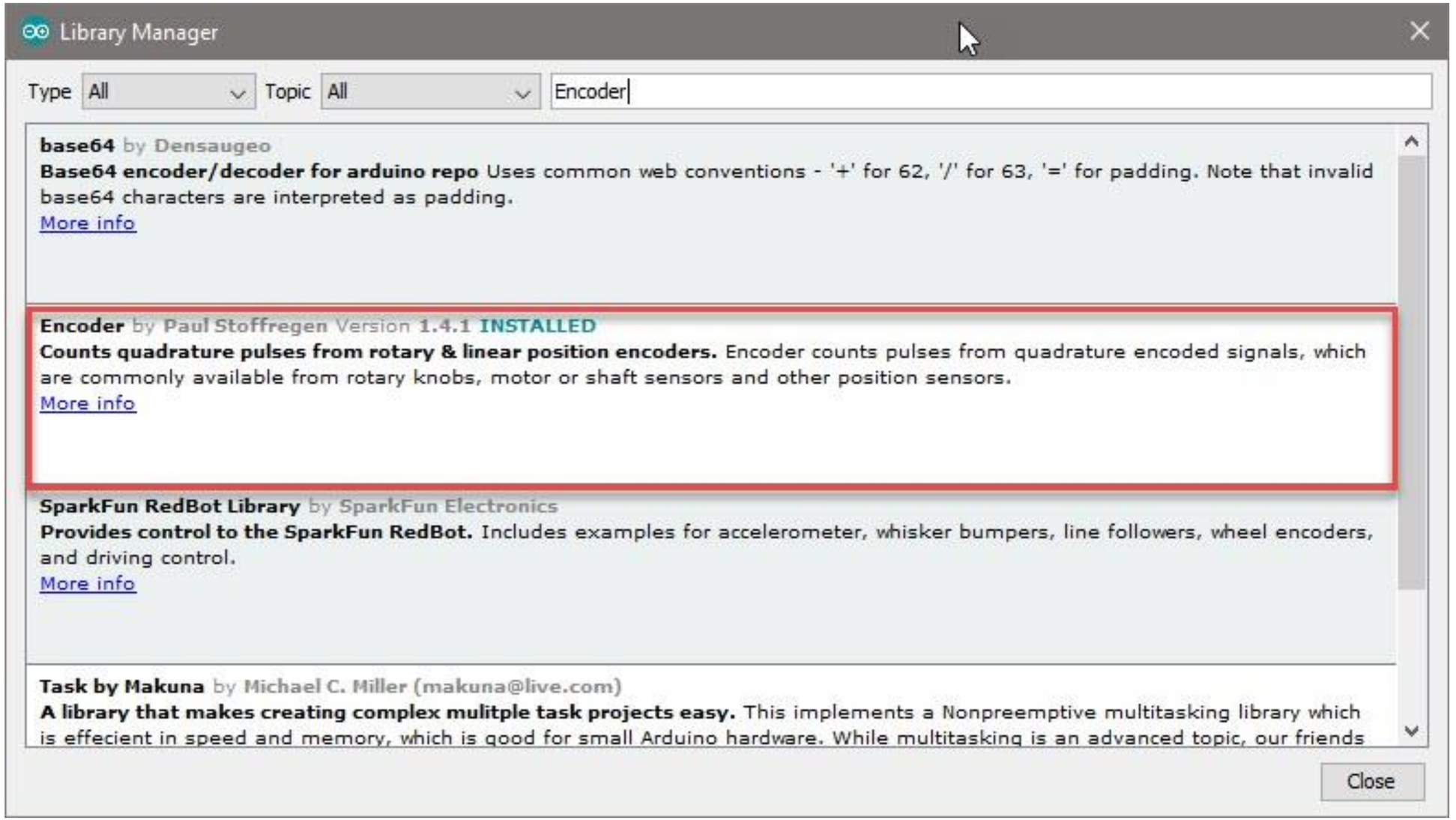
Error *theroetical and pratical?*

Resolution ?

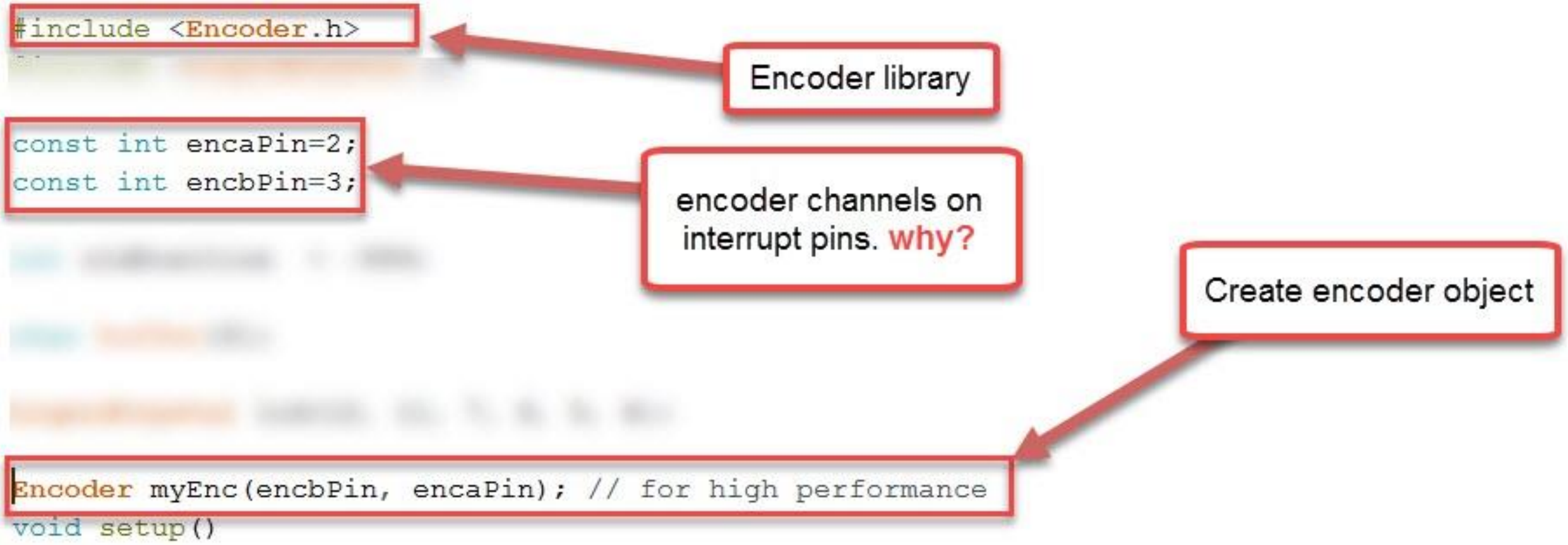
$$\mathbf{Encoder\ (PPR) = 6\ (poles) X\ 2 (channels) X\ 19 Reduction\ Ratio}$$

ARDUINO ENCODER LIBRARY

ARDUINO ENCODER LIBRARY



ARDUINO ENCODER COMMANDS



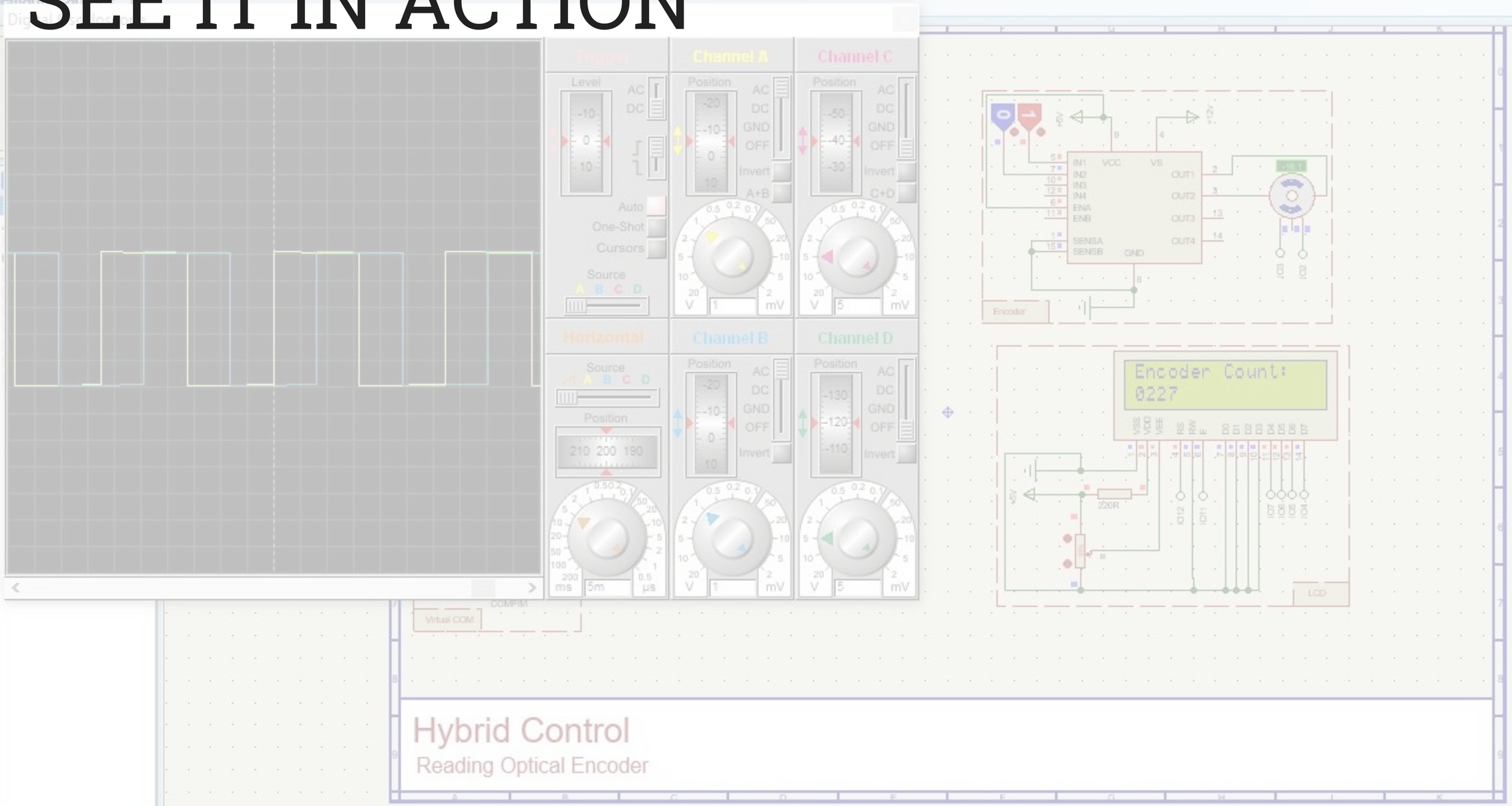
ARDUINO ENCODER COMMANDS

```
void loop()
{
  int newPosition = myEnc.read(); // Reading encoder position

  myEnc.write(0);

}
```

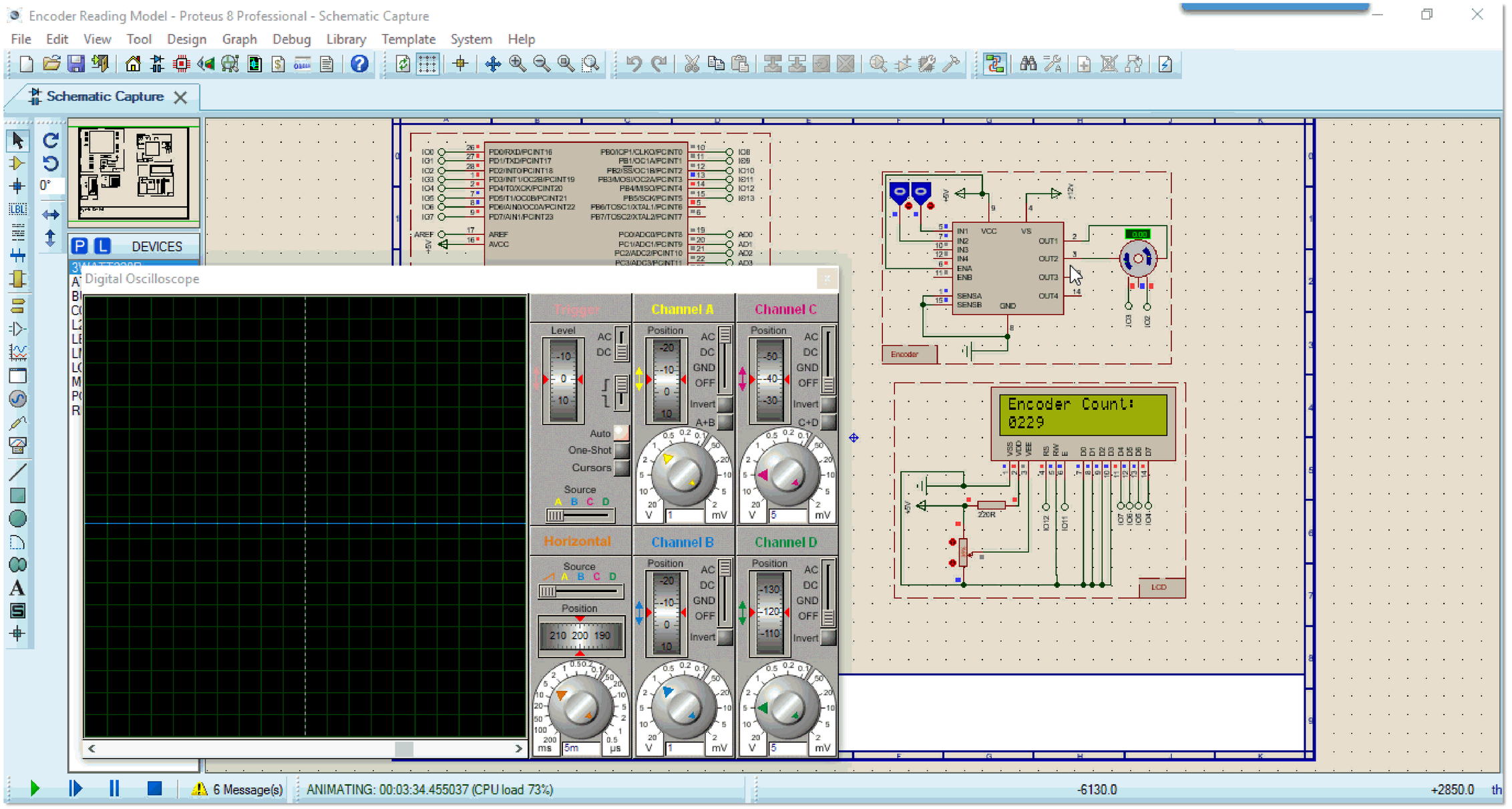
Read encoder count
(counter running in background)
(ISR)

Reset counter after each revolution

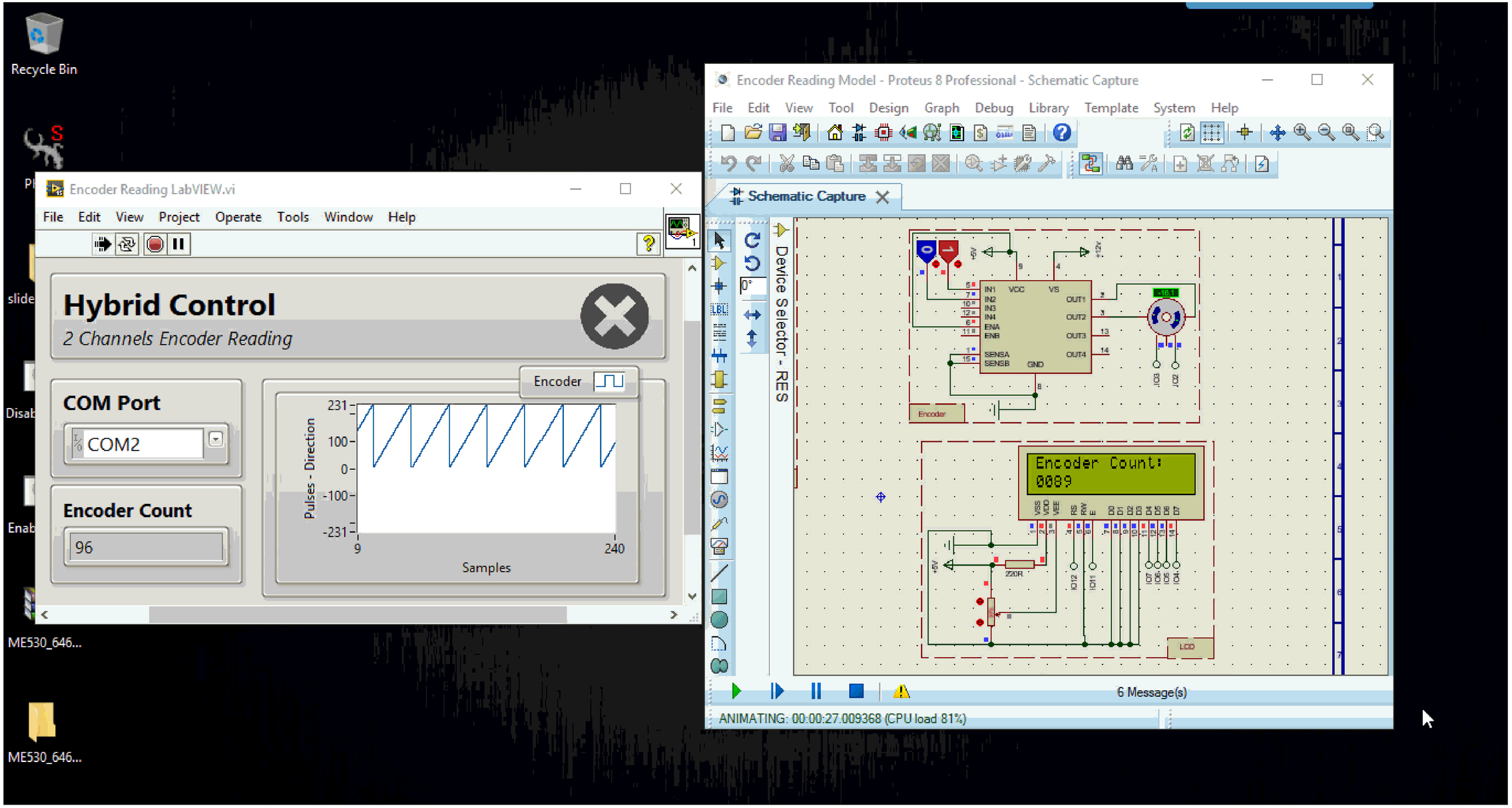
SEE IT IN ACTION



ENCODER READING EMBEDDED

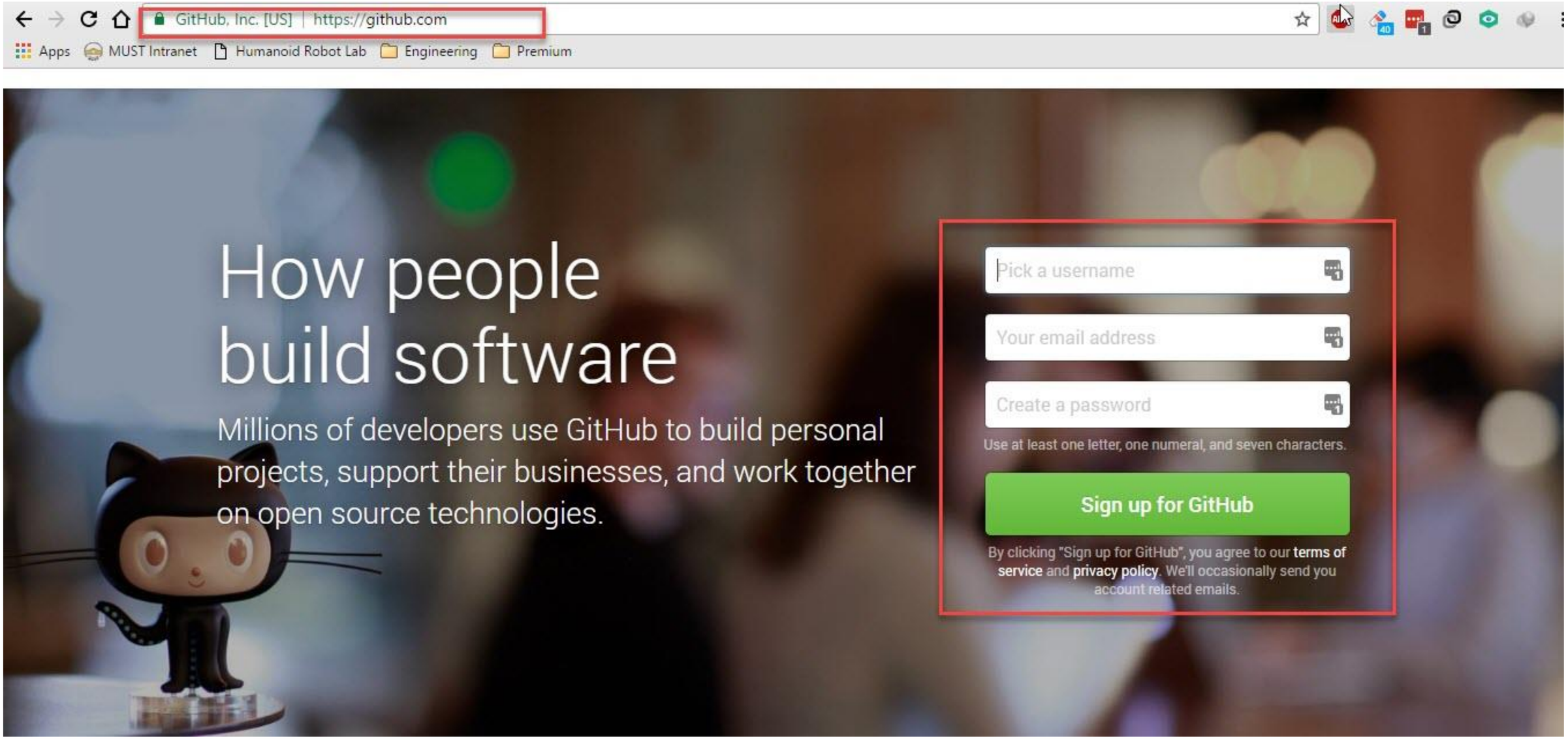


Data Streaming to Another Device (PC)

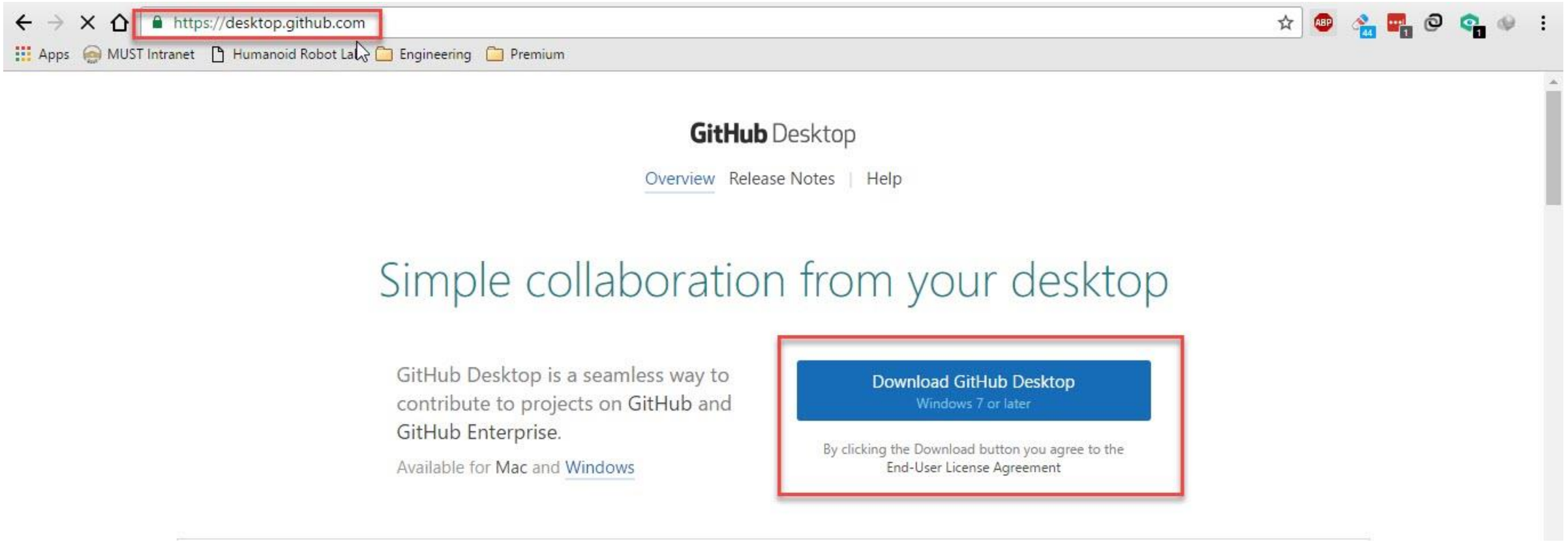


Getting Lab Files

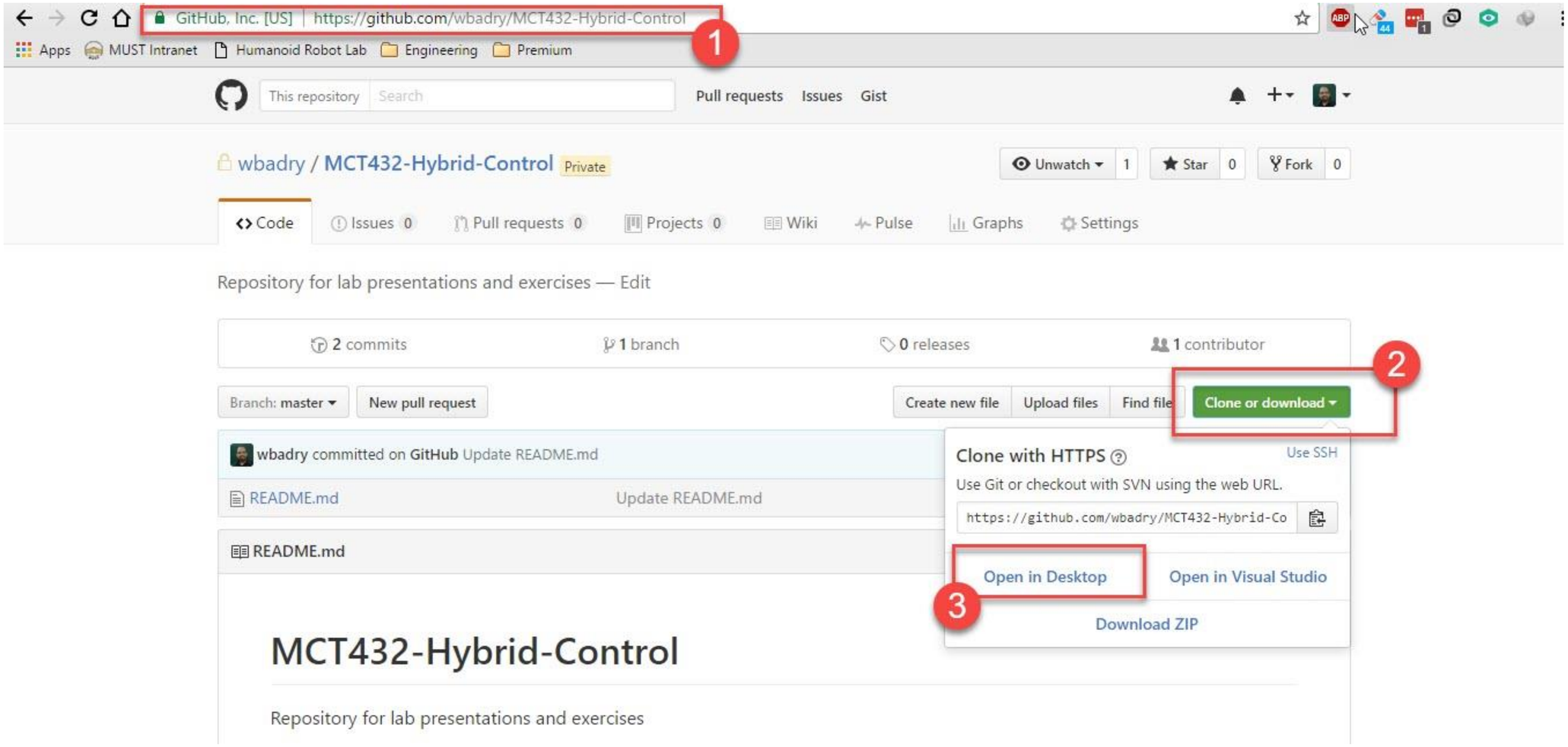
Create GitHub account



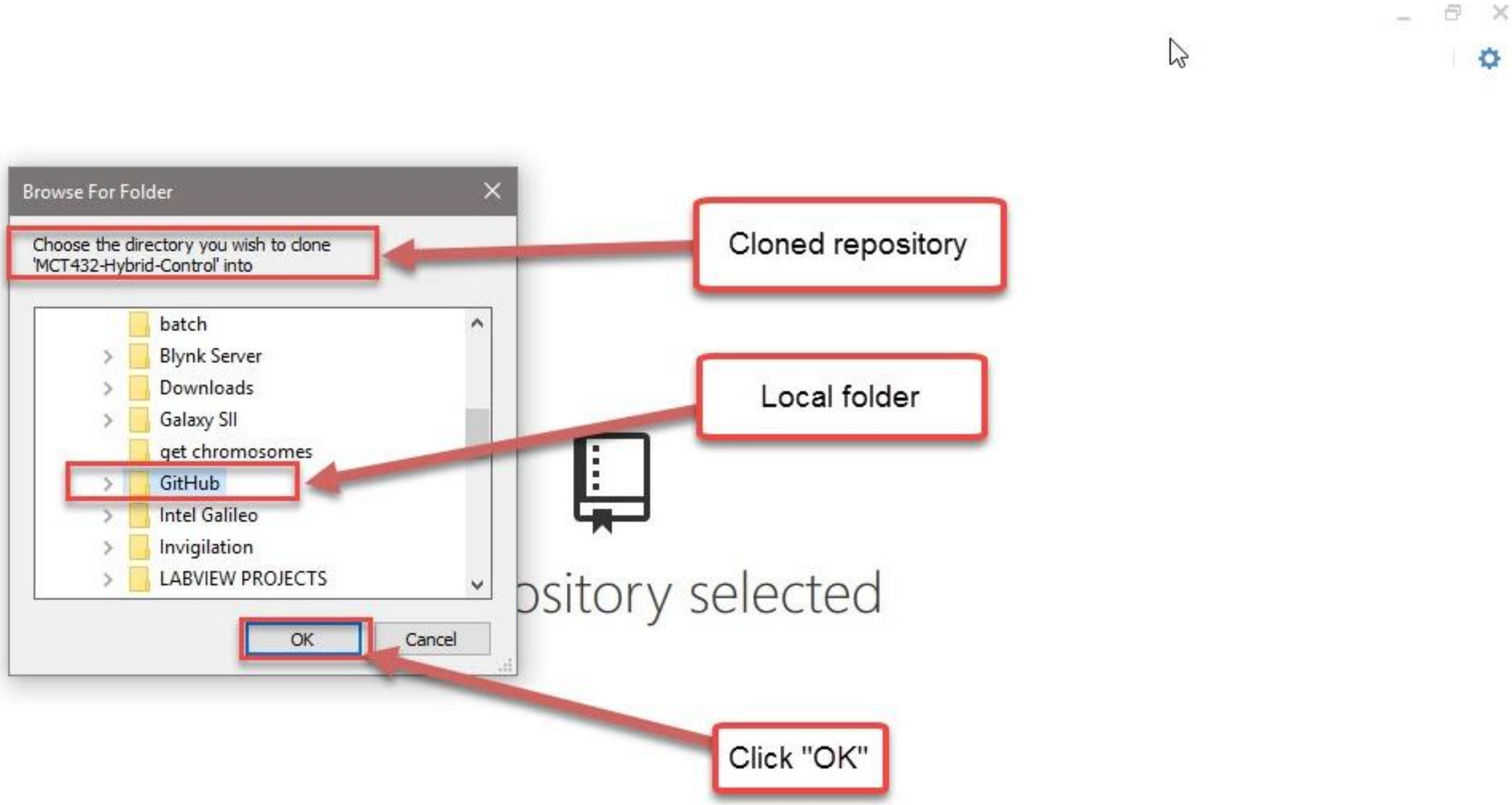
DOWNLOAD GITHUB DESKTOP



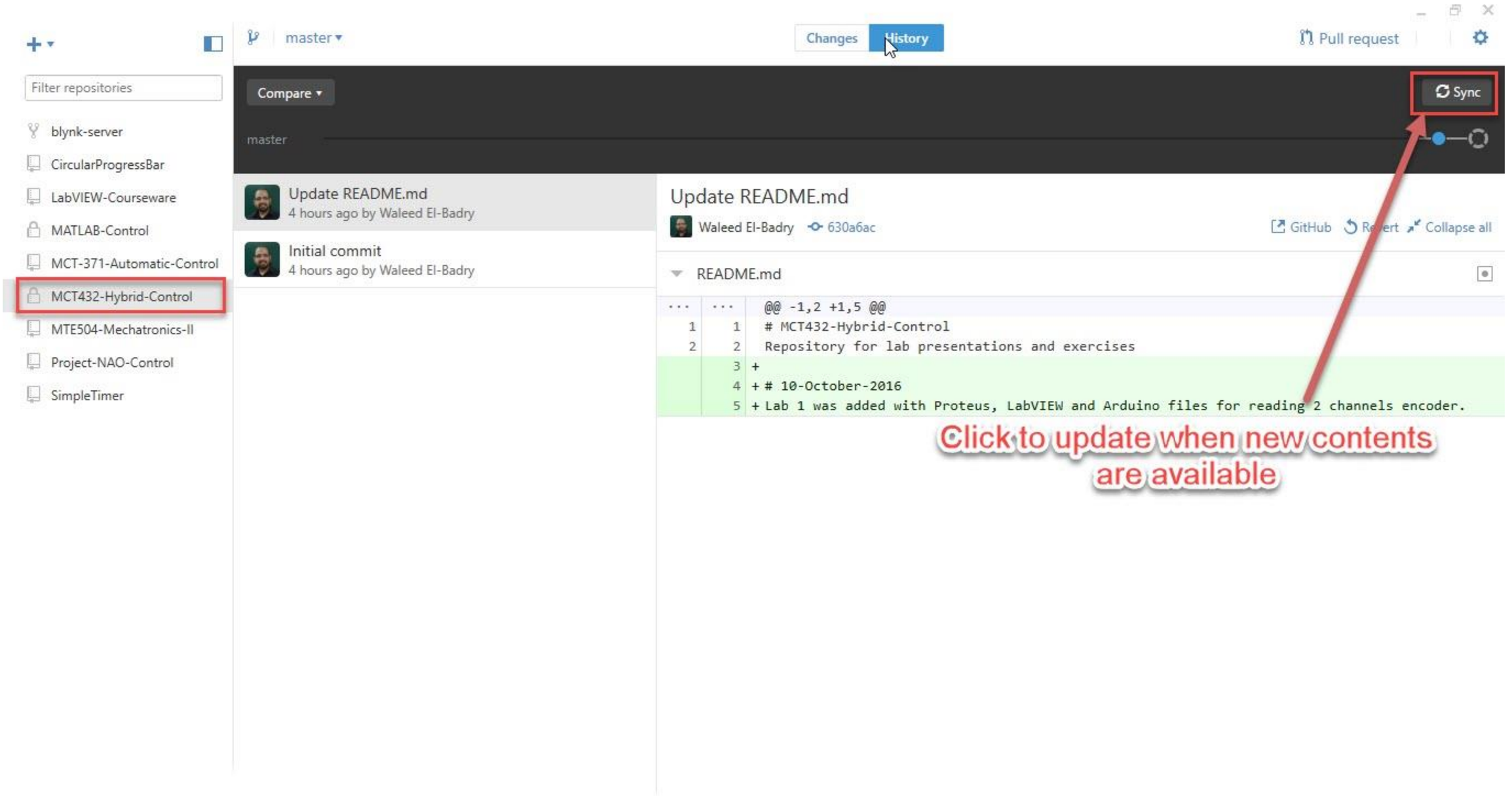
GO TO
https://github.com/wbadry/MCT432-Hybrid-Control



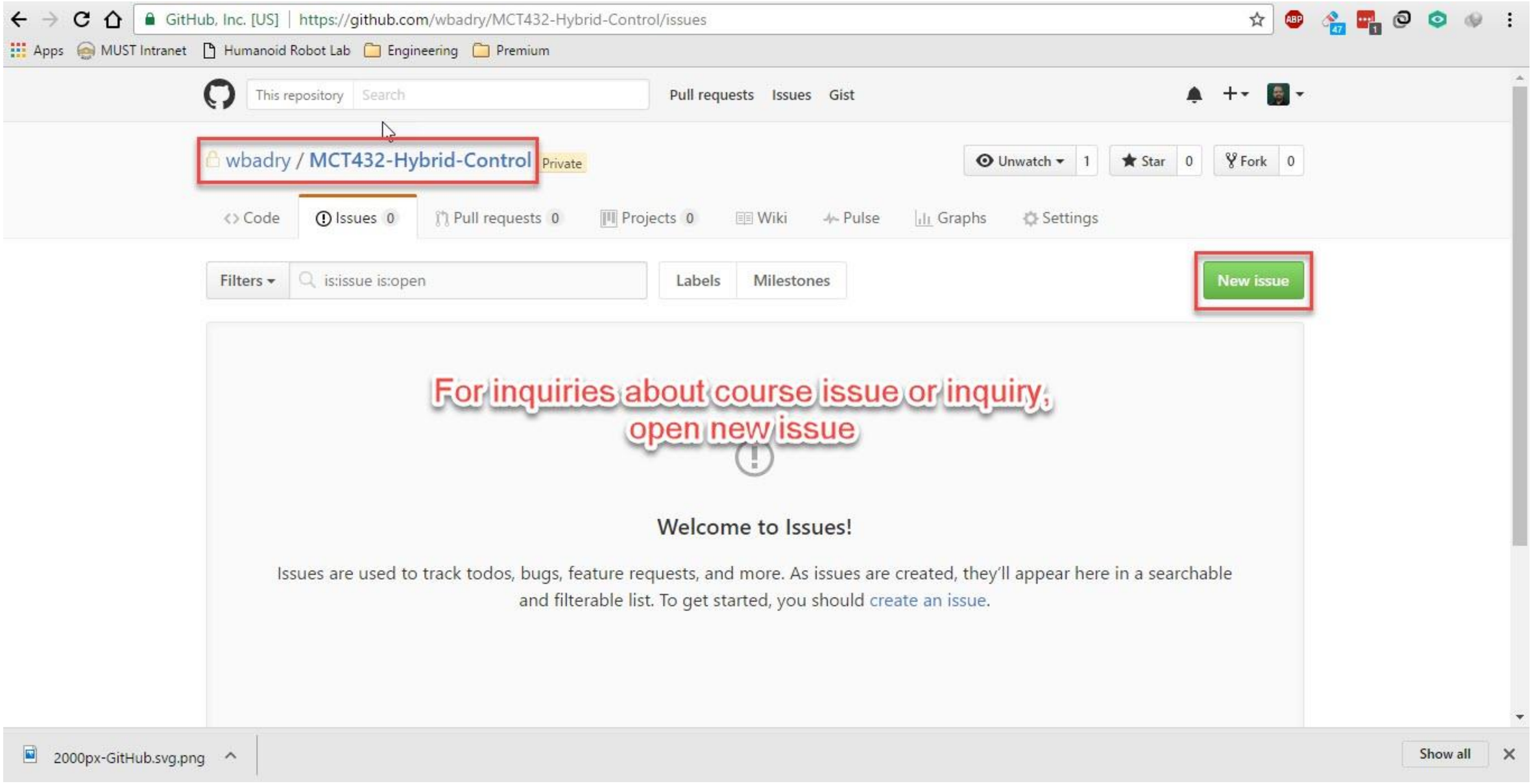
SAVE IT ON YOUR LOCAL FOLDER



SYNC TO GET NEW FILES

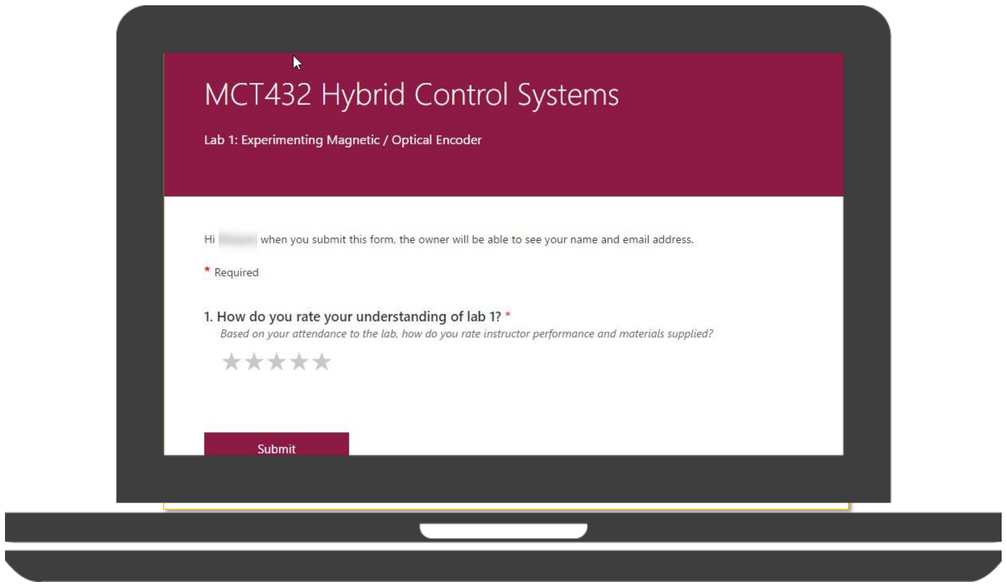


COURSE INTERACTIVITY




YOUR
FEEDBACK
MATTERS!

YOUR OPINION MATTERS



LINK to rate lab 1

https://goo.gl/H5n8BY

THANK YOU