SESSION 1 INTRO TO ROV SYSTEMS& ELECTRONICS BASICS

RECOMMENDATIONS

- Bring sketch and pin
- All slides and codes will be available with you on our Facebook group or google drive
- We will start sharp on time
- Bring your laptop without asking
- If you have any questions don't hesitate to ask even it was repeated
- all assignment and workshops is mandatory !
- We have one break 10-15 min
- Half of your training will be on search
- Buy an Arduino Uno (optional)

ROV TYPES
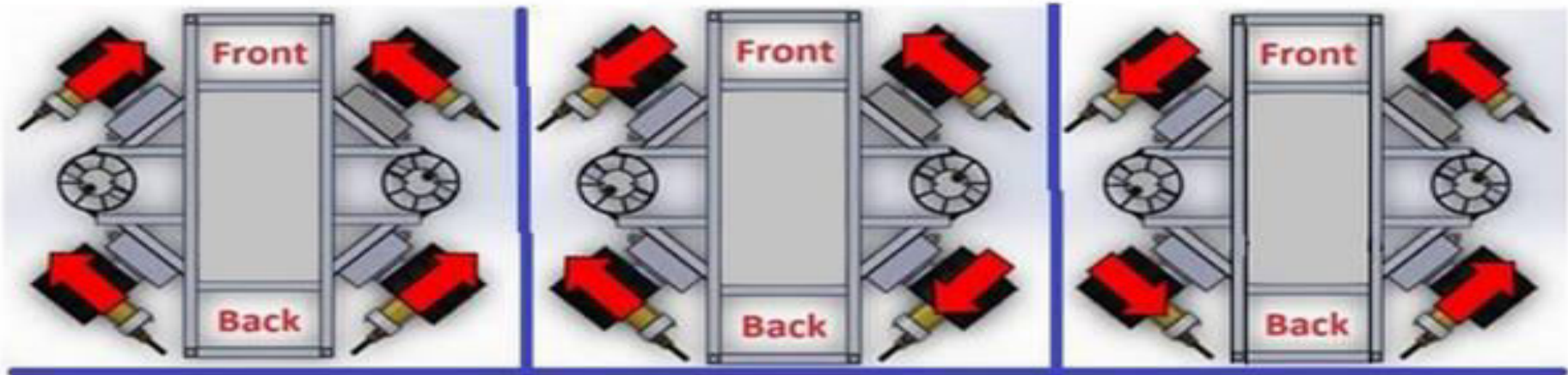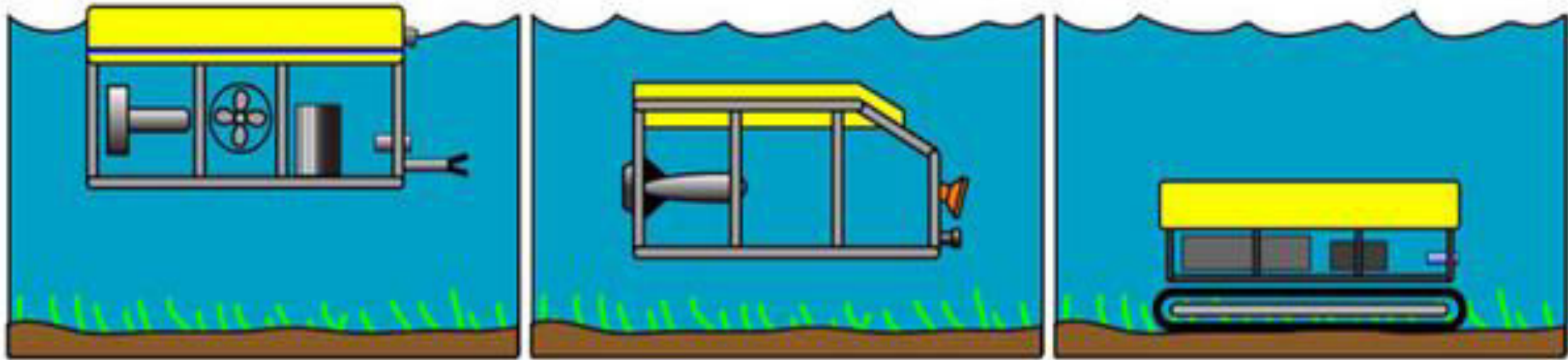
DRY HULL
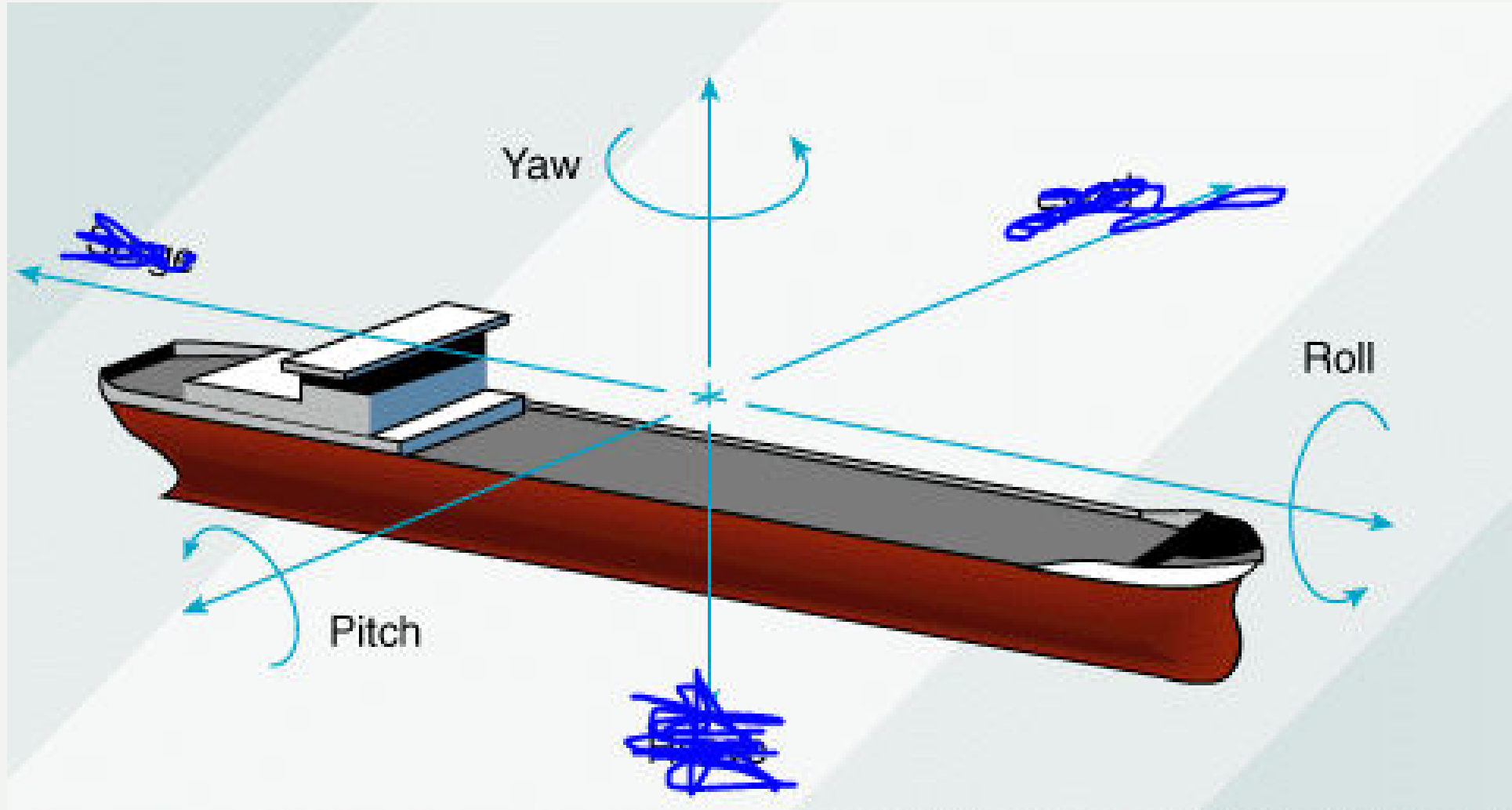
OPEN SYSTEM
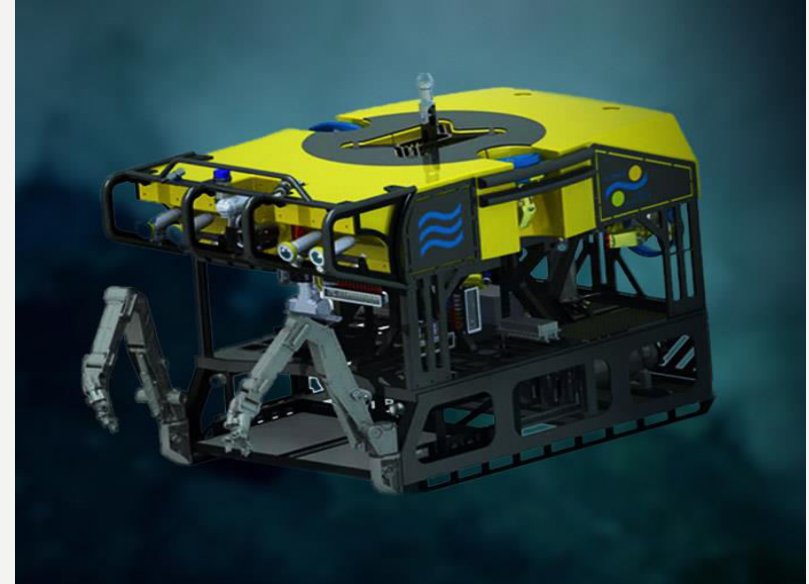
BUOYANCY & THRUST

Figure 1

Figure 2

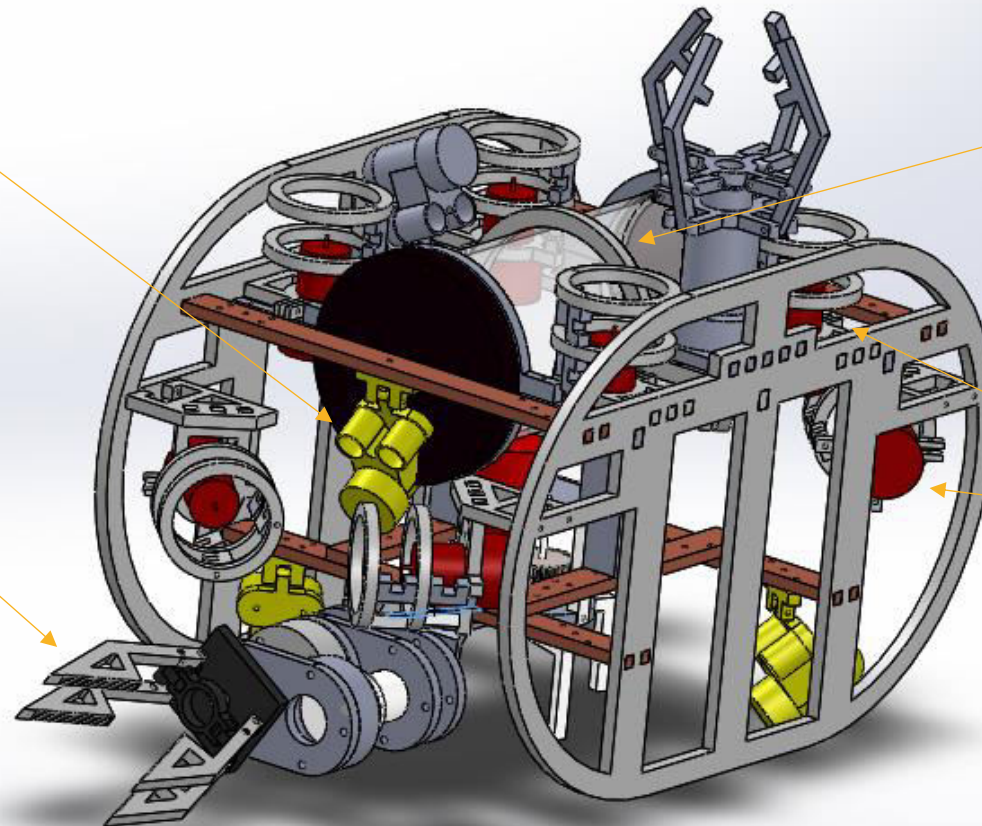Figure 3

ROV MANEUVERING

ROV COMPONENTS

frame

cameras

Control box

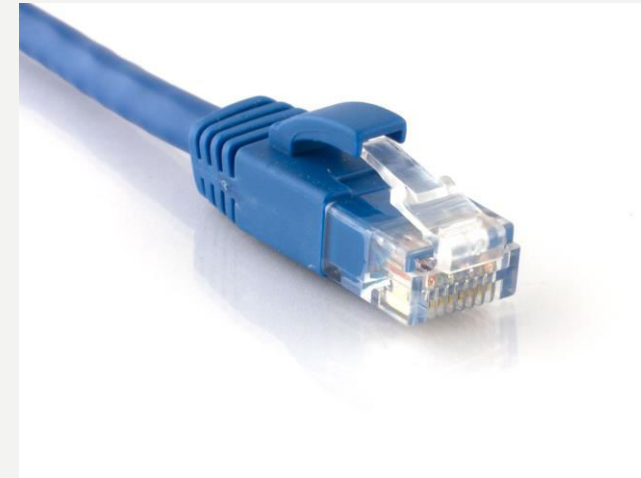Manipulators (Arms)

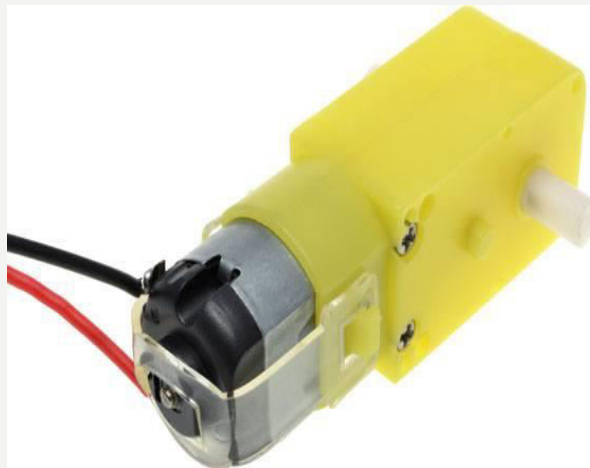Motors (thrusters)

CONT. ROV COMPONENTS
STATION

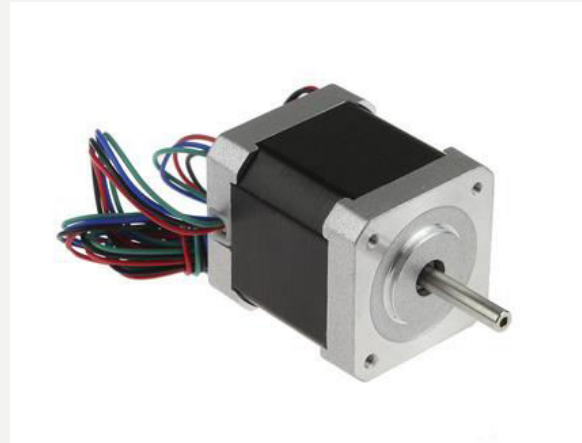# CONT. ROV COMPONENTS
TETHER

48 volt
30 A

DC MOTORS

Brushed dc motor

Stepper motor

Servo motor

Brushless motor

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BRUSHED MOTORS EXAMPLE (BILGE PUMP)

- A bilge pump is a water pump

- Water sealed motor 1 meter

- 12 Volt DC

- Max Current 7 Amp

- 5000 rpm

BRUSHLESS MOTORS (T100)

- 3 wires motor

- Must use special driver (ESC)

- Higher efficiency (no-brushes)

- Higher speed

- MAX Current 12.5A

- Operating voltage 6 – 16 volt

- MAX power 135 watt

- 4200 RPM

- Maximum Forward Thrust 2.3 kg_f

- Maximum Reverse Thrust 1.85 kg_f

ESC
ELECTRONIC SPEED CONTROLLER

- Current Draw: **30A Continuous**

- **Voltage: 6-16.8 Volts**

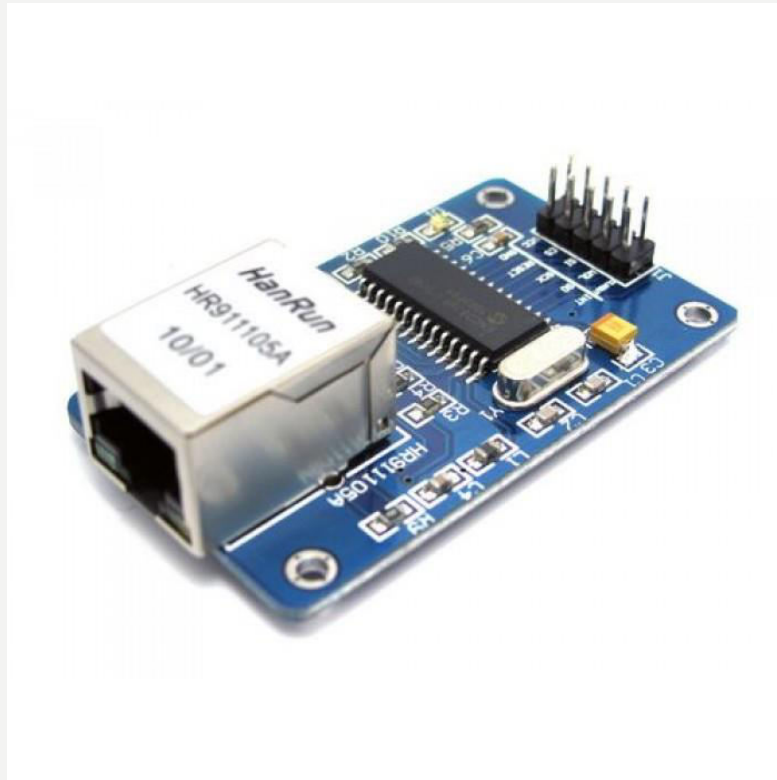- BEC: **0.5A Linear**
  Input Freq: **1KHz**
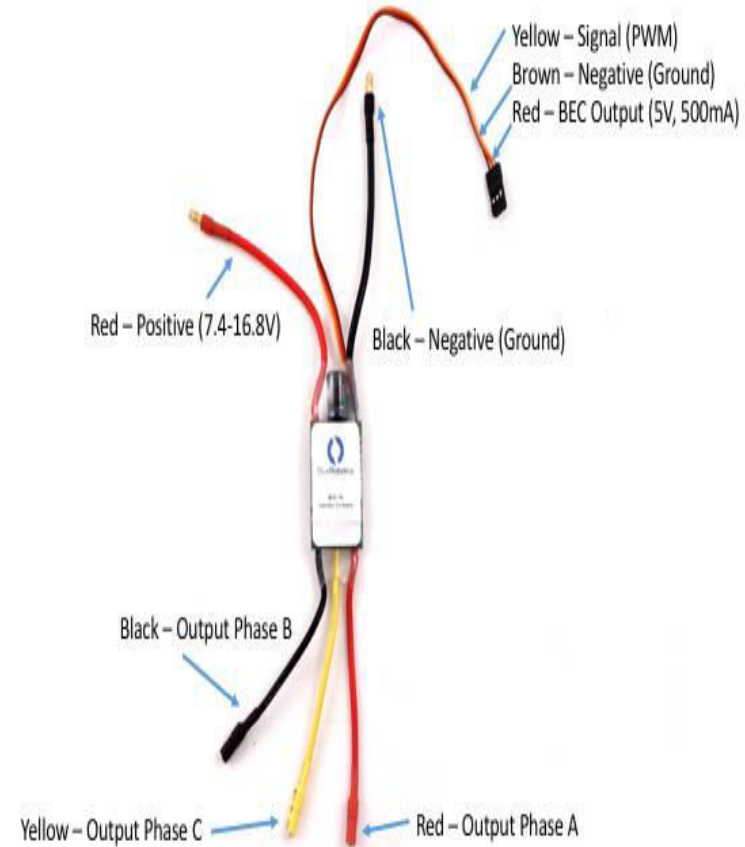
SERVO MOTORS

- Allow the control of the position (angle) of the motor
- Most commonly used in arms and cameras
- 3 terminals
  - VCC
  - GND
  - Signal

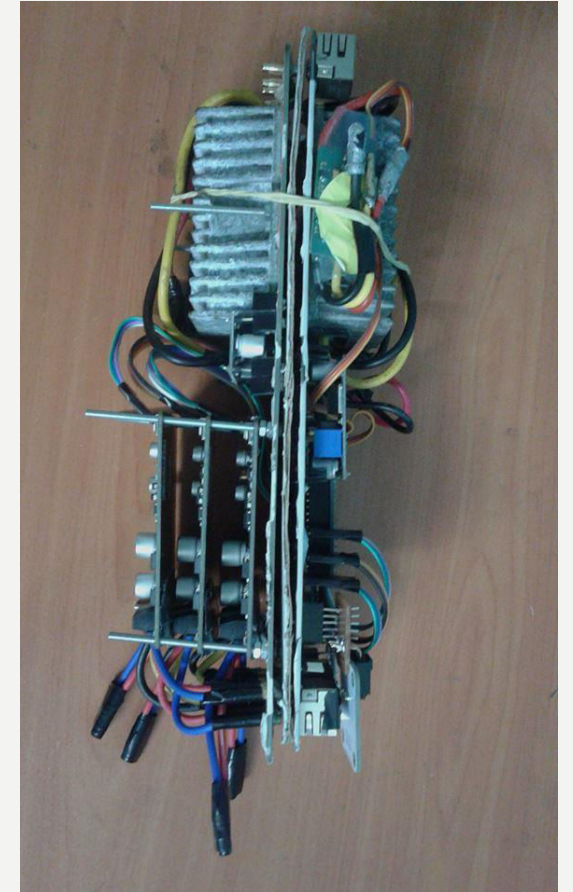# ETHERNET MODULE & ARDUINO MEGA

DC-DC CONVERTER & VOLTAGE REGULATOR
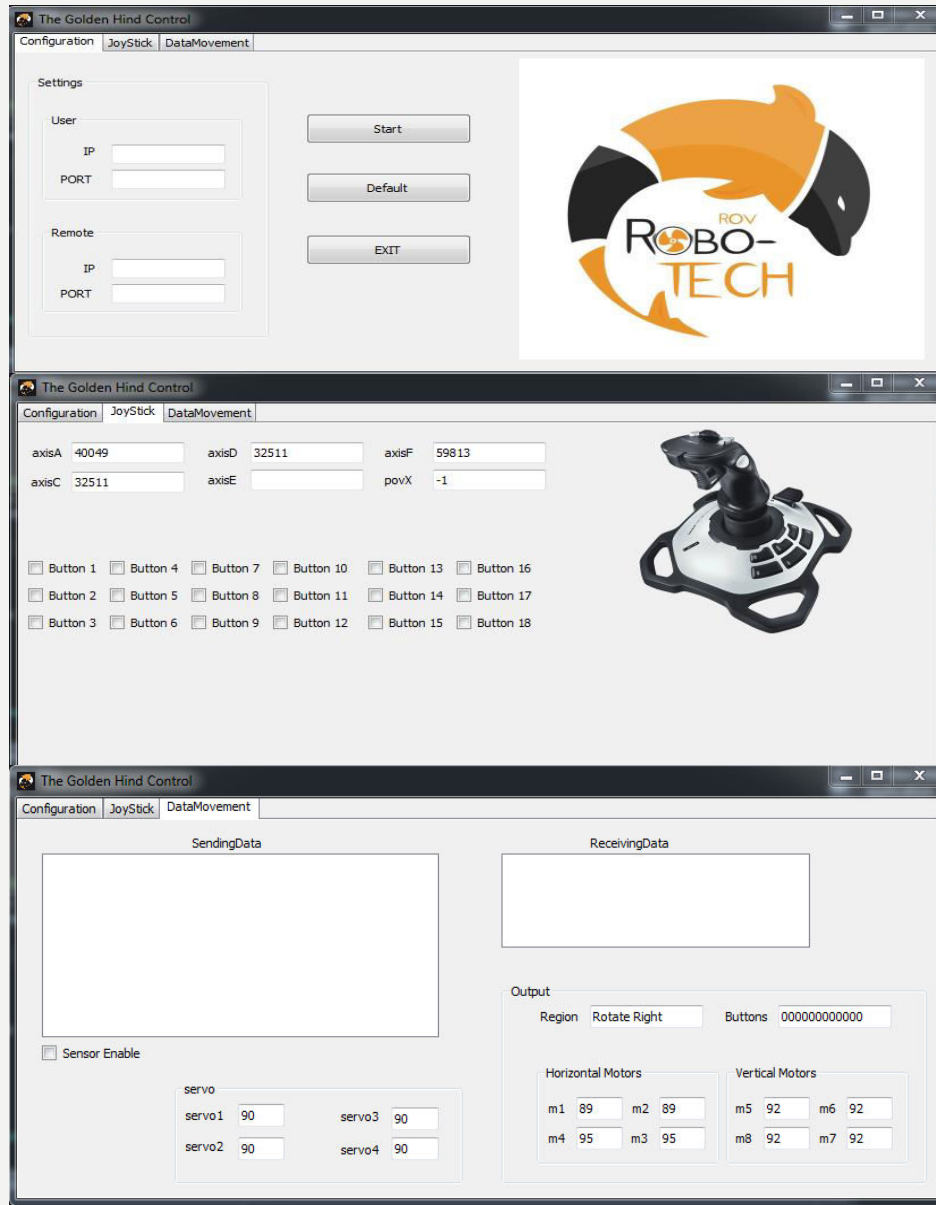
ANALOG CAMERAS(DVR) & IP CAMERAS (NVR)

WHAT IS YOUR ROLE AS ELECTRICAL TEAM MEMBER ?!

1 - SIGNAL AND POWER BOARD (MOTHER BOARD)

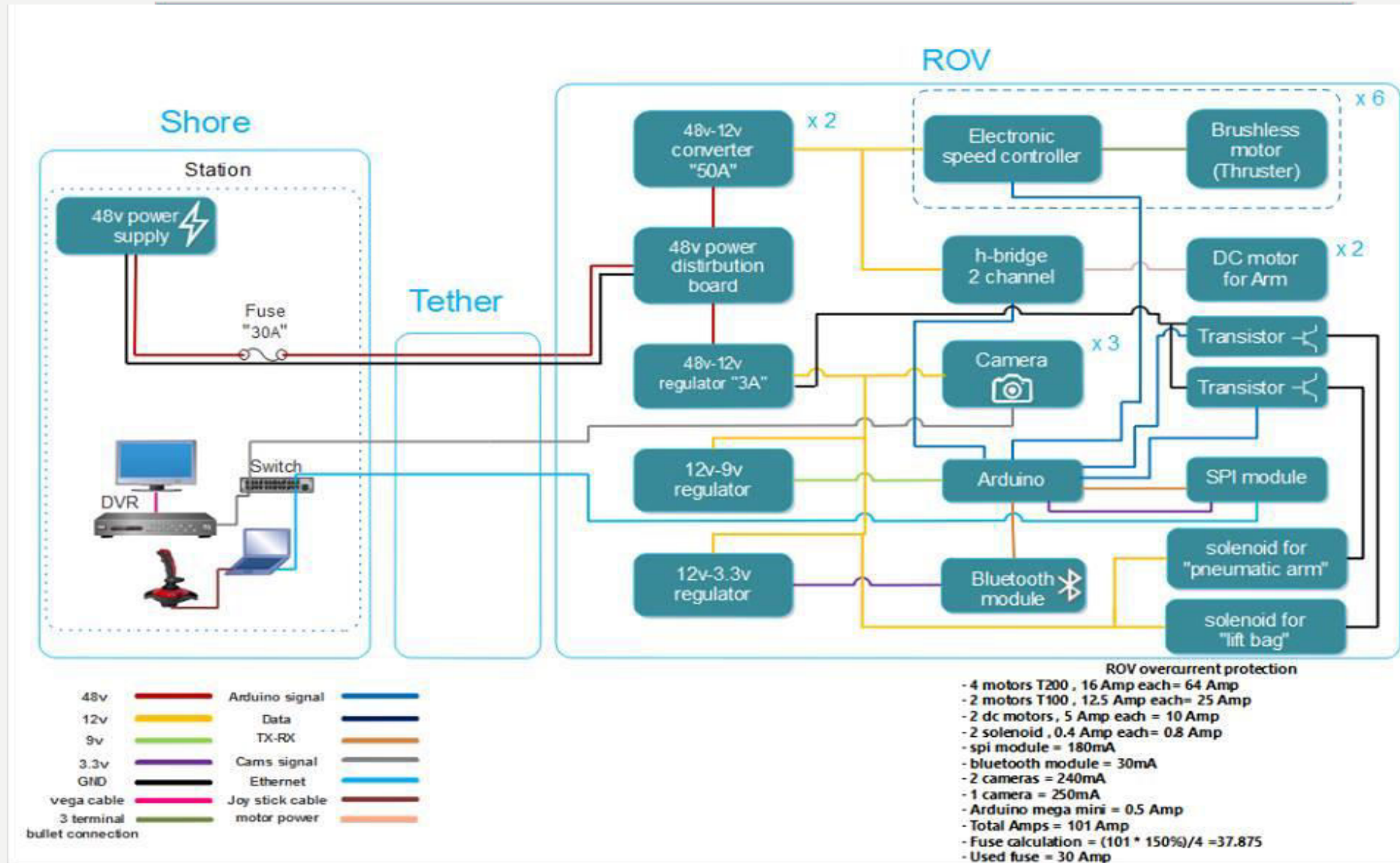# 2 - GUI & JOYSTICK

3-ARDUINO CODE

4 – R&D

- Small & high resolution cameras
- small & high current converters
- smaller Arduino
- New reliable joystick with many buttons
- Newer communication system
- Sensors (accelerometer – gyroscope – compass – water sensor – pressure – temperature)
- PID feedback system for auto stability
- Smaller , low cost and high kgf thrusters
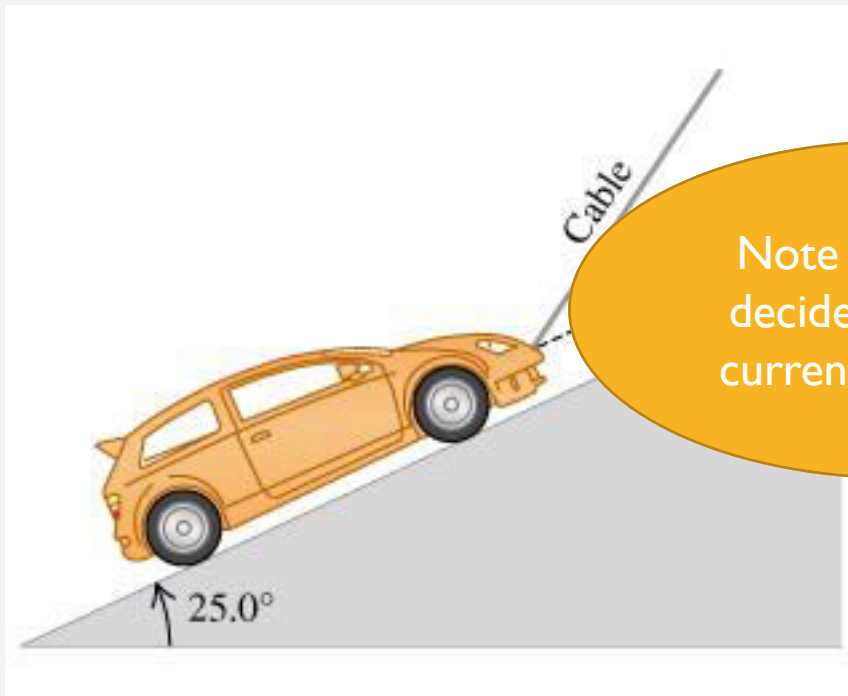
IMPORTANT SITES

- https://www.bluerobotics.com/ >> BLUE ROBOTICS >>VIP

- http://www.teledynemarine.com/seabotix/ >> SEABOTIX

- https://www.amazon.com >> Amazon

- https://www.ebay.com/ >> EBay

- https://www.aliexpress.com/ >>Ali Express

- https://www.alibaba.com/ >> Ali baba

ROV SYSTEM INTERCONNECT DIAGRAM (SID)

VOLTAGE VS. CURRENT SPEED VS. TORQUE

HOW TO CONTROL DC MOTORS

DIRECTION (POLARITY)
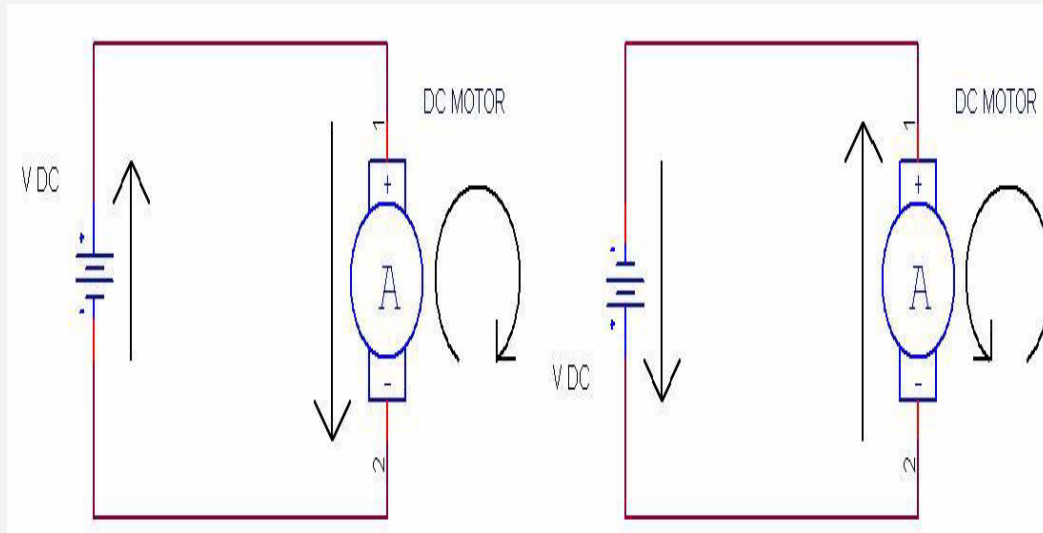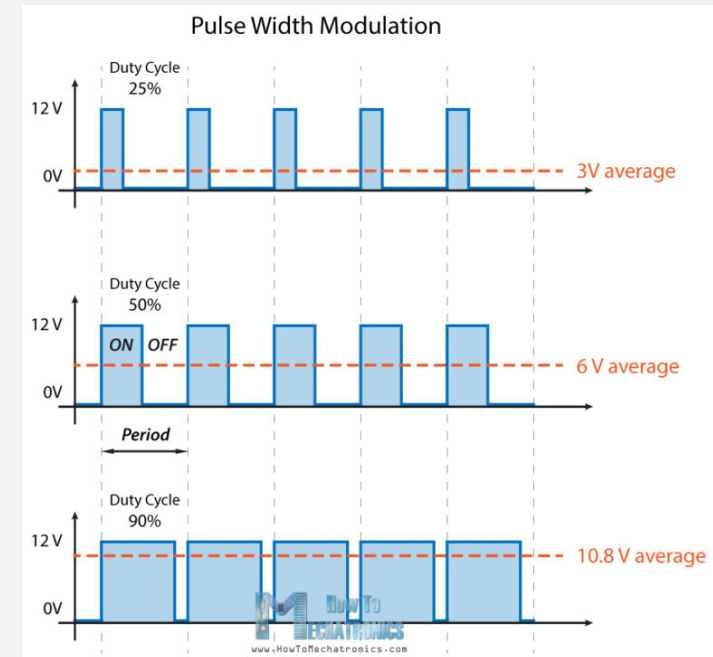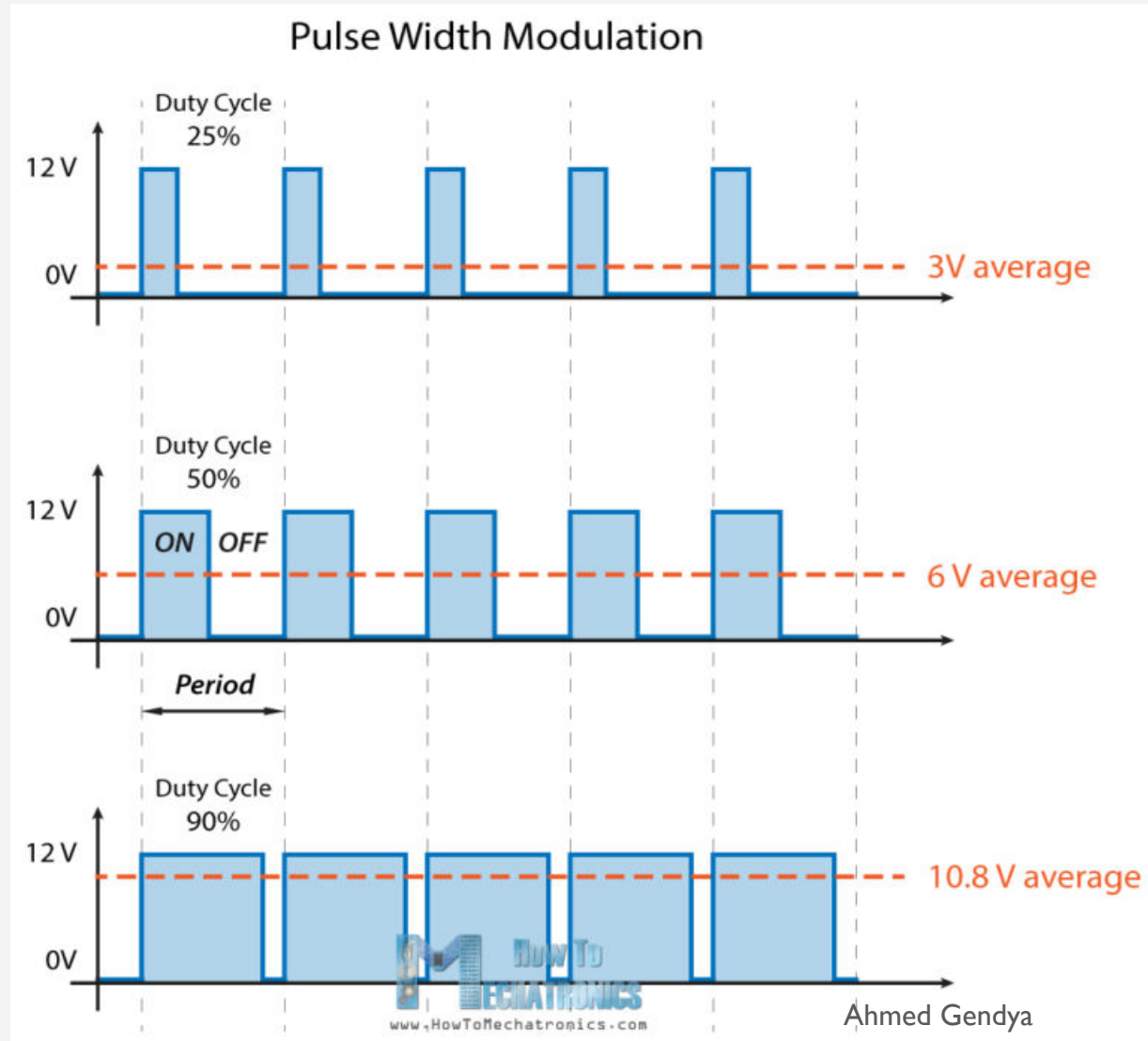

SPEED (PWM)

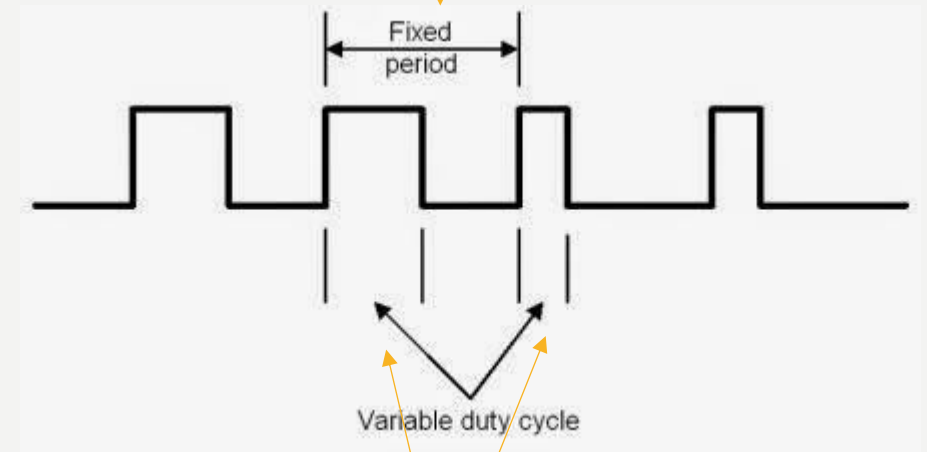# PWM

If the PWM is an input for DC motor Is the motor will switch on and off ?!

Cycle or period or pulse

Duty cycle = on time / cycle

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26

WHY PWM !

- No power dissipation than any potentiometer (high Efficiency)

- Transistors reliable than any potentiometer

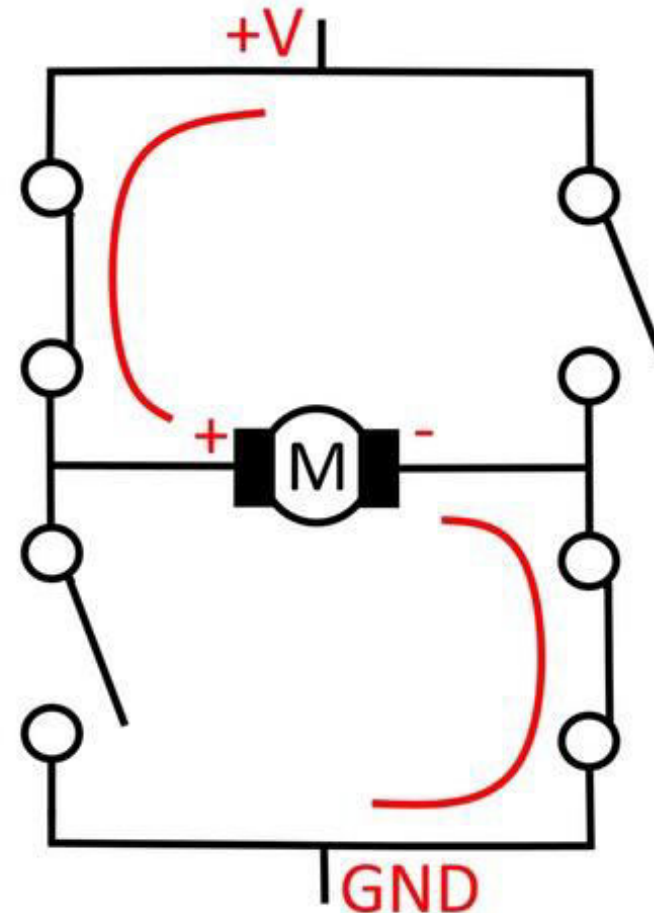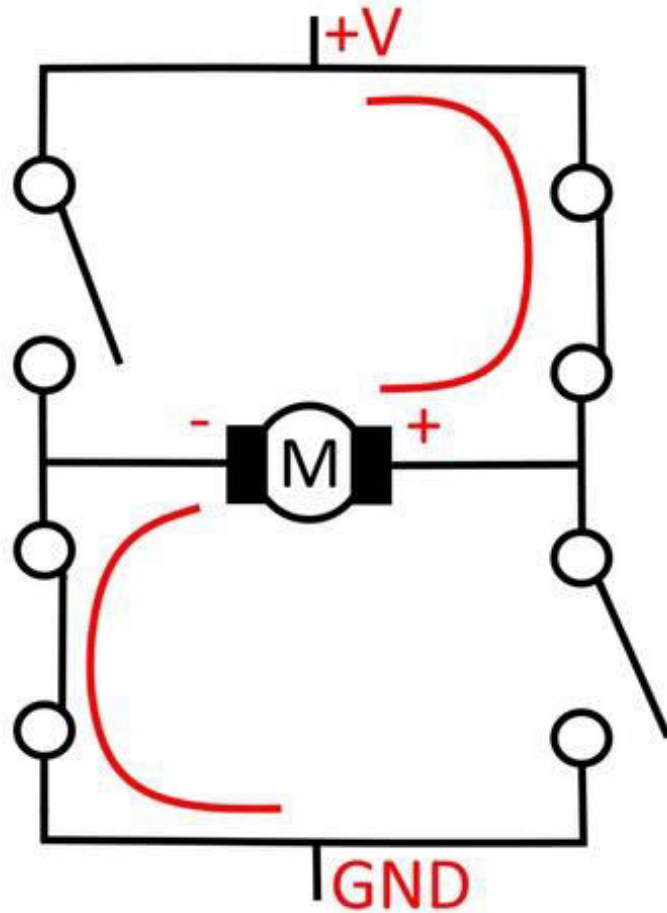- Easy to configure as a software

- **APPLICATIONS :**

- Light control (diming LEDs)

- DC Motors speed control

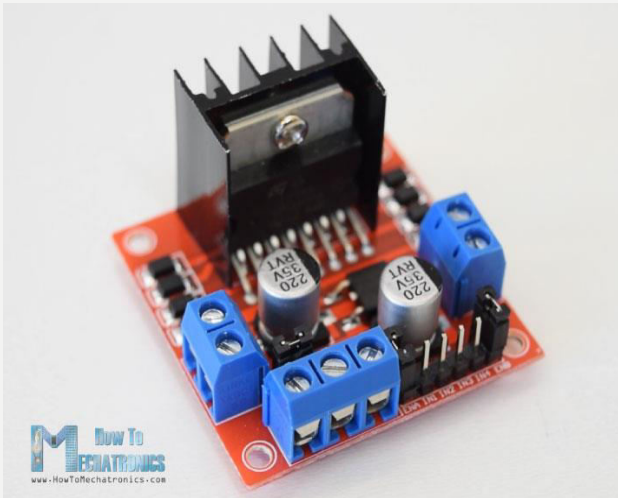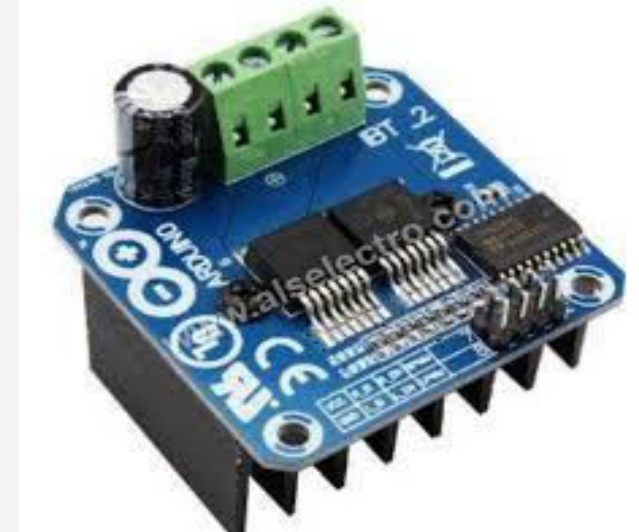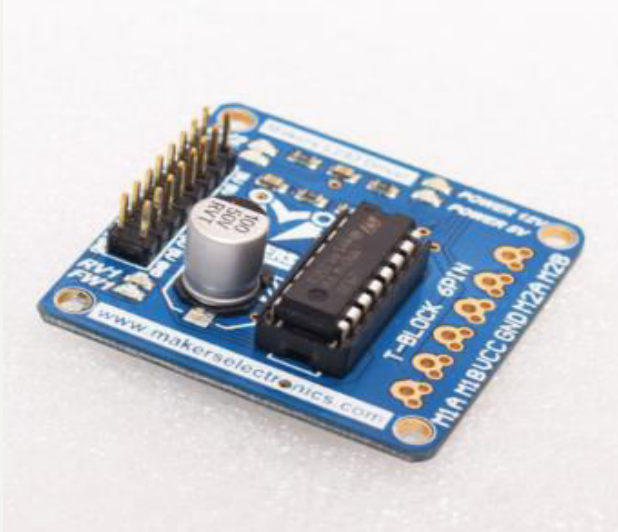- Dc – Dc converter to Stepdown voltage (buck converter)

- Valves control

- **Note** : PWM can be generated without microcontroller with timer 555 ic

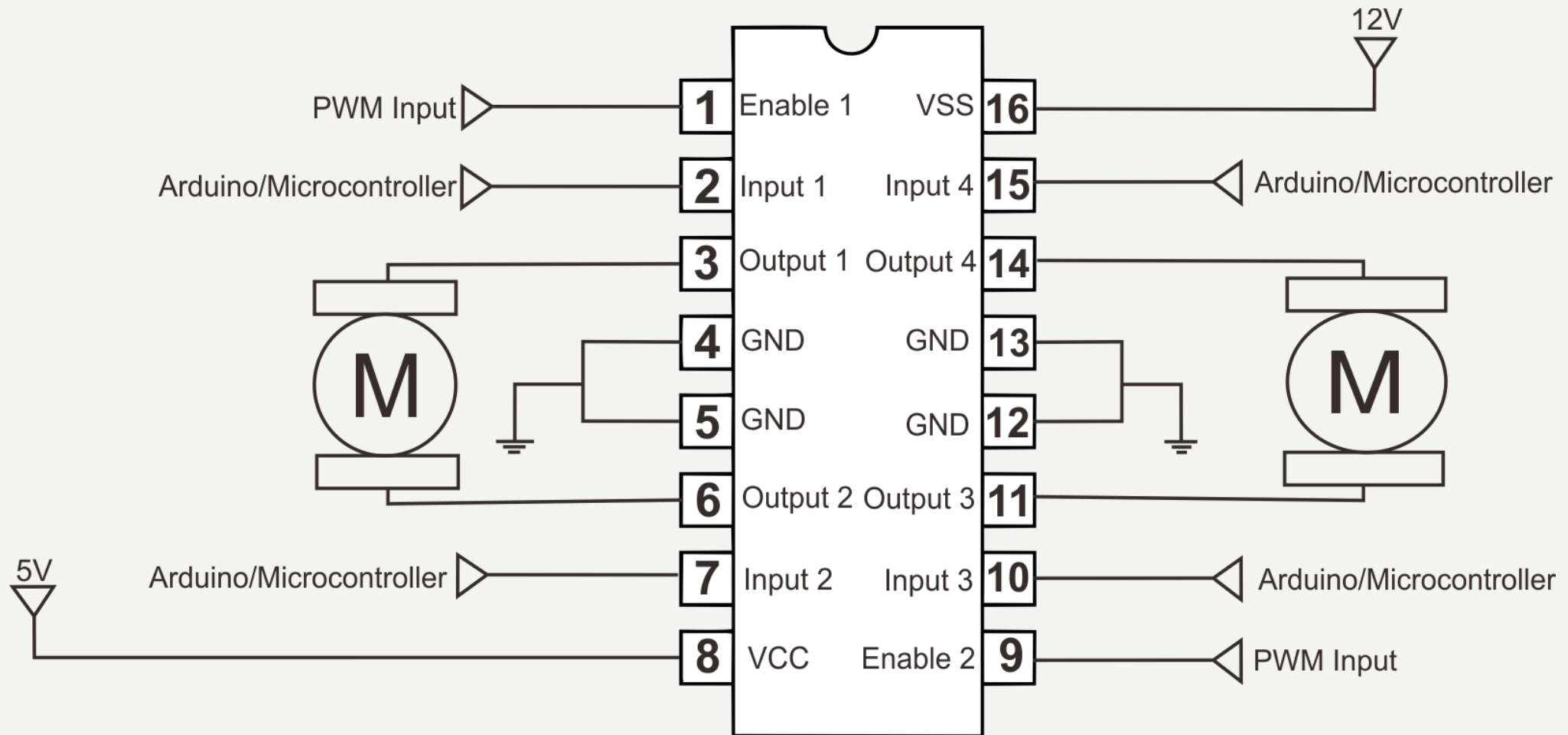- PWM signal generated by the AVR (Arduino) timers

H-BRIDGE

How an H-bridge can change direction

H-BRIDGES-MODULES

L 293D

PWM Input — **1** Enable 1   VSS **16** — 12V

Arduino/Microcontroller — **2** Input 1   Input 4 **15** — Arduino/Microcontroller

3 Output 1   Output 4 **14**

4 GND   GND **13**

5 GND   GND **12**

6 Output 2   Output 3 **11**

Arduino/Microcontroller — **7** Input 2   Input 3 **10** — Arduino/Microcontroller

5V — **8** VCC   Enable 2 **9** — PWM Input

CONNECTION WITH ARDUINO UNO

Pwm from Arduino
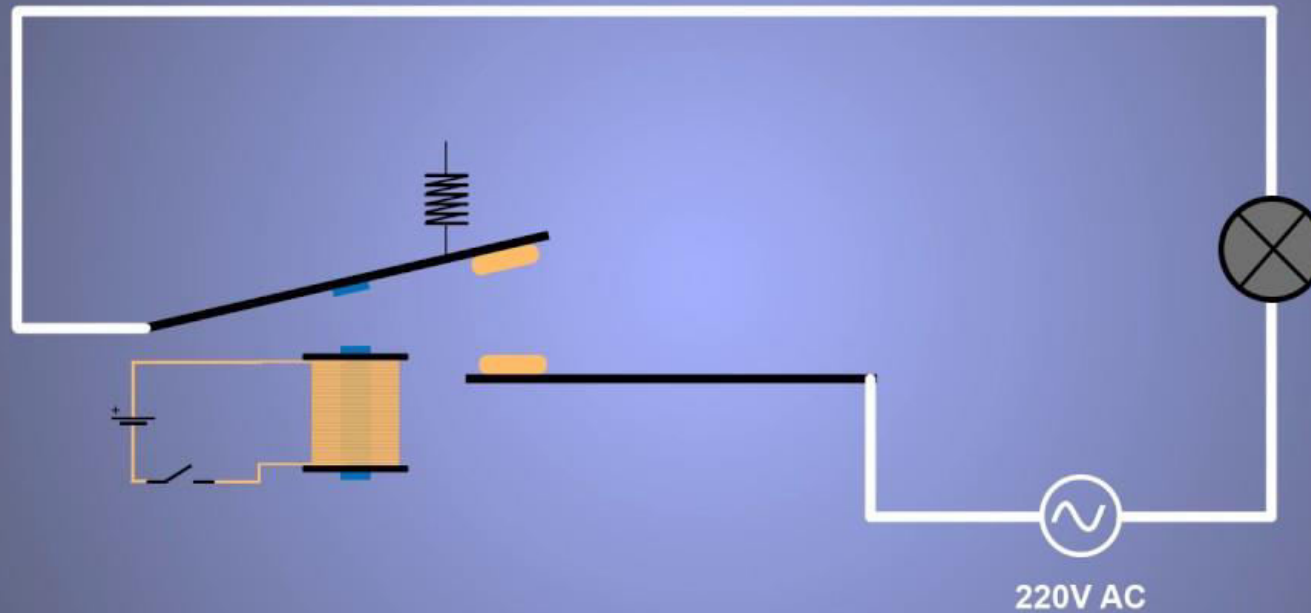
www.microcontroller-project.com

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CYTRON H-BRIDGE BOARD

- dual motor driver

- current up to 10A continuously and 30A peak (10 second) for each channel

- voltage range from 5 to 25 V

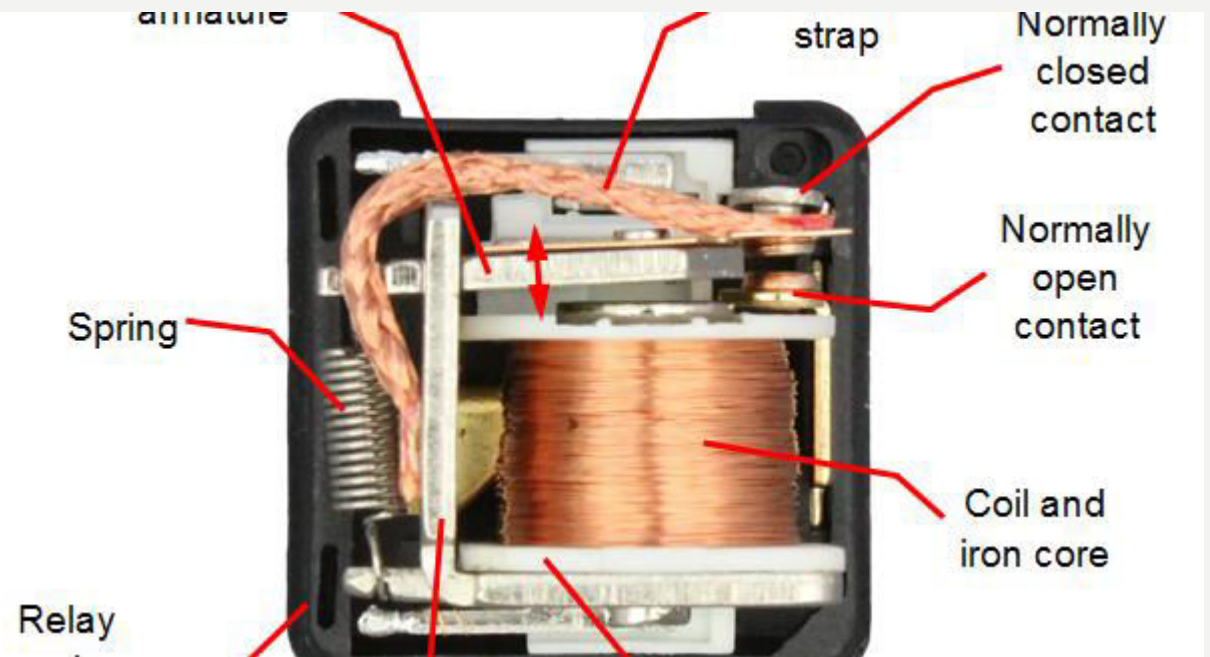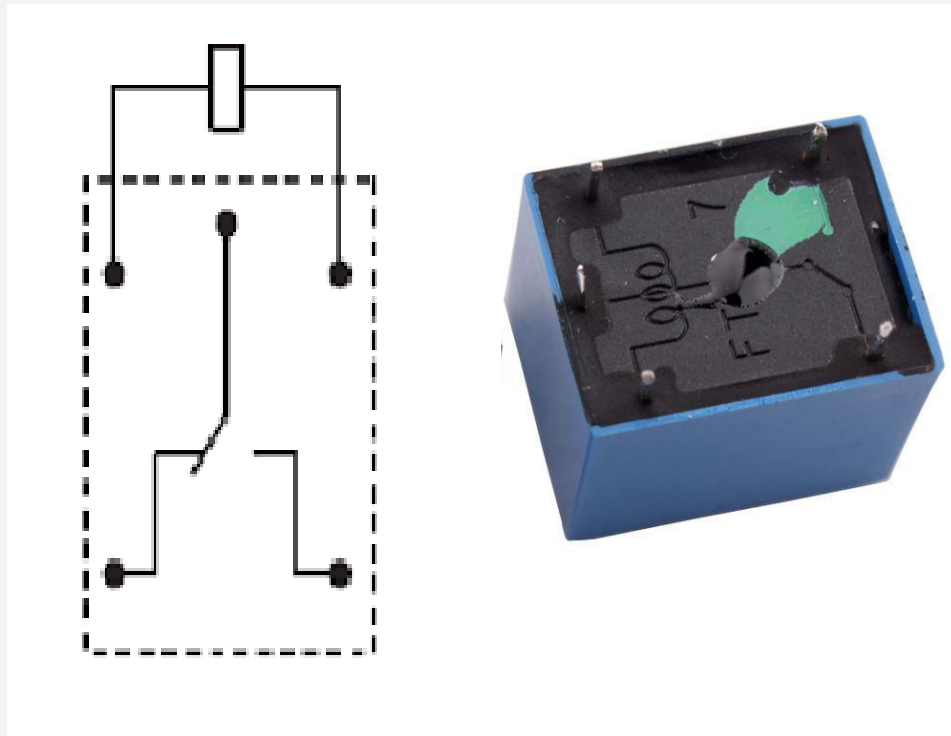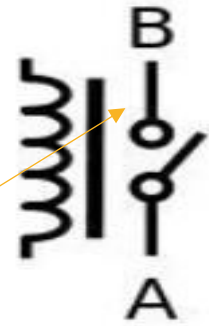- includes fast test switch for driver testing
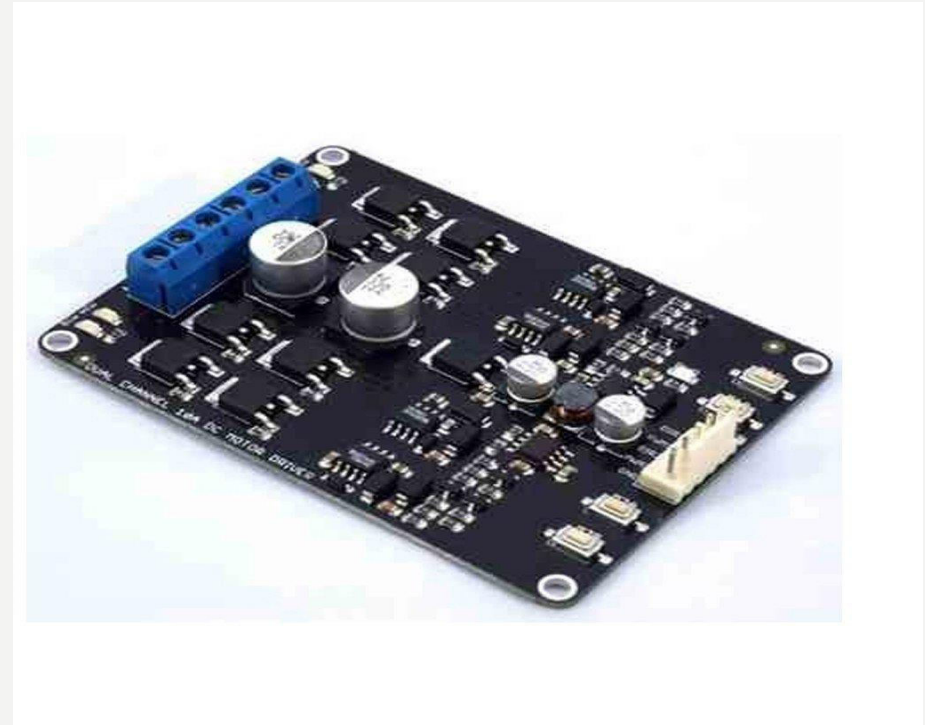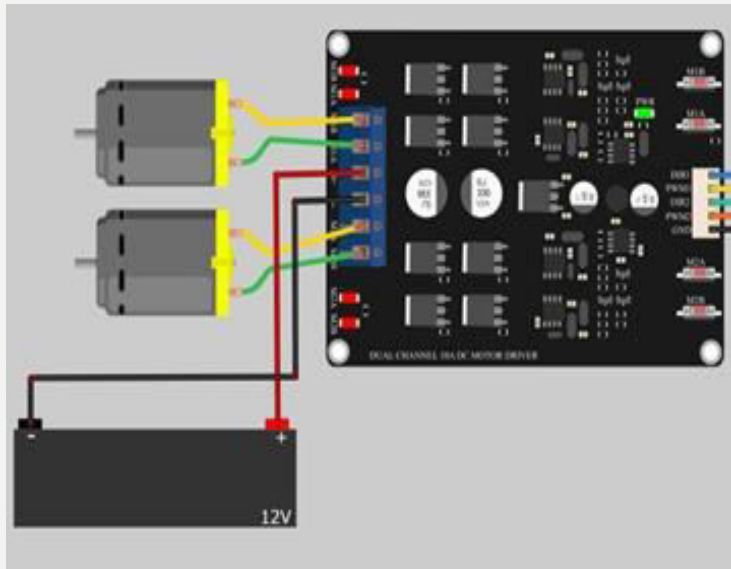
RELAYS

HOW DOES IT WORK?

220V AC

When the control switch is **turned ON** current starts flowing through a coil, it generates magnetic field that
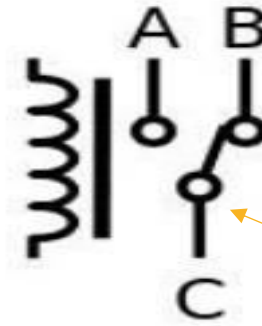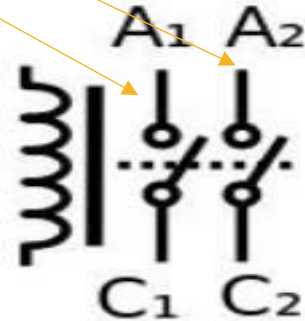
DETAILED LOOK INTO RELAY WIRING

armature

Spring

strap

Normally closed contact

Normally open contact

Coil and iron core

Relay

RELAY TYPES (POLE – THROW)

Throws number : how many states each pole have
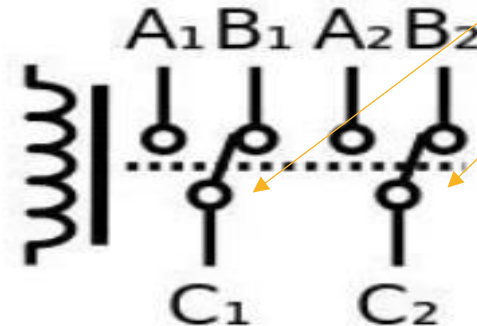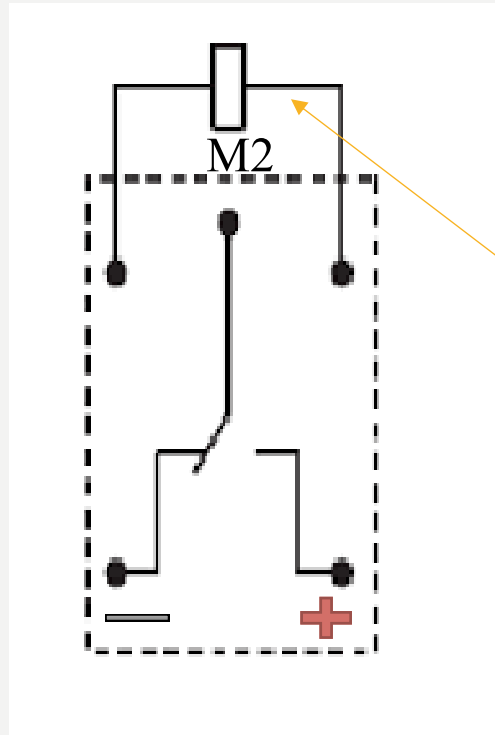
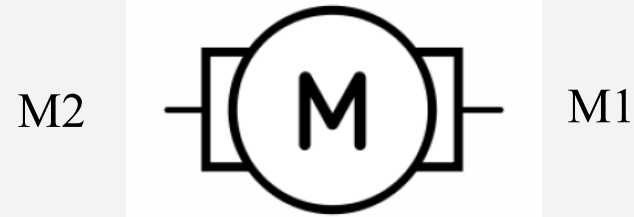Poles number : how many commons the relay have

SPST

SPDT

DPST

DPDT

CONTROL MOTOR WITH 2 RELAYS

M2

M1

M2

M1

Signal from Arduino may not enough to switch on the coil direct

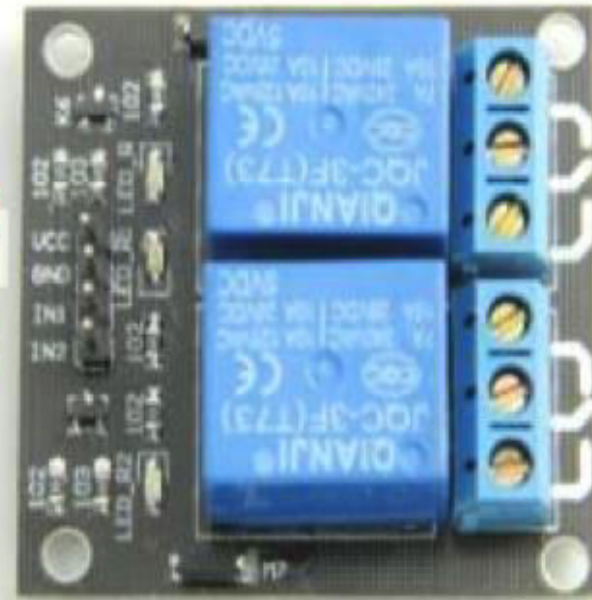Where is the signal from Arduino here !
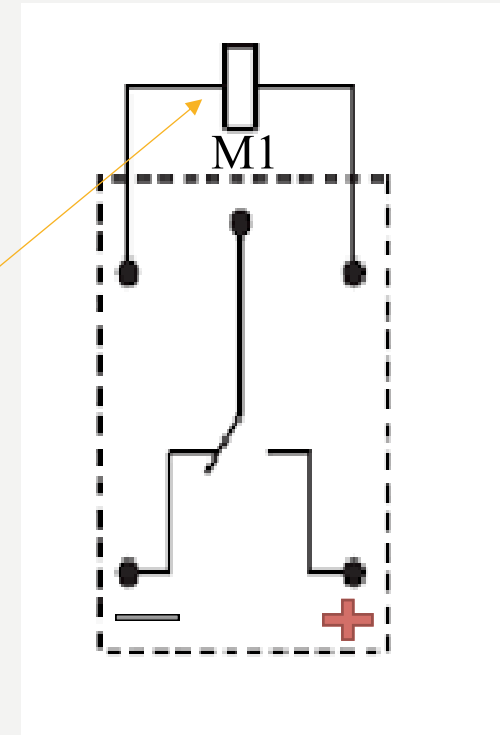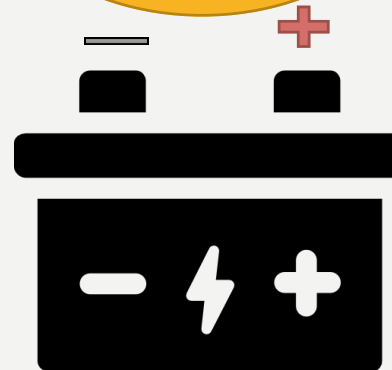
We can add one transistor to control the speed

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RELAY MODULE WITH ARDUINO

The coil is active low so it wait a "0" signal not "1"

Vcc= 5V (+)
GND= Ground (-)
In1= Digital Input
In2= Digital Input

NC= Normally Closed
COM= Common Pin
NO= Normally Open

NC= Normally Closed
COM= Common Pin
NO= Normally Open
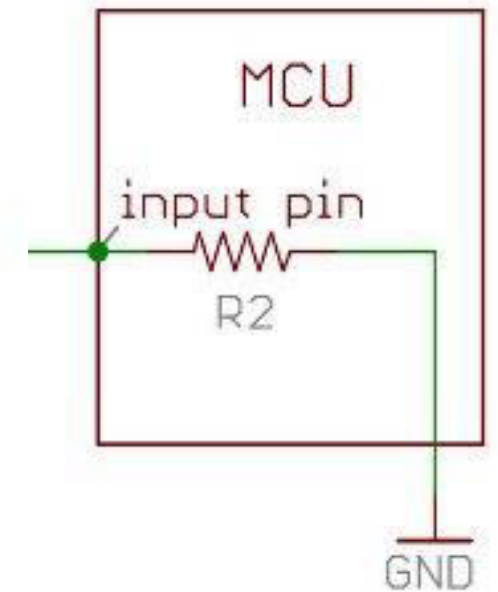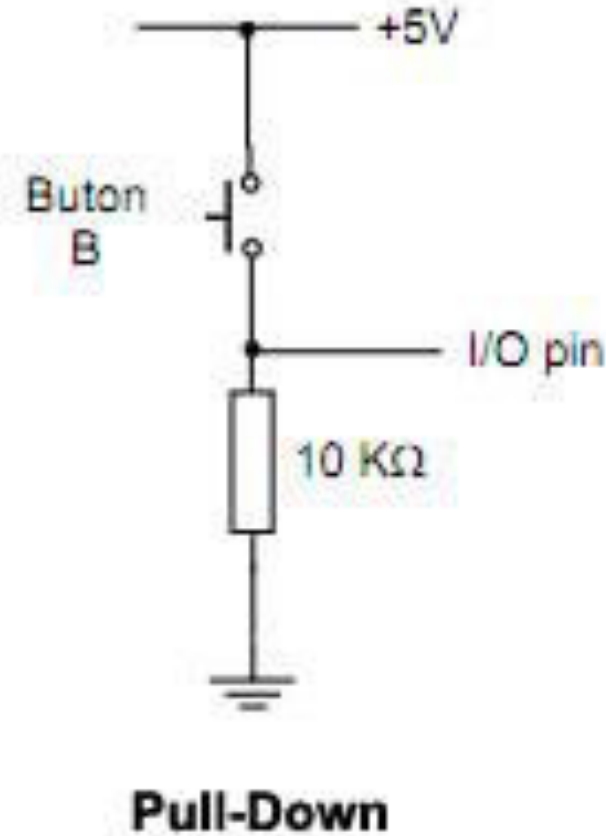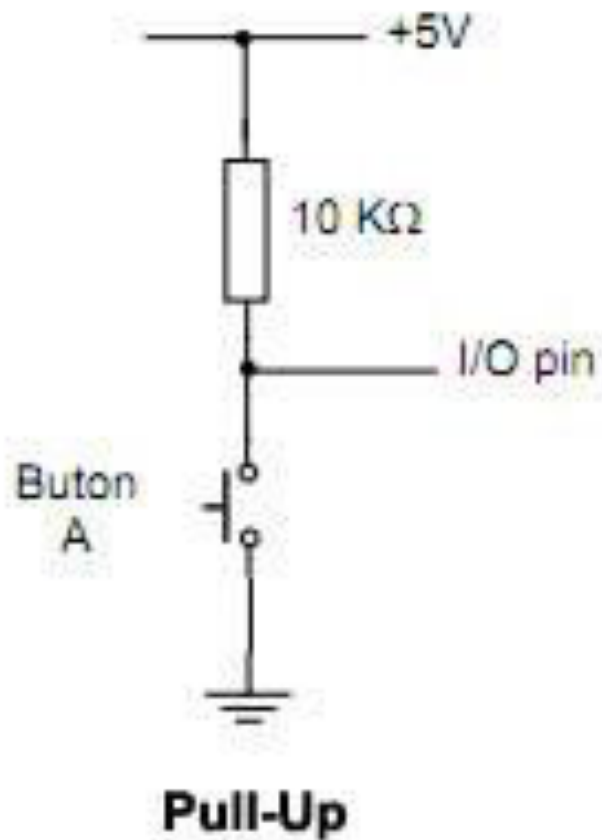
RELAYS VS H-BRIDGE(TRANSISTORS)

Relay:

1. Mechanical parts (noise)
2. Slower response
3. Can't drive directly from a controller
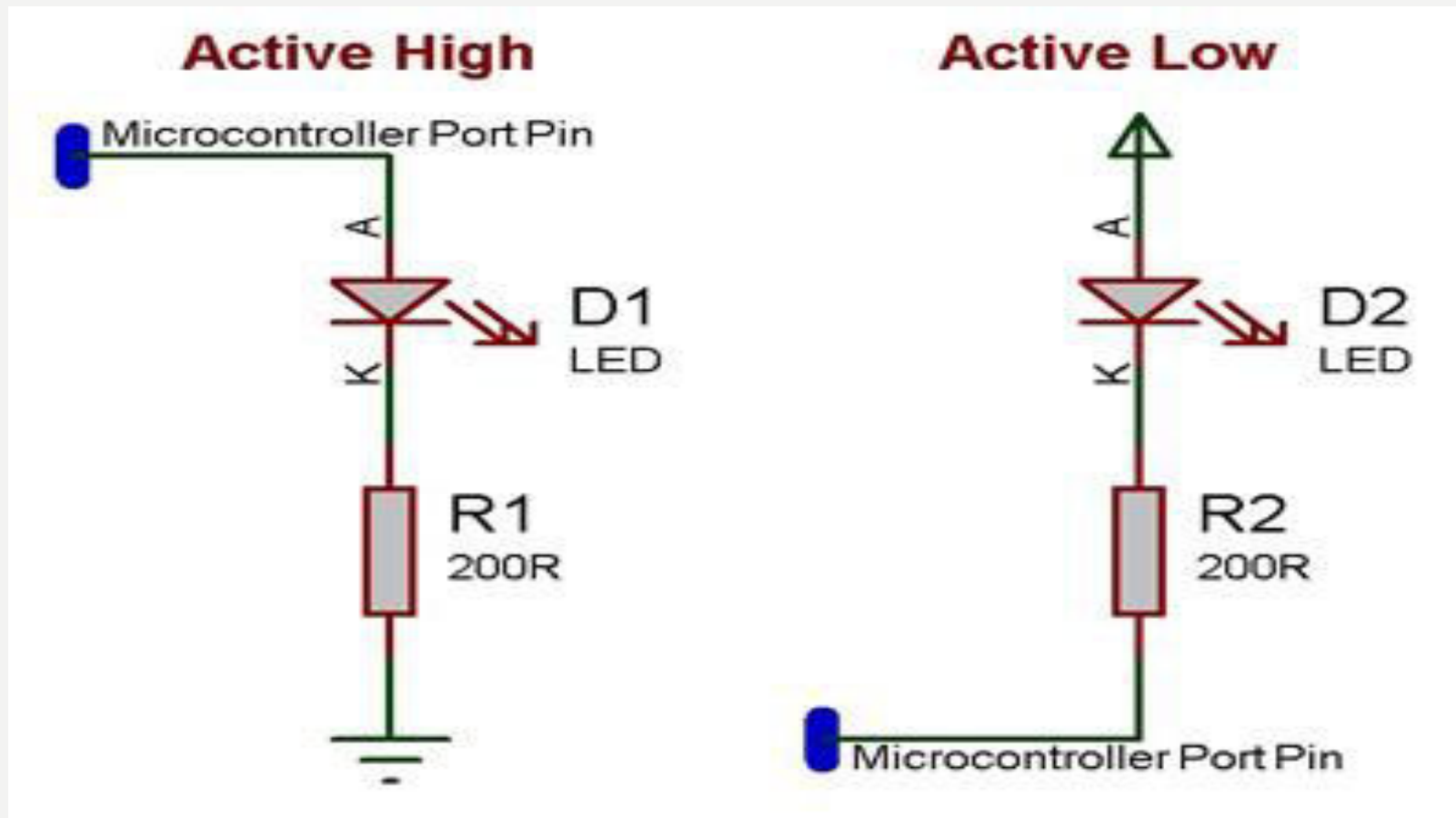4. Robust
5. larger

Transistor

1. Electrical part
2. Faster response
3. Can drive directly from a controller
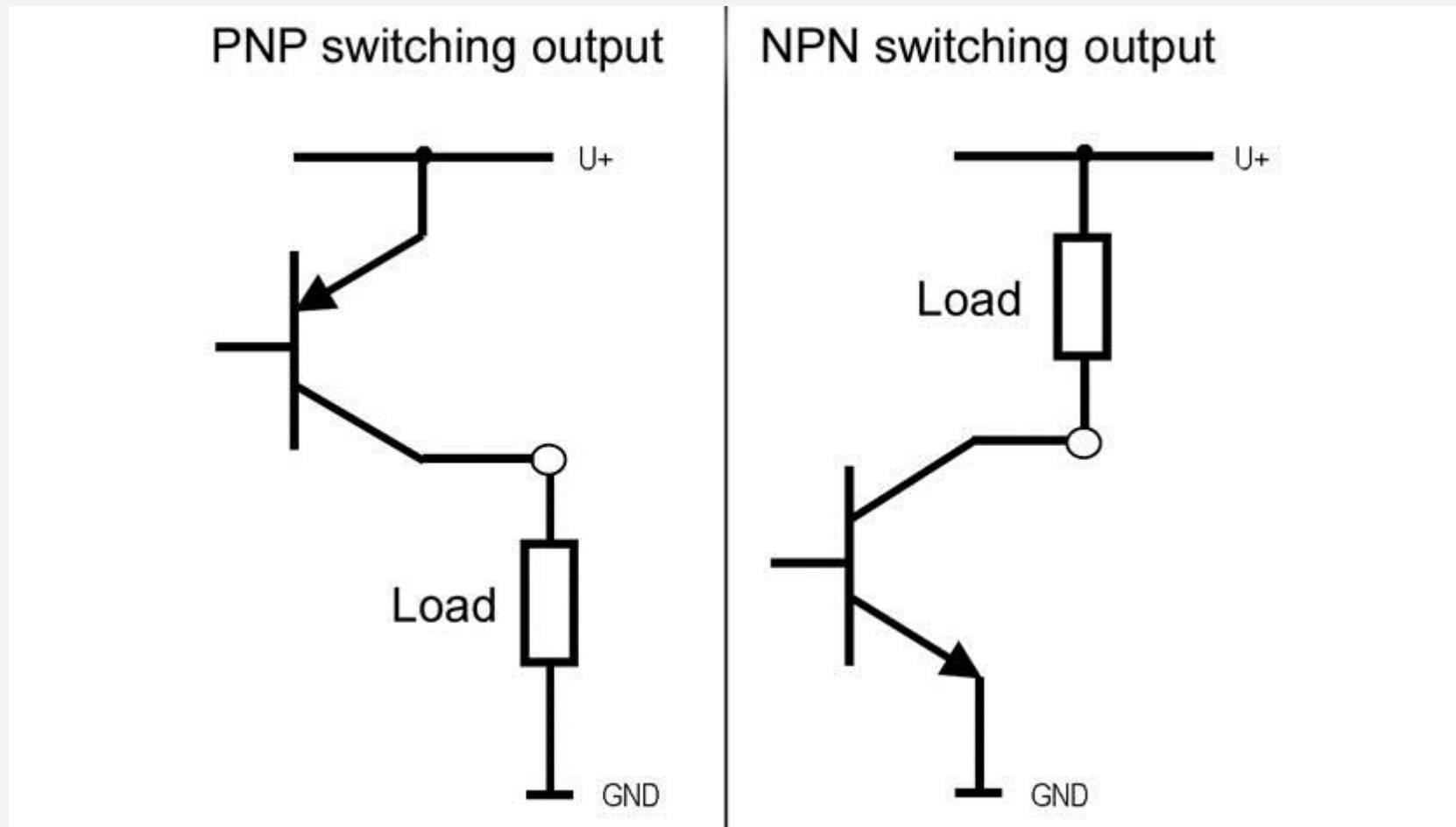4. Easy to damage
5. Smaller (nano)

INPUT PULL UP & INPUT PULL DOWN

ACTIVE HIGH VS ACTIVE LOW

TRANSISTORS

ASSIGNMENT 1

- Search on (T200 thruster – power cables – ESC - analog camera – pressure sensor) on blue robotics site and give as the link of each component ,its specs and price in PDF

- Search on types of sensors in ROVs and describe the fn of each one on a PDF

- Search on one analog or IP cameras on EBay or amazon you should select the lower cost with high resolution (HD preferred) and wide (2.7 or 2.8 lens) and the smallest one