Final Project

Making a Line Follower Vehicle

Line Follower Vehicle

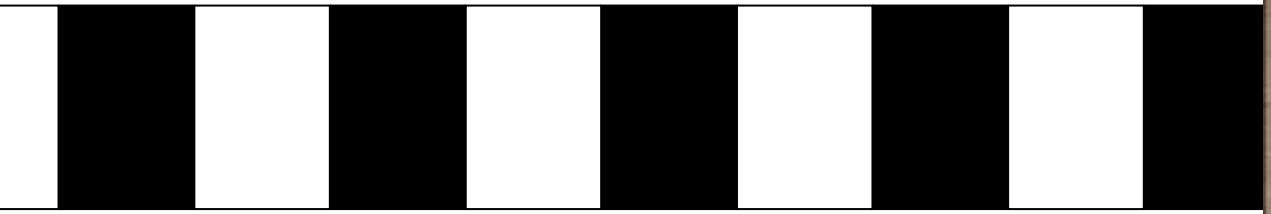
Goal

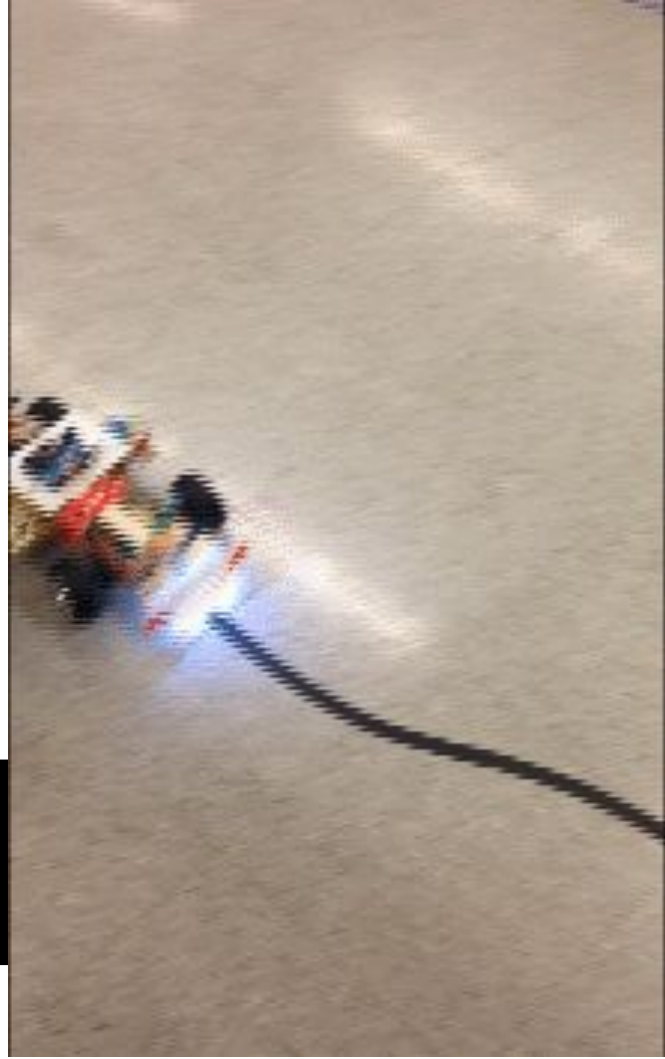
- Make the vehicle follow a dashed line

- Stop for 3 sec every 10 pairs of black+white stripes

- As fast as possible

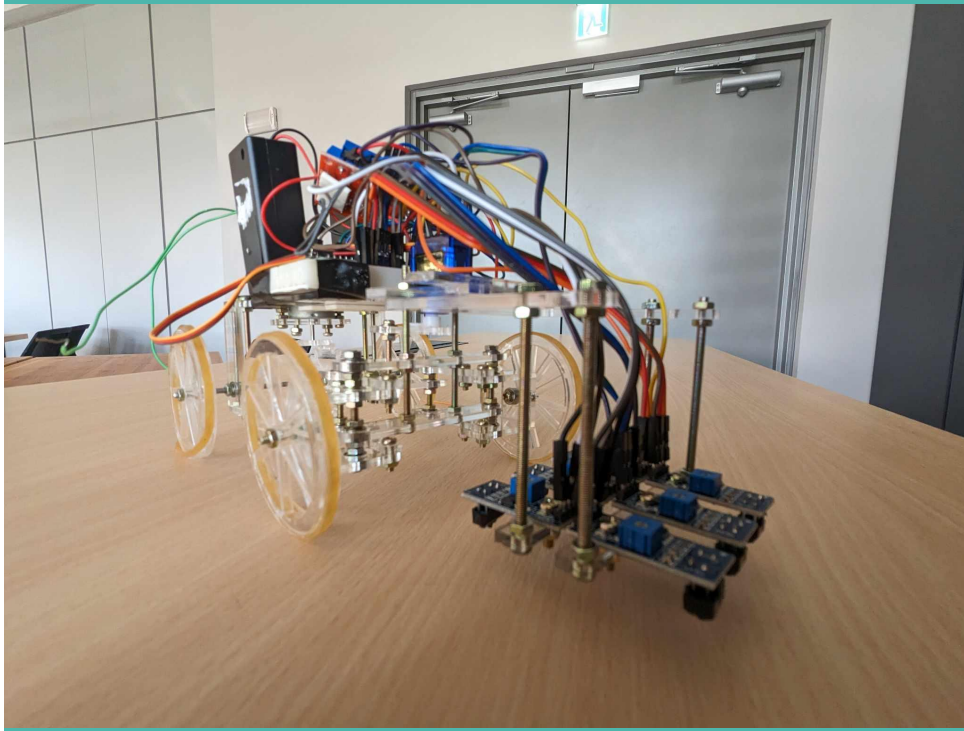
=> Control **Speed** & **Direction**



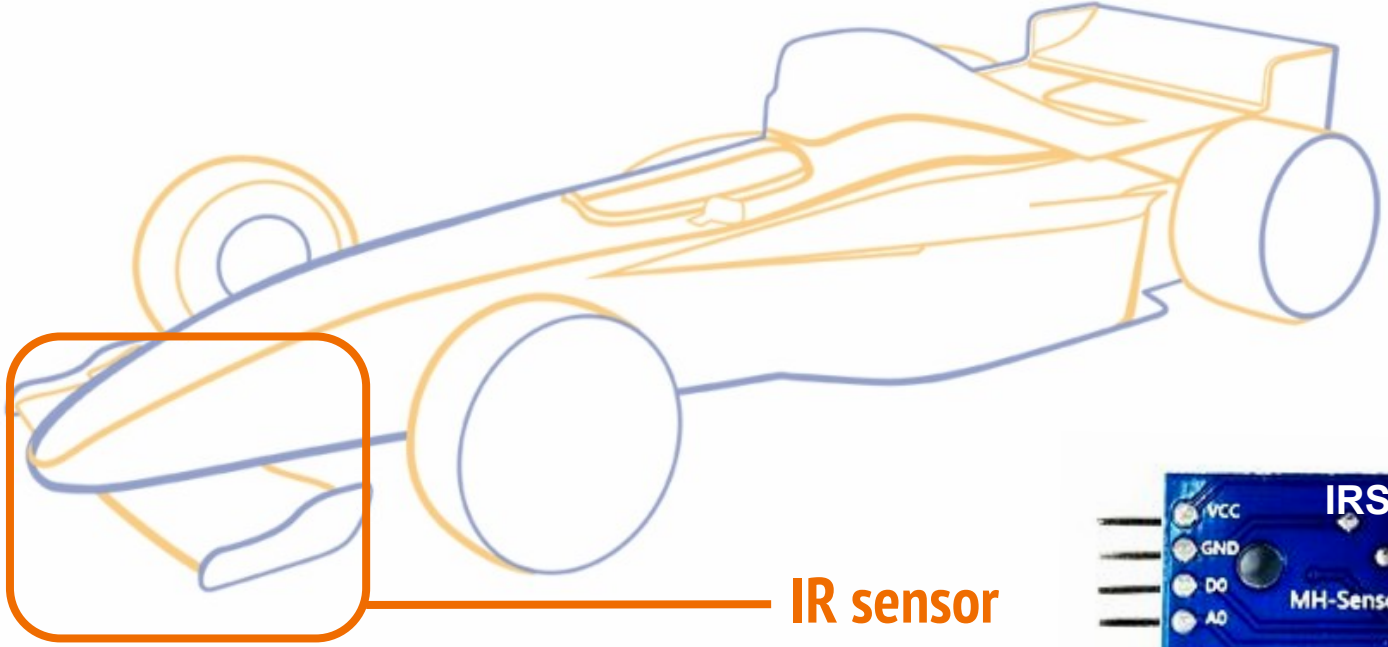


Example

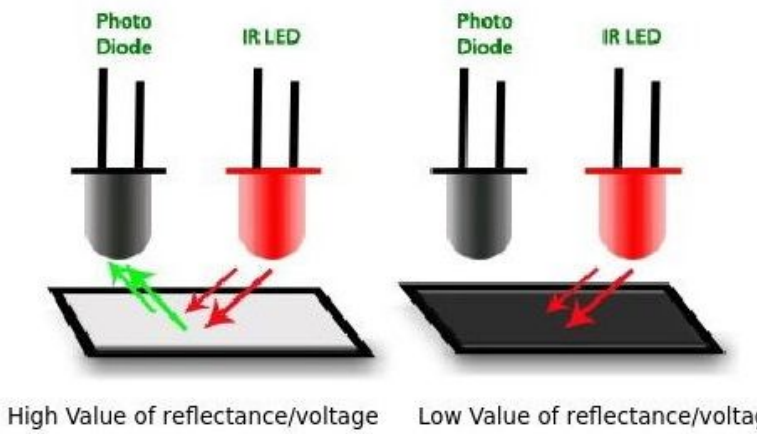
(You can design your own)



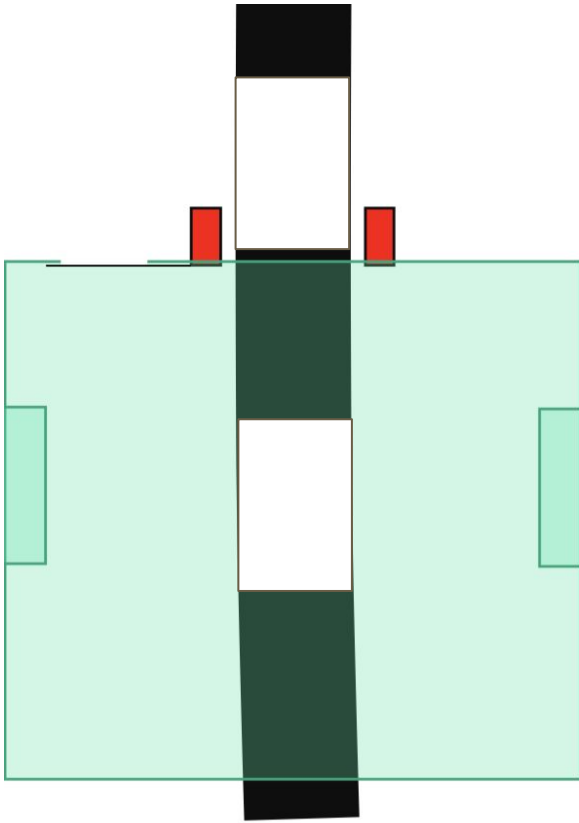
Components



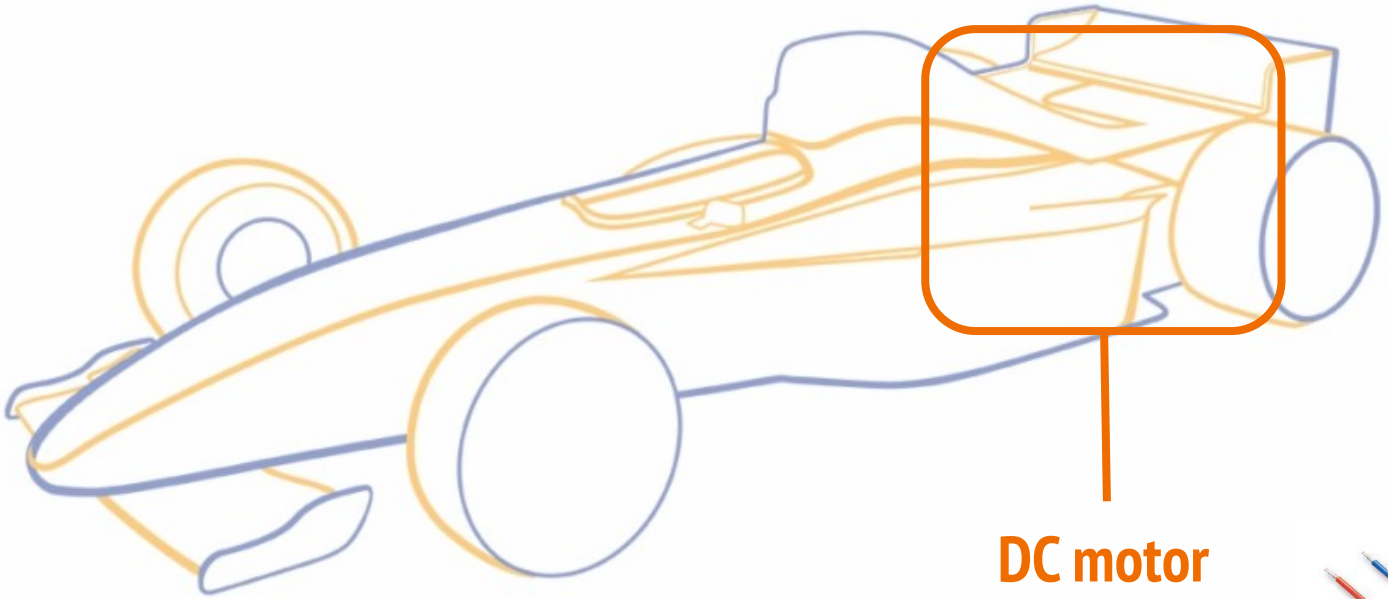
IR Sensor



High Value of reflectance/voltage Low Value of reflectance/voltage

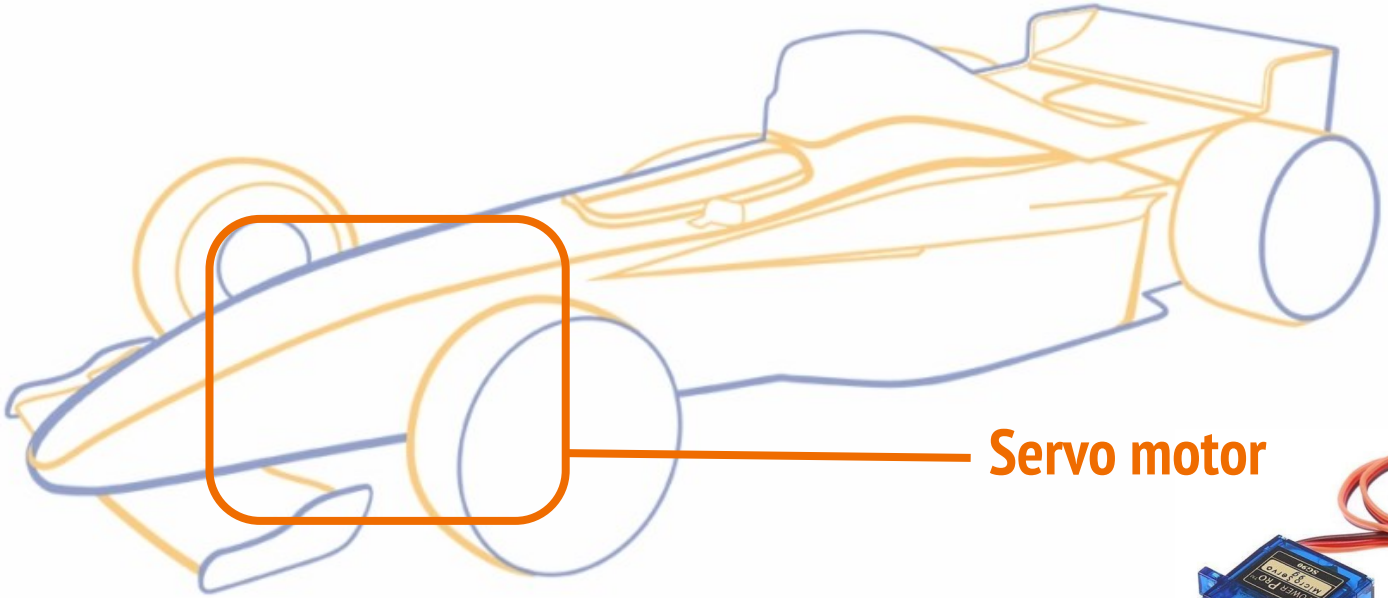


Components

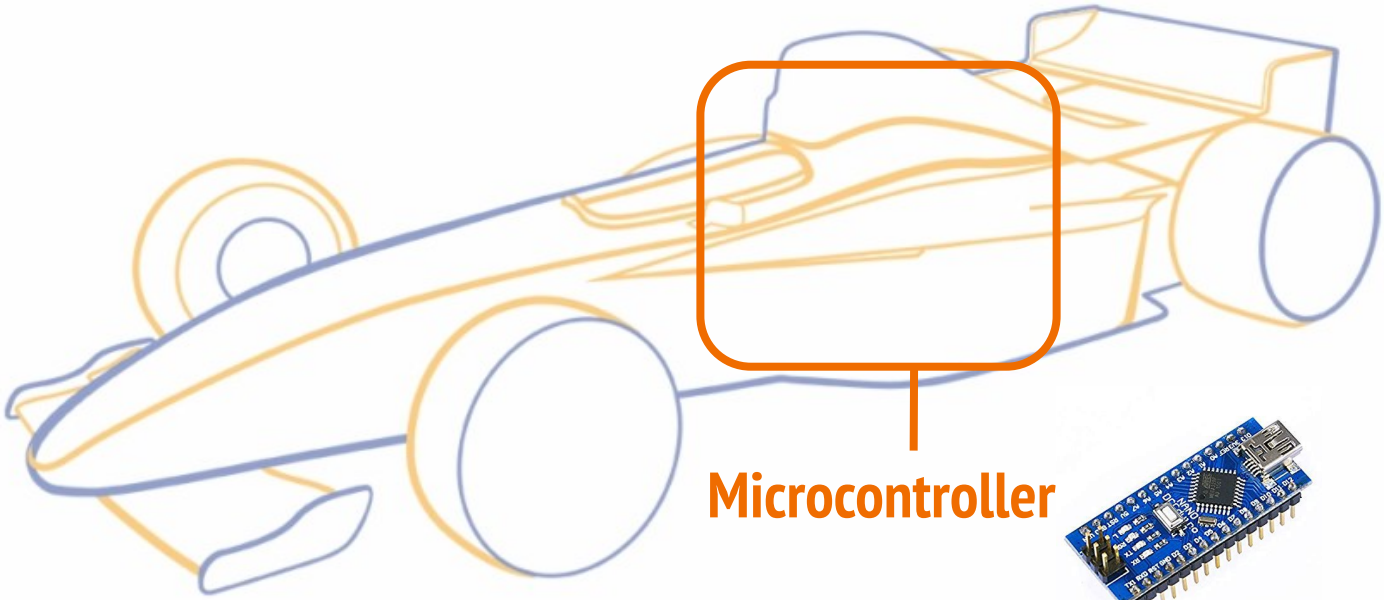


DC motor

Components



Components



Rules

- The chassis should be built from **acrylic boards & 3D print(30g at most)**
- The components described above (**IR sensor**, **DC motor × 1**, **servo motor × 1**, and **Arduino Nano**) will be provided
- We will also provide **motor driver, tapped rod**, **nuts**, **bearings**, **rubber bands**, **zip ties**, etc.
- You **cannot** use other components without our permission

Material List

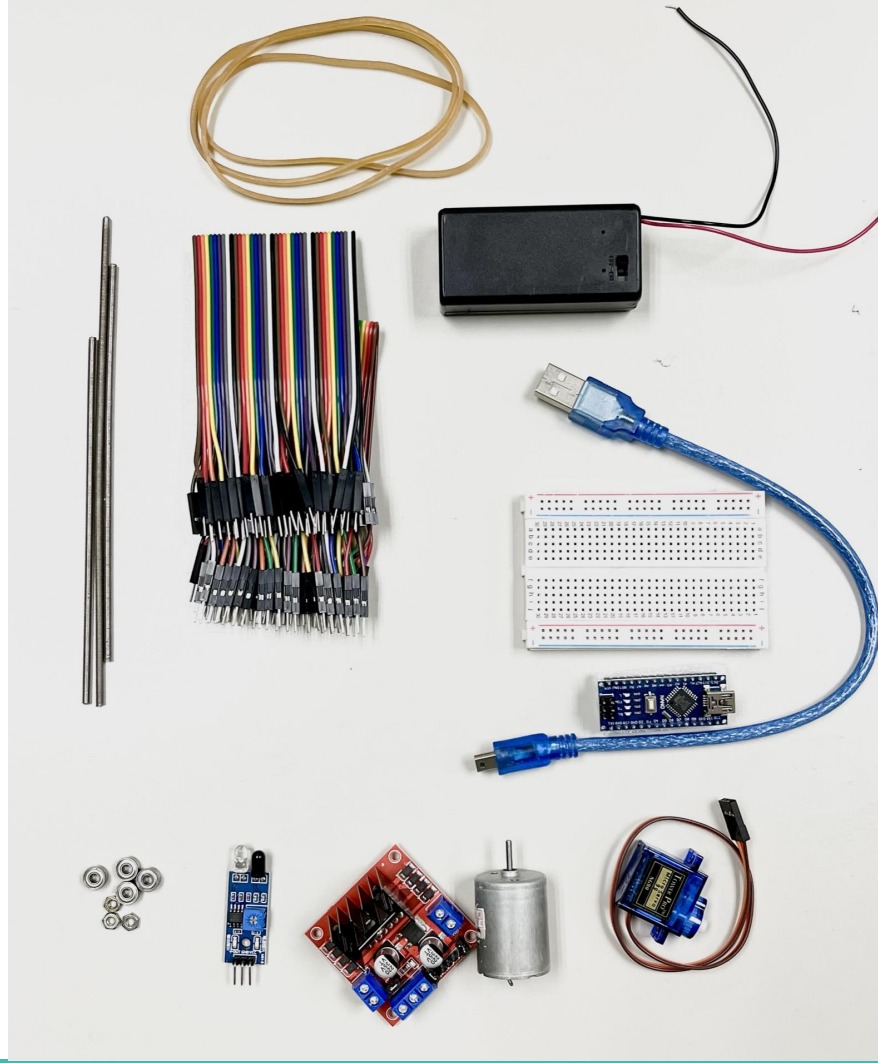
- Acrylic board (3 mm thick) ..... Size limit: A2
- Arduino Nano
- Servo motor (SG-90) ..... Limit: 1
- DC motor (RF-370CA-15370) ..... Limit: 1
- Motor driver (L298N)
- IR sensors (IRS-90) ..... Limit: 4
- DuPont / single-core wires
- Threaded rod (M3*)
- Screws, nuts, & washers (M3*)
- Bearings (3×8†)
- Rubber bands
- Zip ties
- 9V battery and case
- Electric tape
- Super glue
- Putty

Materials are unlimited

(but please try to save resources & only **2 dc/servo motors** are allowed)

* nominal diameter: 3 mm, actual diameter is slightly smaller (~2.9)

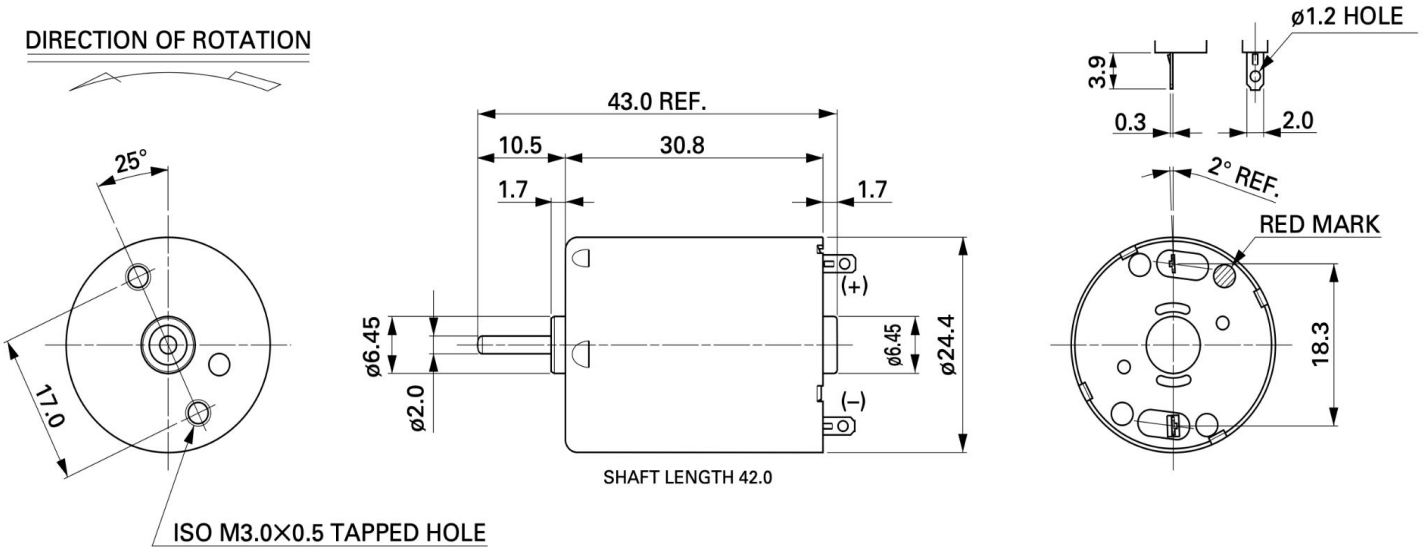
† inner diameter: 3 mm, outer diameter: 8 mm



Motor Datasheet

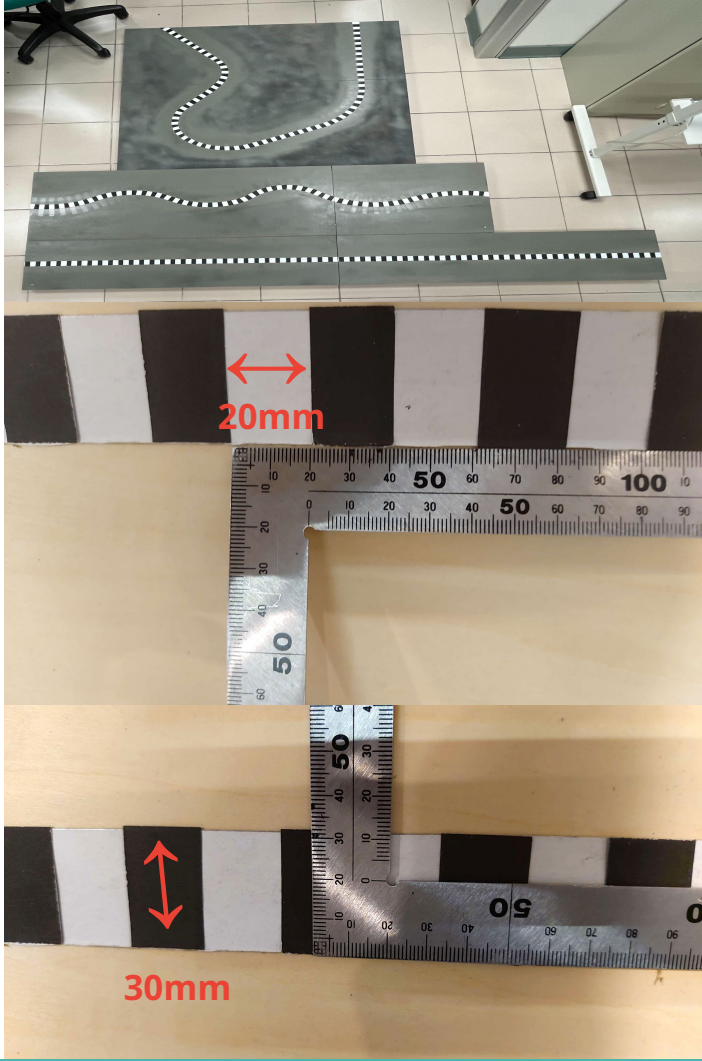
MODEL	VOLTAGE		NO LOAD		AT MAXIMUM EFFICIENCY					STALL		
	OPERATING RANGE	NOMINAL	SPEED	CURRENT	SPEED	CURRENT	TORQUE		OUTPUT	TORQUE		CURRENT
			r/min	A	r/min	A	mN·m	g·cm	W	mN·m	g·cm	A
RF-370CA-15370	3 ~ 12	12V CONSTANT	5600	0.026	4840	0.17	2.48	25.3	1.25	18.3	187	1.06

UNIT: MILLIMETERS

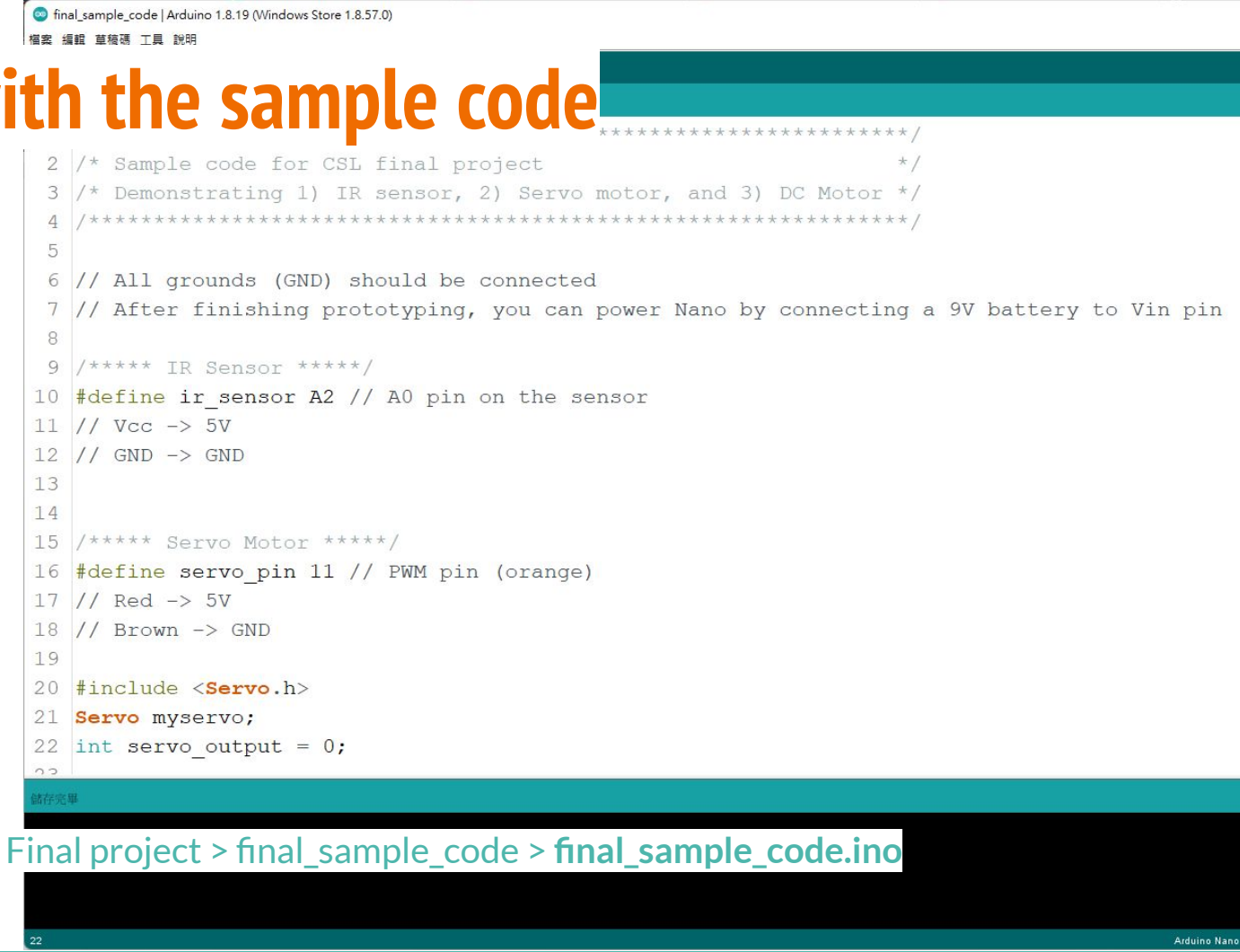


Specifications

- Stop for 3 seconds every 10 pairs of black+white stripes
- Each stripe is around 30 mm wide and 20 mm long

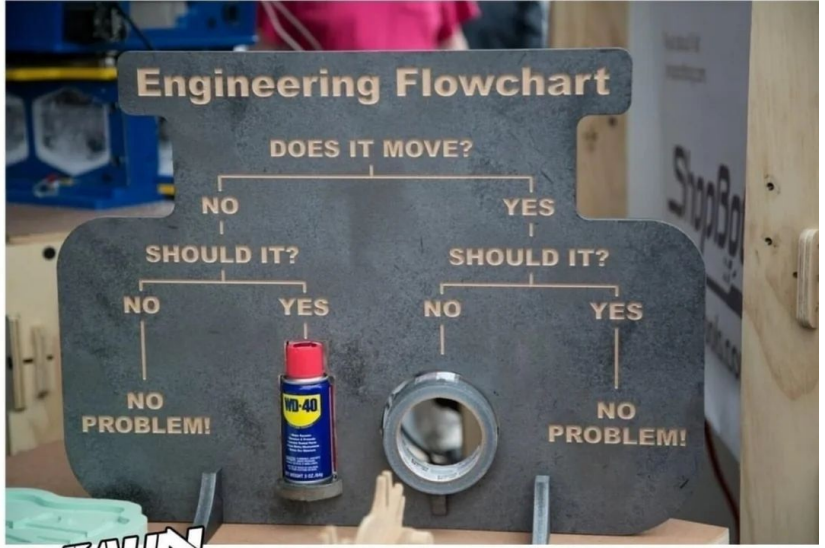


Get started with the sample code



NTU COOL > 文件 > Lab > Final project > final_sample_code > **final_sample_code.ino**

Check your hardware as well when debugging!



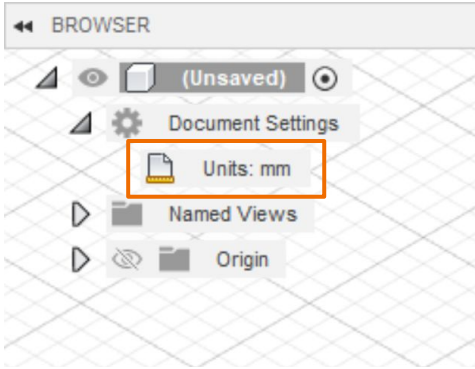
Make Reality Space

- ◯: Administrators present, classroom & tool space available
  △: Administrators absent, only classroom space available
- No shifts on public holiday and make-up days
- Remember to book if you want to cut & print
- Check booking record & material weight

Booking form

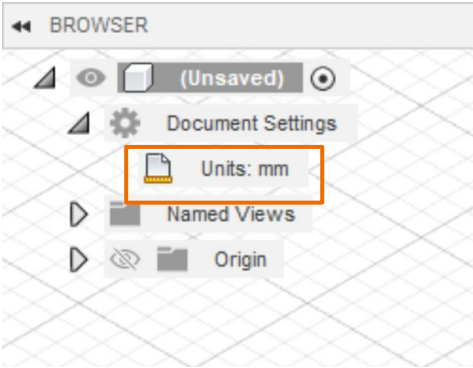
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
10:00 - 13:00	◯	△	◯	◯	△	△	△
14:00 - 17:00	◯	◯	△	CSL	◯	△	△
18:00 - 21:00	△	△	◯	△	△	△	△

Notes for Laser cutting



- **Remove construction lines** (dashed lines)
- Make sure the units are set properly (**mm**)
- Removing duplicated segments (lines) is preferable
- Beware of your material usage; try to remain under A2 (420 x 594 mm).

Notes for 3D printing



- Export files to .3mf or .stl
- Make sure the units are set properly (**mm**)
- Beware of your material usage; you should not use above **30g**.
- Try to avoid using 3D printing if possible; most components can be laser cut.

Schedule

- Nov. 23 Final Project - Chassis
- Nov. 30 Final Project - Transmission and Steering
- Dec. 07 Final Project - Control and Sensing
- Dec. 14 Final Race
- Dec. 21 Final Exam

Final Race

We will record your total lap time, your completeness, and check your stops

Rules:

- Penalty for not stopping: 10s each
- Interfere with the vehicle: 30s each

Awards:

- Fastest racer(Track 1 & 2)
- Smallest kart(need to pass track 1 & 2)
- Best completion rate
- Most innovative