



University of British Columbia
Electrical and Computer Engineering
ELEC 291/292

Robot Assembly

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This document shows how to assemble the robot for project 2. The materials listed below are required. A picture of the materials from the project #2 parts kit is also shown below.

Description	Quantity
Ball caster kit	1
Geared motor	2
Servo wheels	2
Robot chassis	1
4-40/2-56 screw/nut kit	1
4 x AA battery holder	1
9V battery clip	1
DPDT Switch	1



Steps

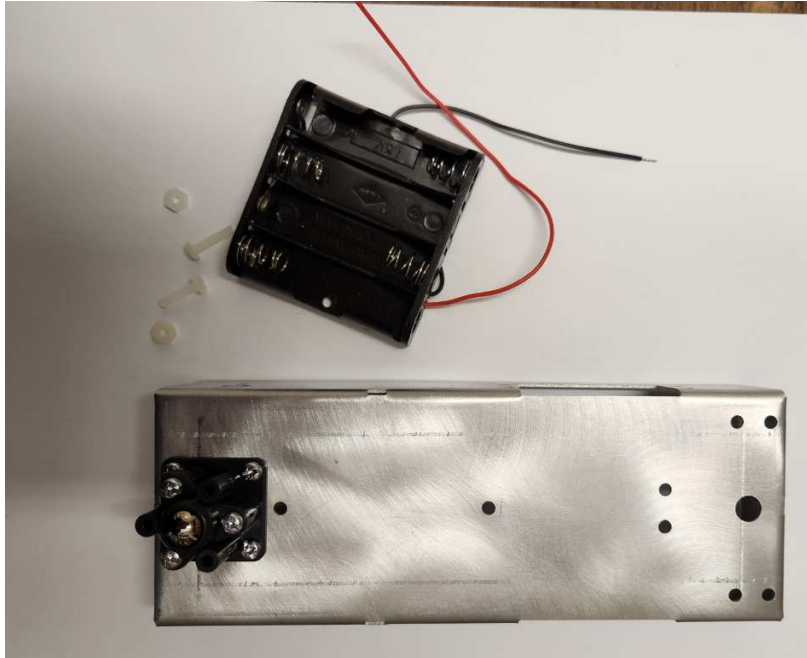
1) Follow the directions included with the caster wheel in order to assemble it. There are materials to assemble two caster wheels. We just need one. The caster wheel comes with machine screws to attach it to the robot chassis.



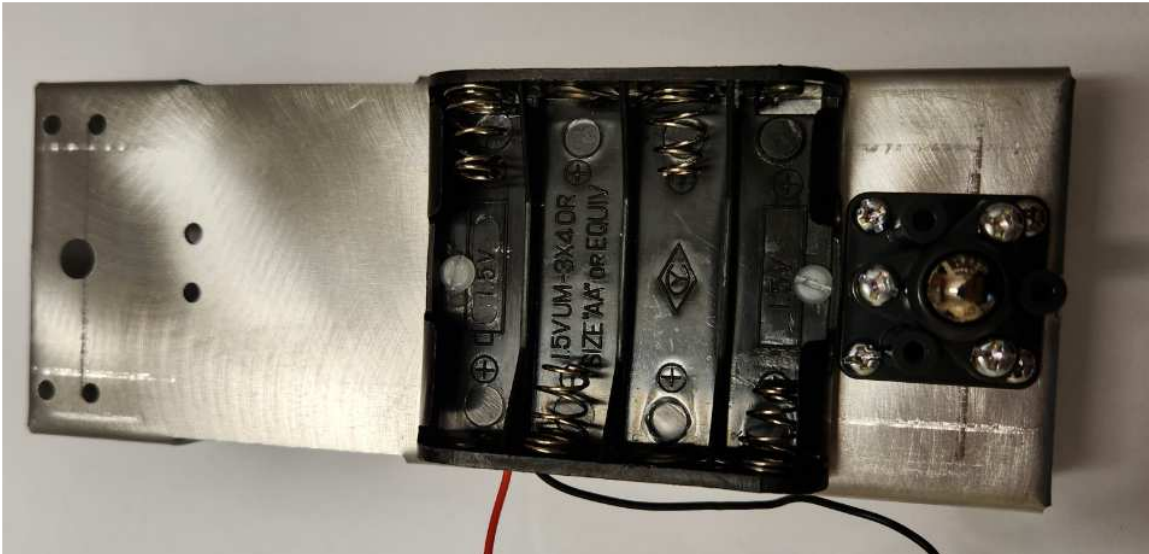
2) Attach the caster wheel to the robot chassis as shown in the picture bellow.



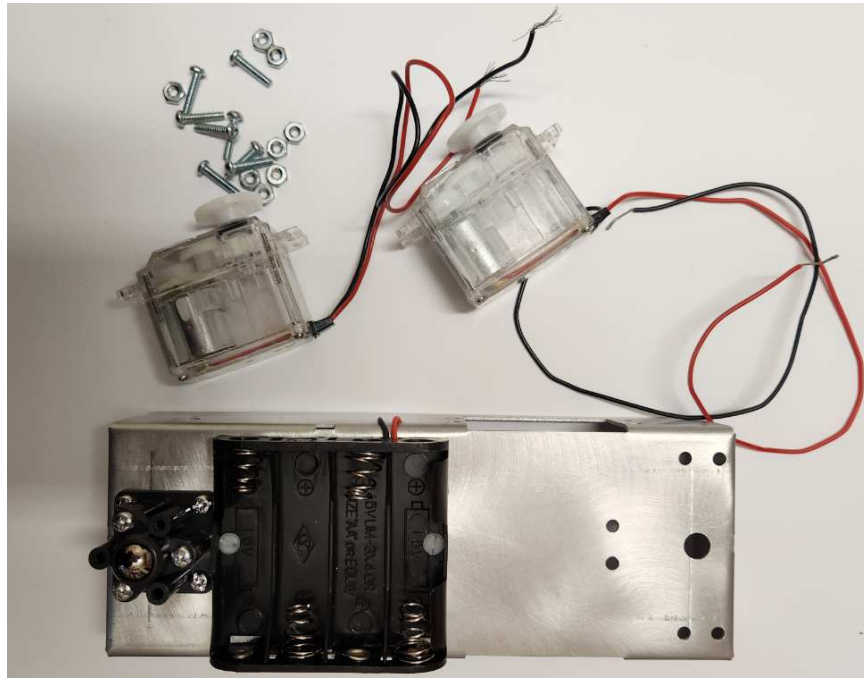
3) The next step is to attach the 4 x AA battery holder to the bottom of the robot. We will be using two 2-56 metal screws and nuts. In the picture bellow the screws are 4-40 nylon screws, which are hard to install and often break. Use the SMALL 2-56 screws. 4-40 metal screws WILL SHORT CIRCUIT THE BATTERIES.



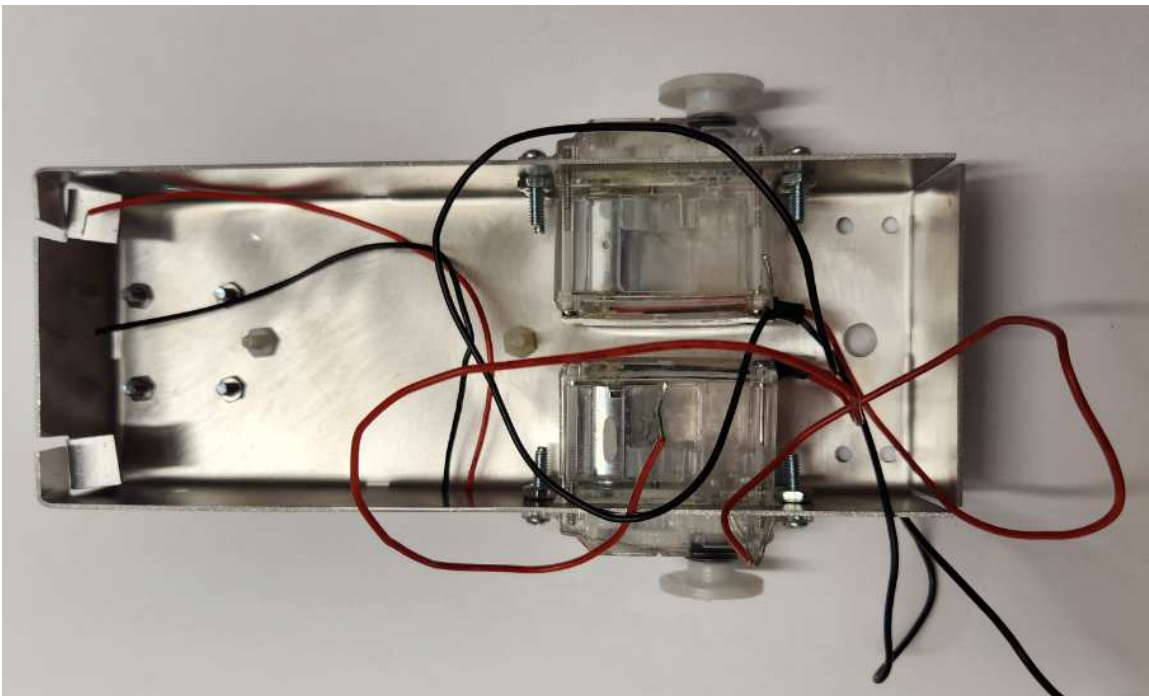
4) Attach the battery holder to the chassis using SMALL 2-56 screws.



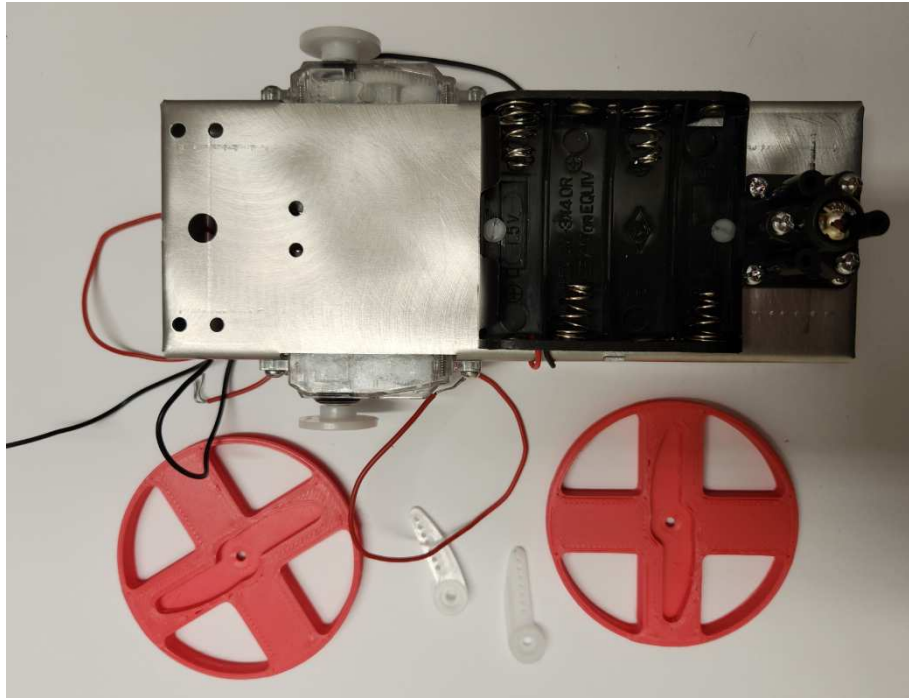
5) The next step is to attach the geared motors to the chassis. We need four 4-40 screws and nuts per motor.



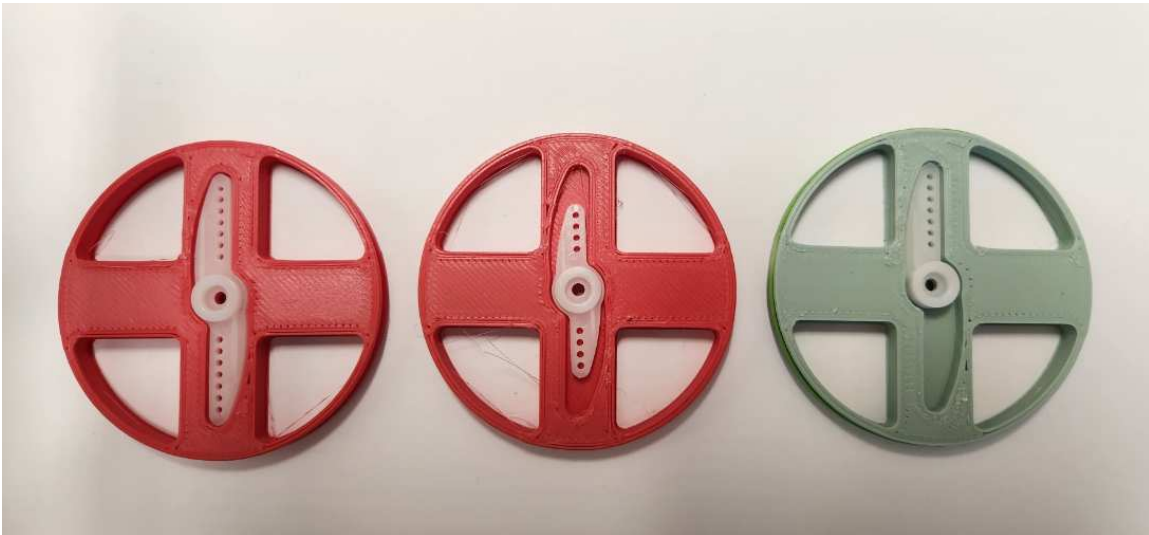
6) Install the geared motors as shown in the picture below.



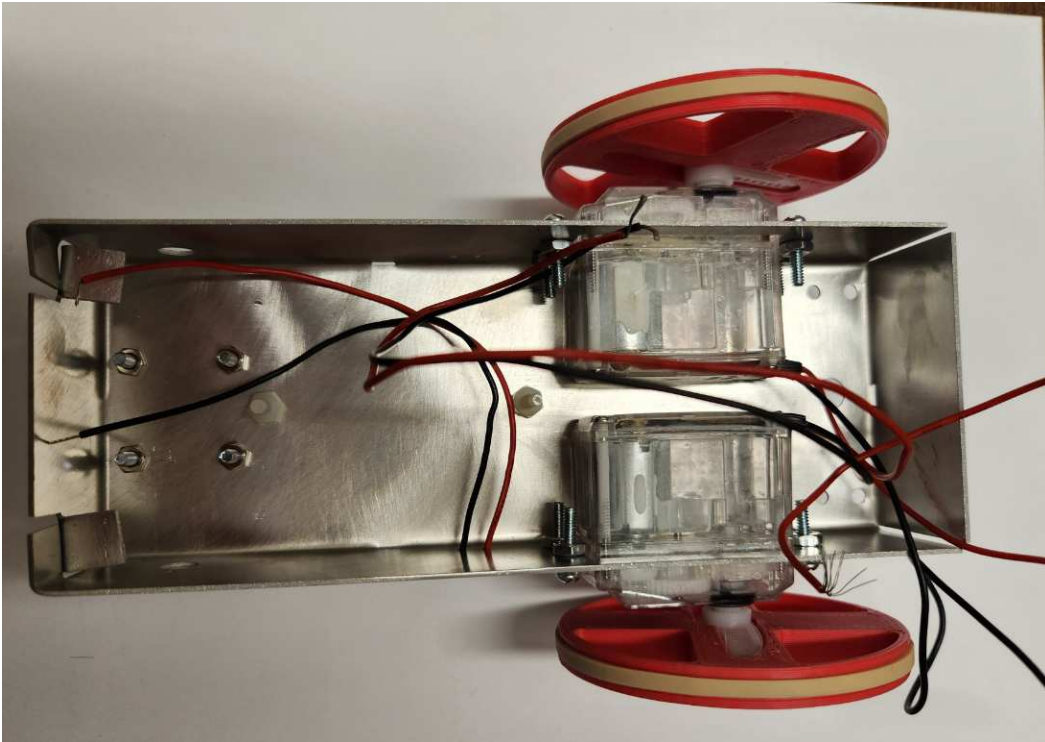
7) Now we can install the wheels. We need to remove the round plastic horns from the wheels first.



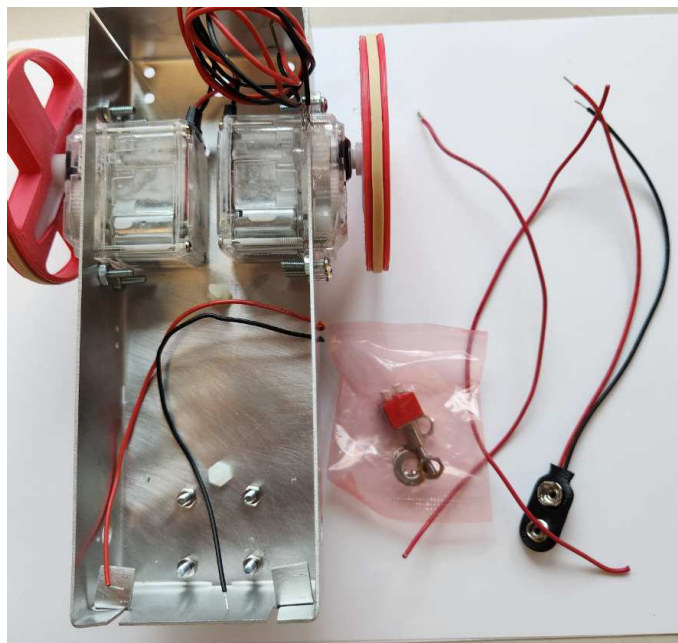
8) The wheels can accommodate three kinds of horns. The best one is the first in the picture below, but the other two work also:



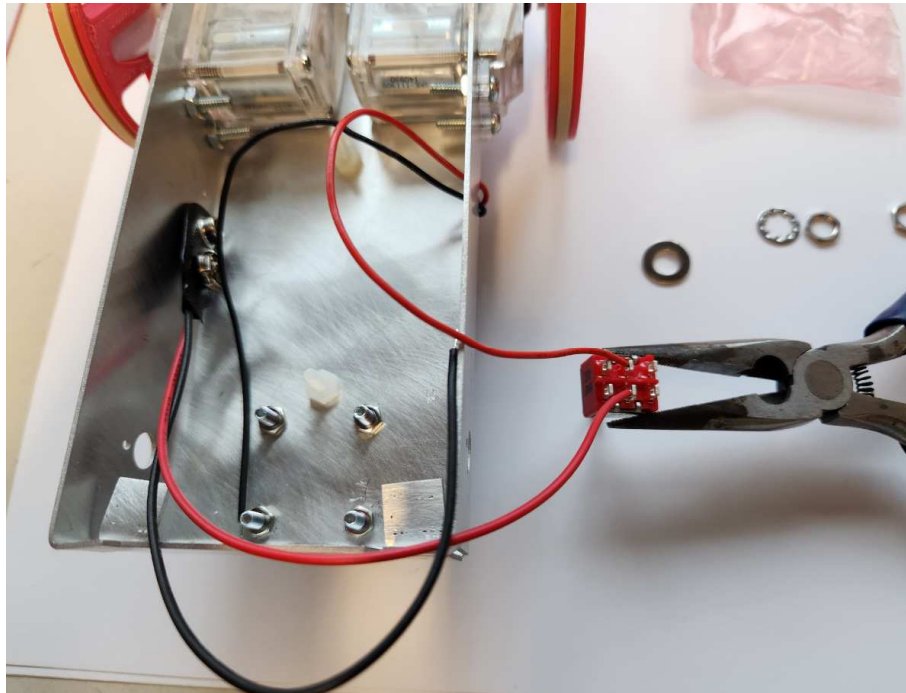
9) After removing the white circular motor horns that come with the servo motors, we install the wheels and secure them with the same black self threading screws that came with the motors.



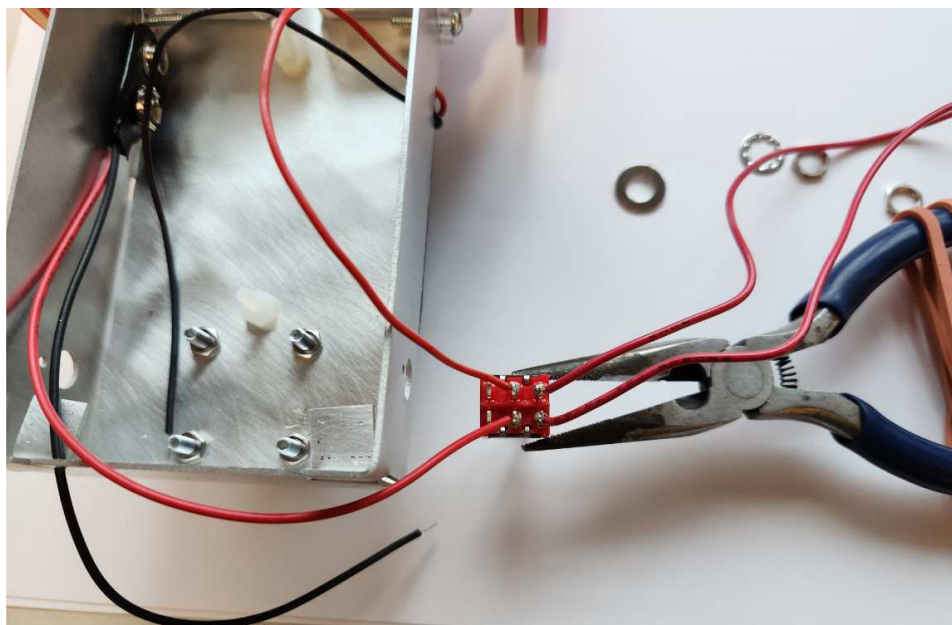
10) We can now install the double-pole/double-toggle DPDT switch allows us to turn the robot on/off.



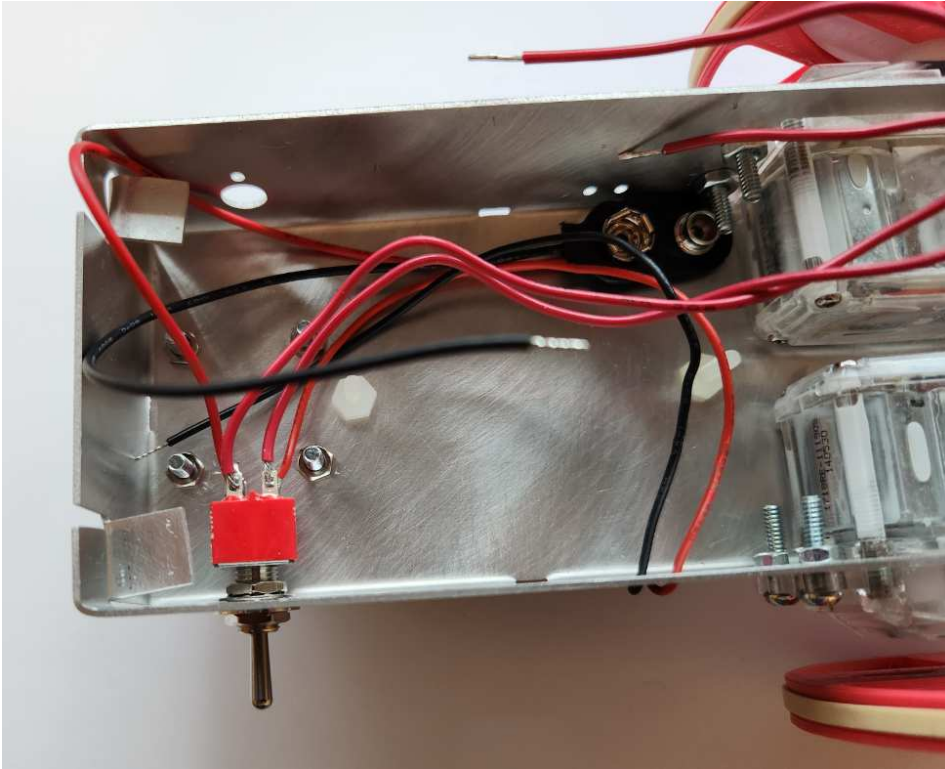
11) Before installing the DPDT switch we need to solder some wires. Start by soldering the red wire of the 4xAA battery holder and the red wire of the 9V battery clip to the center poles of the switch. Note how the wires of the 4xAA battery holder come inside the robot chassis using the two small holes on the side.



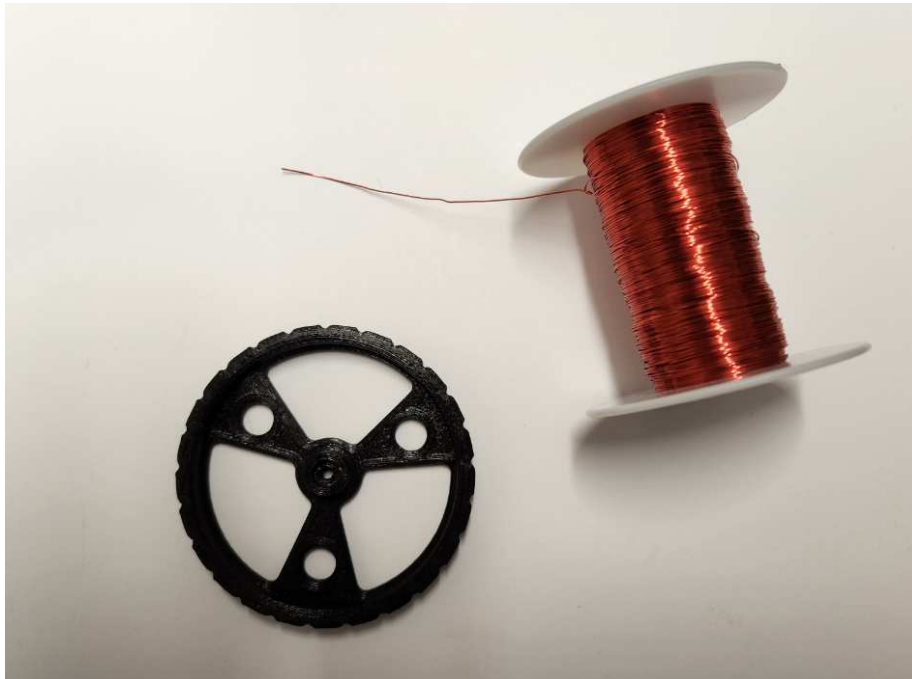
12) Now solder two extra wires to one side of the extra poles of the switch.



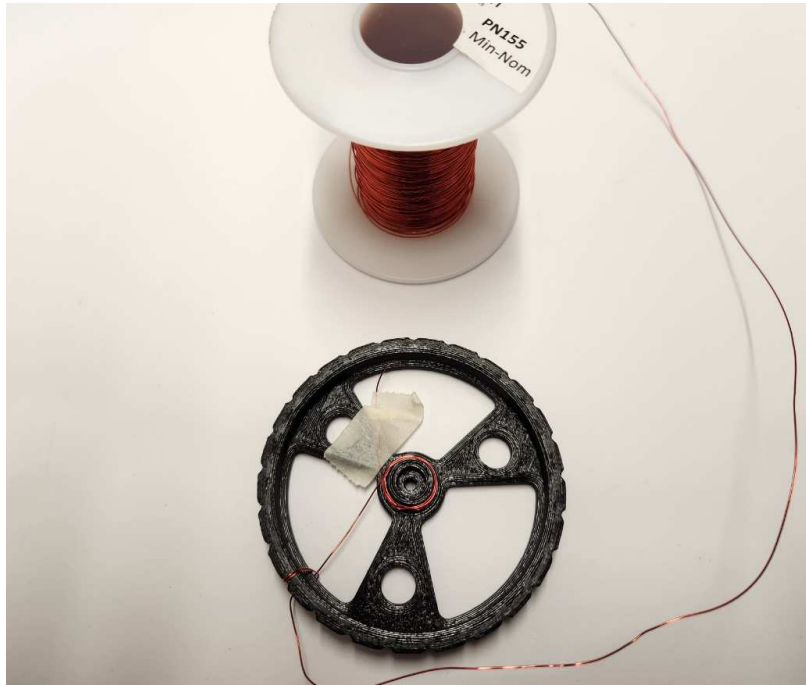
13) Install the DPDT switch. The robot body is now complete.



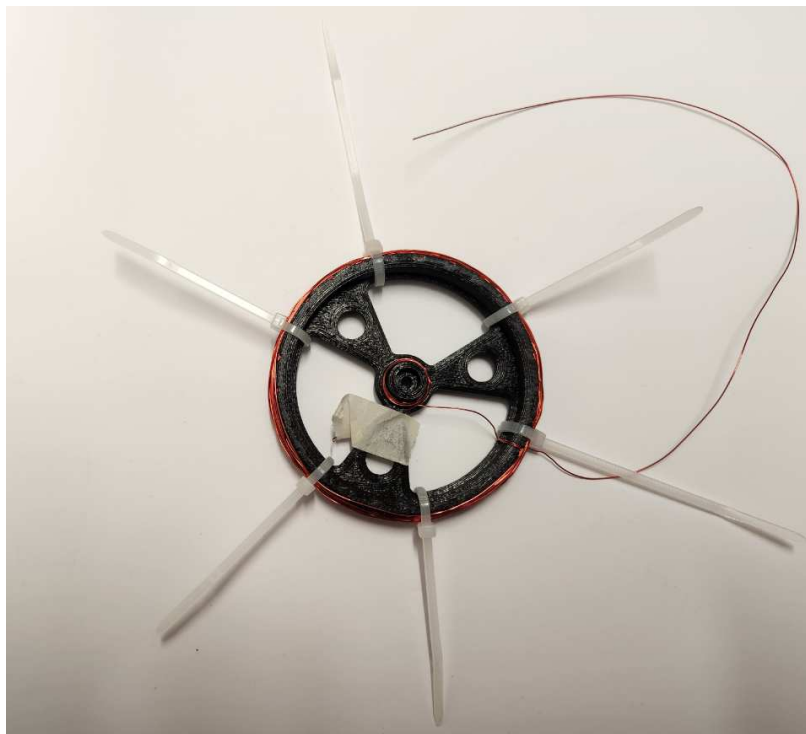
14) The next step is to make the metal detector sensor. For that we are going to use an old design robot wheel and magnet wire:



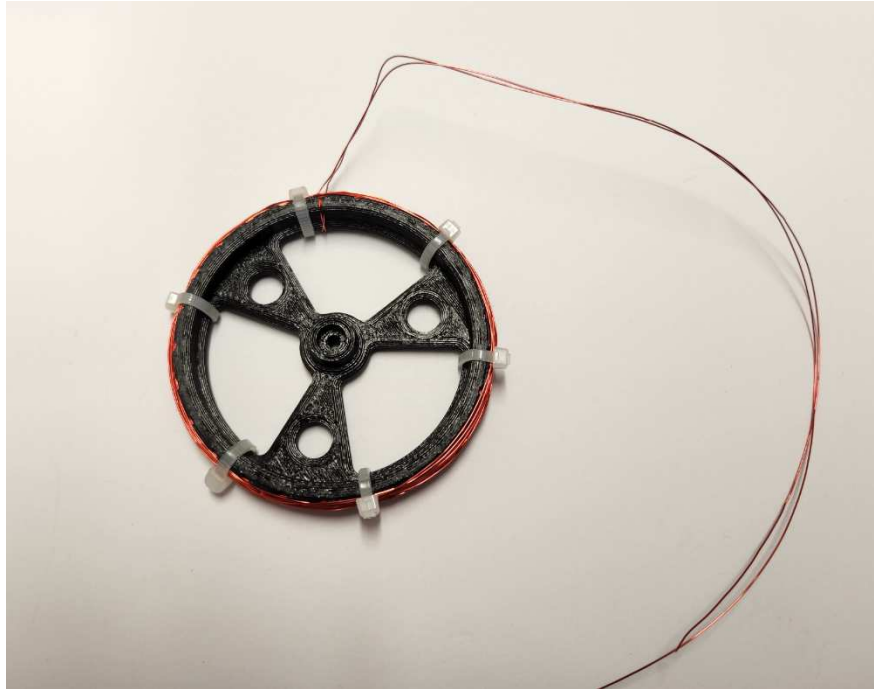
15) Start by winding about 20 to 30 cm of magnet wire around the center of the old wheel. This extra wire is needed to connect the final inductor to the breadboard. You can also use some tape to help secure the wire.



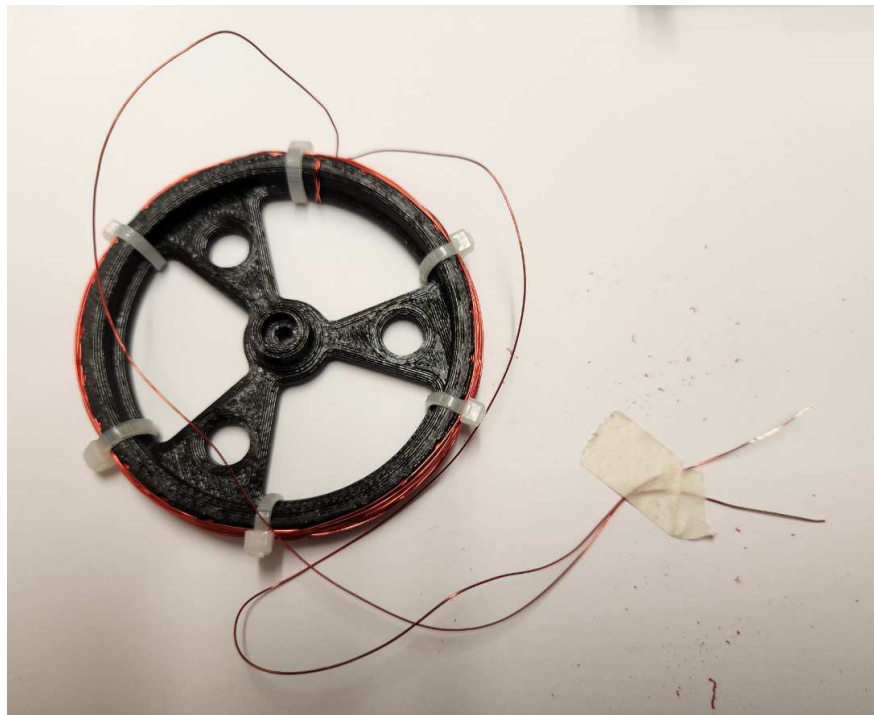
16) Wind 80 to 100 loops of wire around the outside of the old wheel. It is not easy! Once you are done secure the loops using zip ties as shown in the picture below:



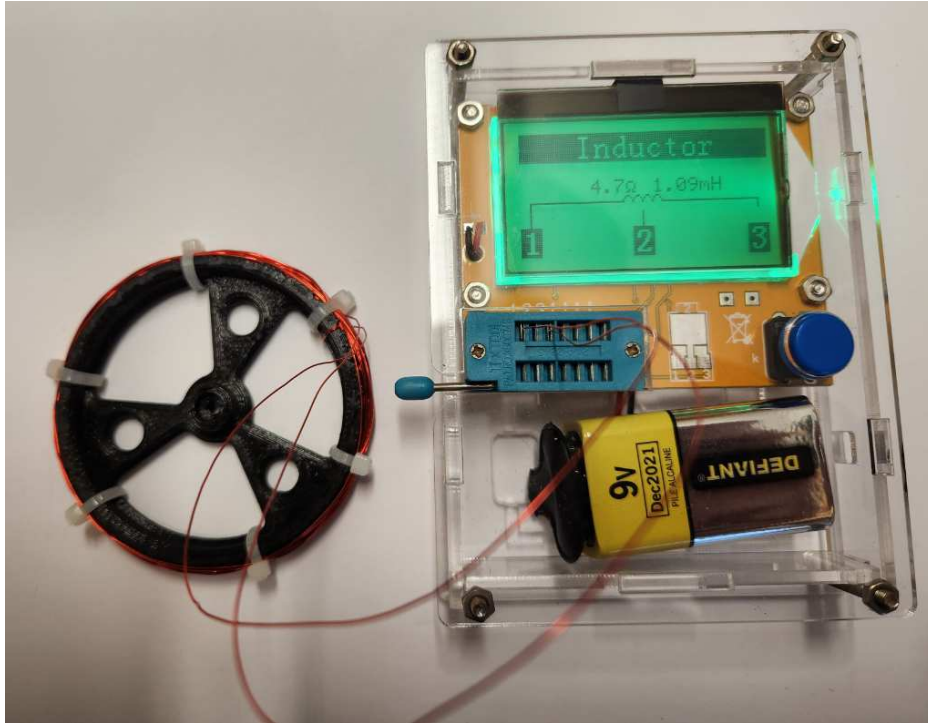
17) Cut the zip ties and bring the end wires of the coil inductor out:



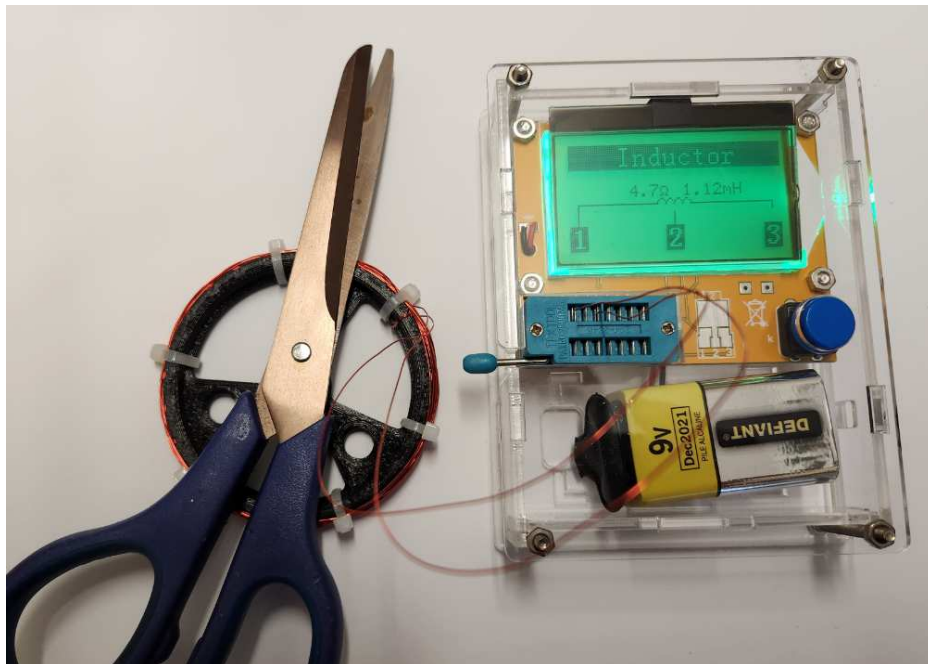
18) Strip the enamel insulated red paint out off the ends of the wires, until you can see the shiny copper:



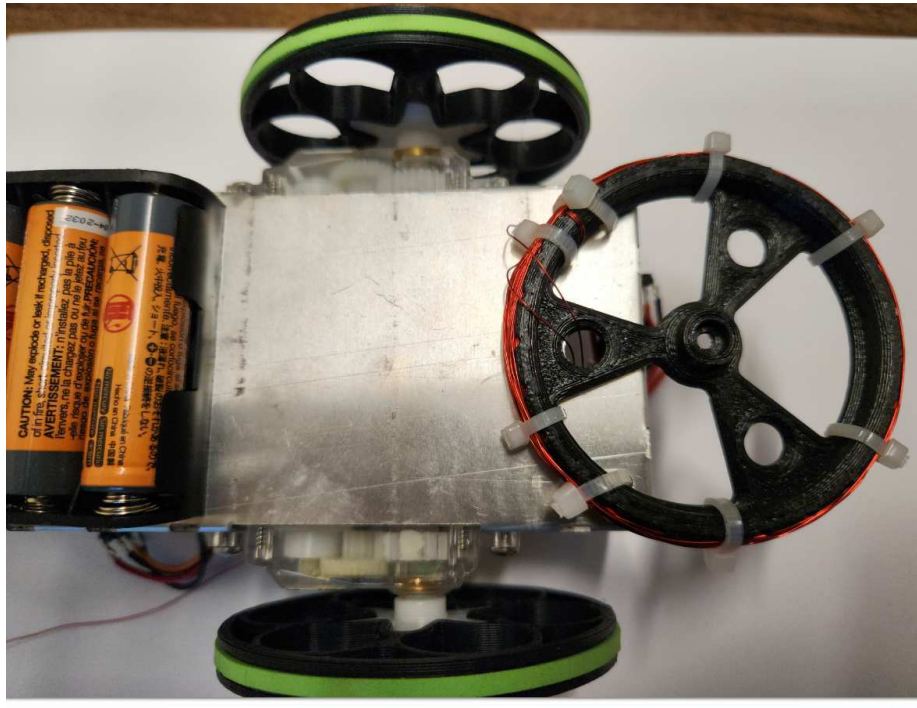
19) If you measure the inductance of the sensor coil it should be around 1 mH:



20) If metal is placed near the sensor coil, the inductance changes a little bit:



21) The sensor coil can now be attached to the robot chassis using a couple of zip ties. Notice how the hole in the old wheel matches the hole in the chassis of the robot. You can use the hole to pass the sensor wires to the robot electronics.



22) This is how it looks from the top:

