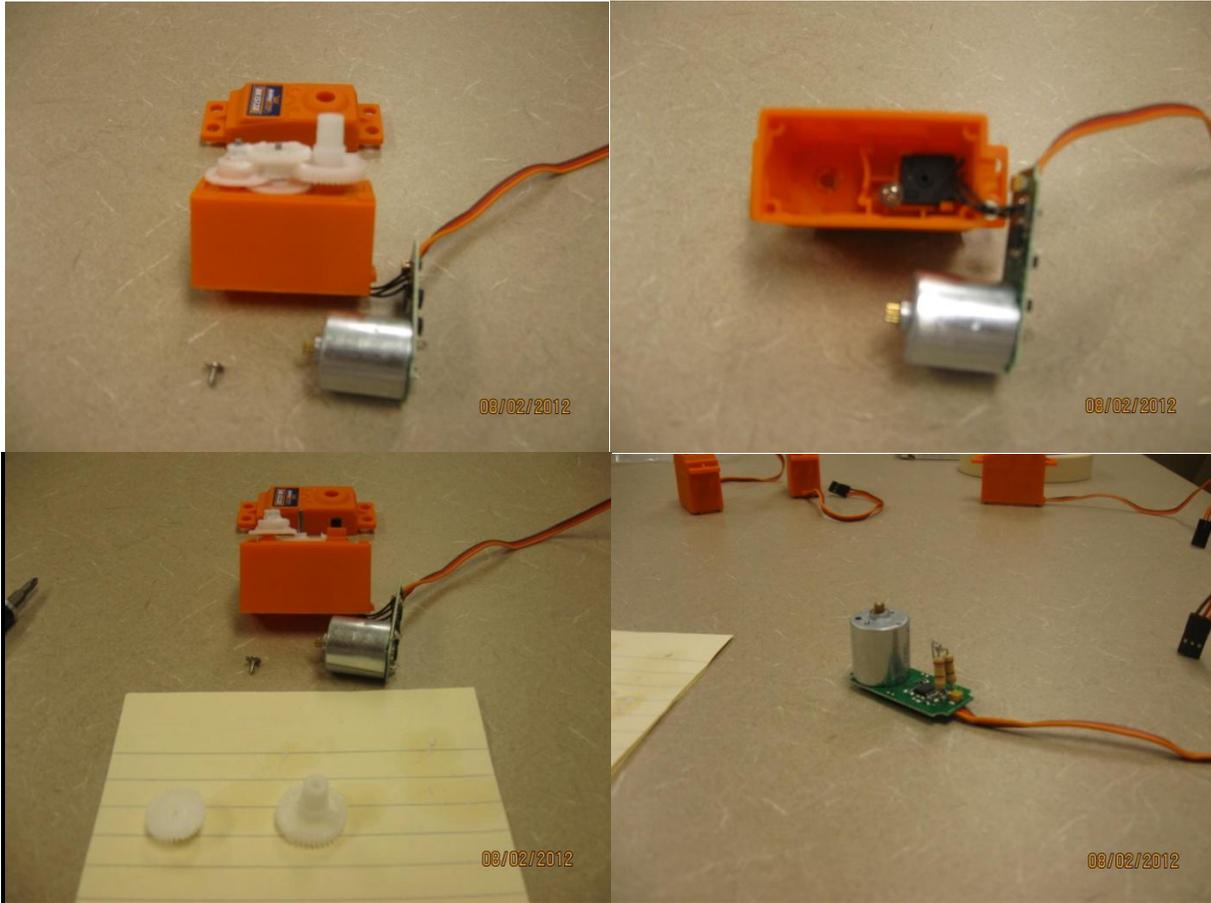


Assembly Instructions for the MAVBOT

The MAVBOT is an inexpensive autonomous robot which can be assembled from readily available parts including some typical household items. Starting with the components in the parts list (from the MAVBOT_Summary.pdf file), and having access to a knife, a wire stripper, some fast drying cement or epoxy and some double sided tape, one should be able to assemble the robot in 1-2 hours. Programming the robot requires just a 3-wire interface to a computer serial port or to a USB-to-serial interface cable and the installation of one open source application (freely downloadable). This is detailed in the Programming_Guide.pdf document. If you have different parts, e.g. different sized wheels, consider these instructions as a guide. Small modifications to the assembly should be no problem.



1) Modify the servos for continuous rotation

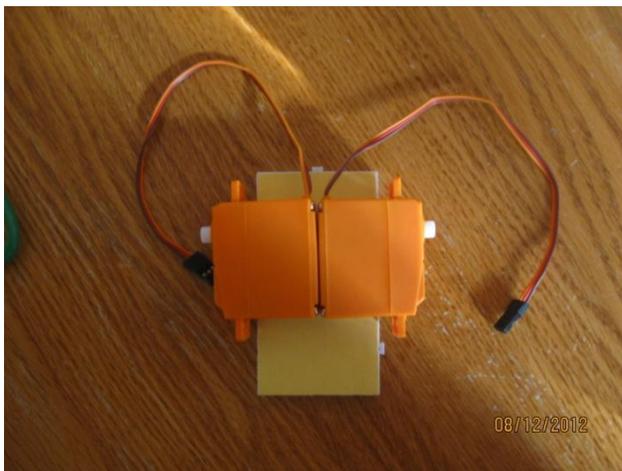


Disassemble the two servos, remove the variable potentiometer and replace with a pair of $\sim 2.5\text{k}\Omega$ resistors. One can also simply remove the potentiometer shaft after centering the potentiometer such that it is held fixed at $2.5\text{k}\Omega$ on either side. I find that replacing the potentiometer is cleaner and reduces the possibility of resistance drift but it's up to you. Also, remove the tab on the main drive output gear such that continuous rotation is unimpeded. There are many descriptions of this type of servo modification on the internet if the description given is inadequate. One can also purchase already modified servos at a premium, but this is a waste of money IMHO.

2) Remove servo sized section of protective tape liner from the bottom of the small breadboard starting about 1/2" from the front. It is useful to use an X-acto knife, razor blade or similar here so that the breadboard is not damaged. Do not cut the double-sided tape underneath. Do not try to remove the double-sided tape or you will likely damage the breadboard.



3) Attach servos back-to-back to the bottom of the breadboard as shown.



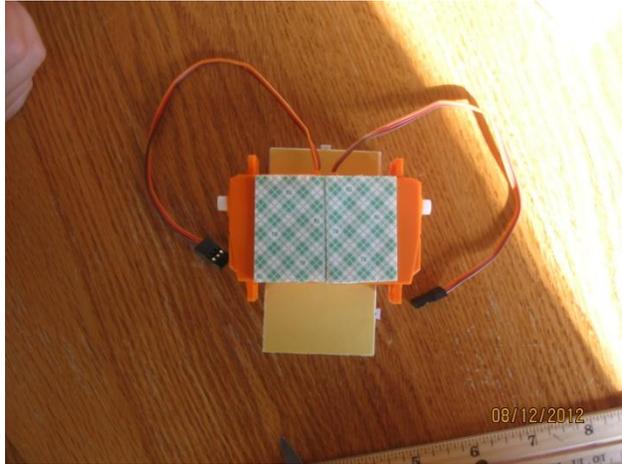
4) Drill/Bore/Cut out center of wheels to leave a flat surface for the servo horn. The method you use depends on the tools you have available. If a drill isn't available, just use your knife and carve a larger circle at the center.



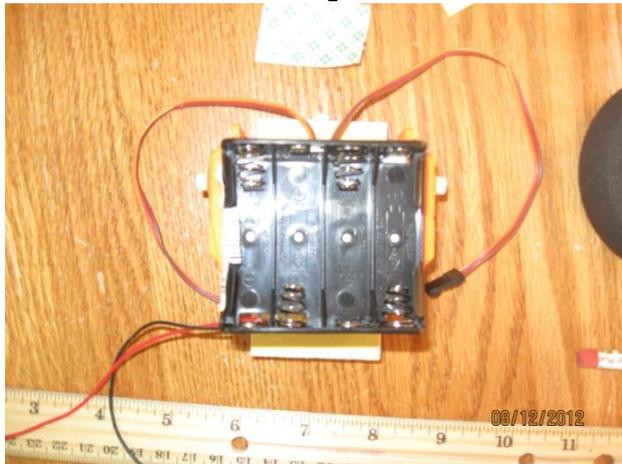
5) Glue 6-legged servo horn from each servo to each wheel as shown. Use plastic cement or epoxy or superglue. Whatever you have handy should work. I find that epoxy works consistently well.



6) Cut a square of thick double-sided tape the size of two servos and attach to the bottom of the servos.



7) Remove the protective paper from the double-sided tape and attach the battery holder to the servos as shown.



8) Straighten large paper clip and then bend a 90 degree angle ~2.25" from the end.



9) Punch two holes in the ping-pong ball 180 degrees apart. One way to accomplish this without a drill press and fixture is to use a compass or large needle or your knife blade to make one hole. Then insert the paper clip until it hits the other side of the ball. If the ball spins without a wobble, you have found the proper position for the opposite hole.

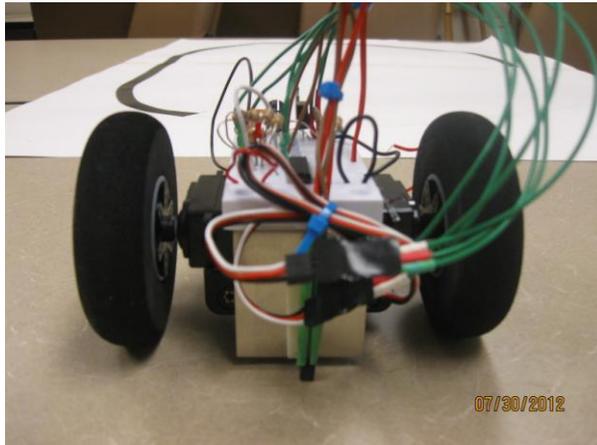
10) Insert long end of paper clip through both holes as shown and bend the paper clip as shown. Bend in two half-loops (one on either end) as shown to complete the caster assembly.



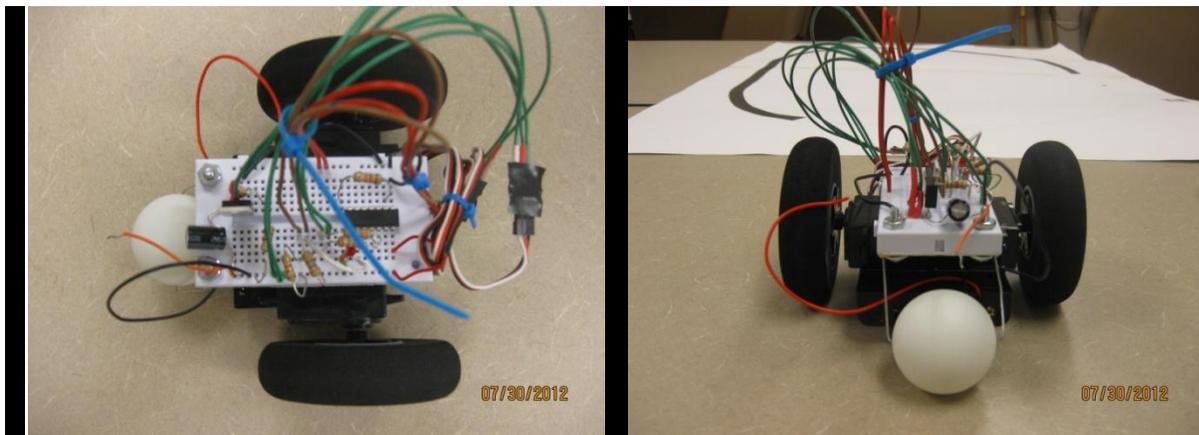
11) Screw the caster assembly to the rear of the small breadboard via the paper clip loops. Angle the assembly to level the robot.

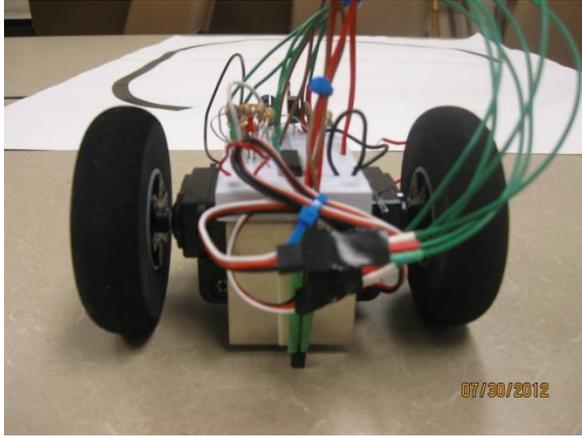


12) Remove the protective tape paper from the front bottom of the small breadboard and attach the sensor plate as shown. The sensor plate is made of Aluminum and is fabricated by cutting a rectangle 2"x1.5" and then bending into an "L" shape along the long side with one part of the "L" at 1.5" long and the other at 0.5" long. Any material with enough stiffness to hold the sensor can be used in place of Aluminum such as card stock.



13) Insert electrical components and wiring as shown in the diagram and according to the electrical schematic. Ensure you understand how the breadboard row and outside column holes are electrically connected. Ensure you do not have power applied when wiring components. Ensure all grounds and positive voltage supplies are connected correctly.





14) Add batteries and connect power from the battery holder to the small breadboard.

15) Attach programming cable (Note: There are three wires to attach from the 9-pin serial port connector to the breadboard).

The wires are connected as follows:

9-pin connector	breadboard
pin 3	22kOhm resistor
pin 2	pin 13 of the PICAXE 14M2 chip
pin 5 (GND)	pin 14 of the PICAXE 14M2 chip

16) Program using the PICAXE Programming Editor software.

17) Don't forget to attach the wheels to the servos. You will likely want to wait until the very end to do this, depending on the type of adhesive you are using, since you want the servo horns to dry completely (step 5).