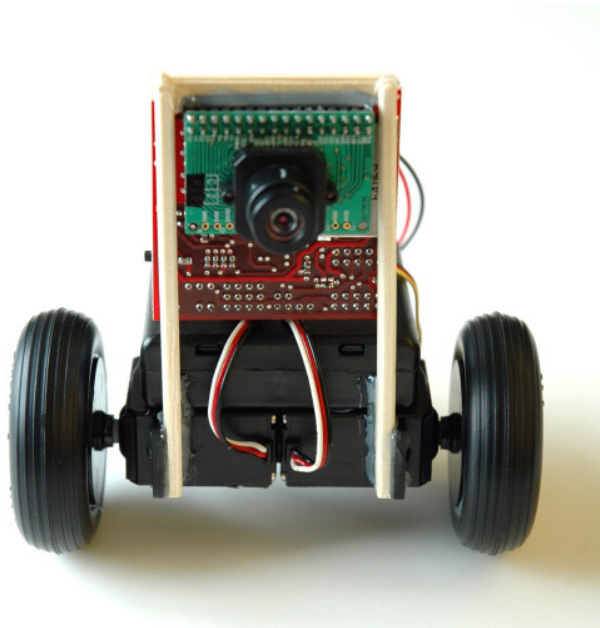


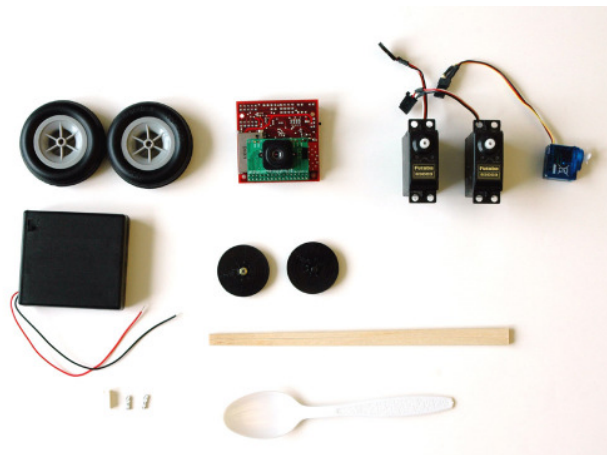
Building a spoonBot



SpoonBot is a simple table-top robot that you can build with your CMUcam3. It is one of the cheapest and smallest vision based robots with local processing that you can build in an afternoon. SpoonBot uses two continuous rotation servos to move forward, backward and turn left or right. There is a mini-servo under spoonBot that moves the spoon caster up and down giving spoonBot the ability to pan and tilt.

This page shows how to assemble your own spoonBot. Once you have spoonBot built, go to [spoonBot-demo](#) to setup the software. Click on image thumbnails for higher resolution photos.

Parts and Tools



spoonBot requires the following parts:

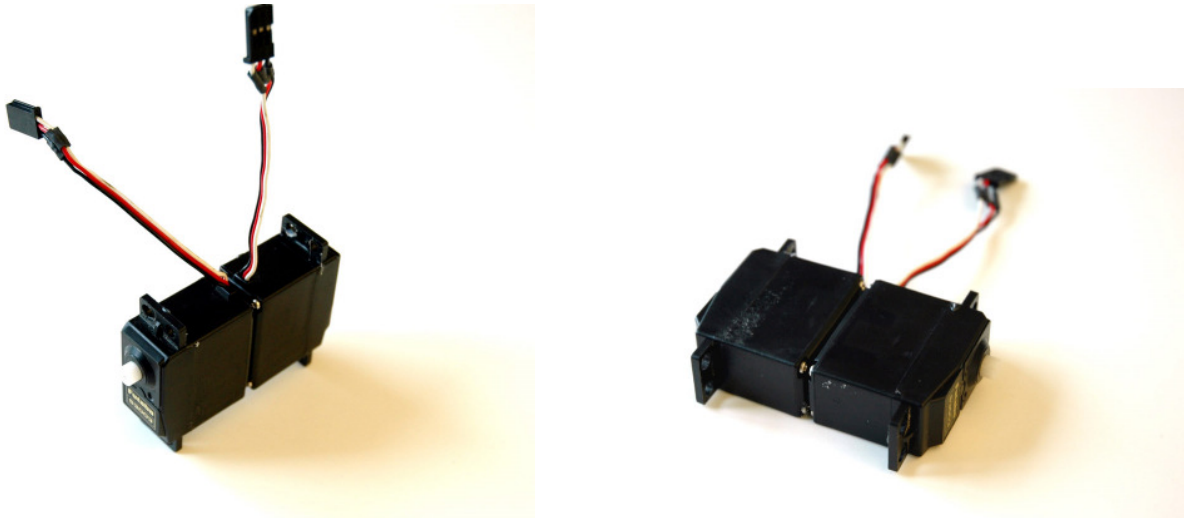
- 2 Continuous Rotation (hacked) servos
 - <http://www.acroname.com/robotics/parts/R174-CONT-RO-SERVO.html>
 - 2 x \$13
- 1 normal micro-servo
 - <http://www.acroname.com/robotics/parts/R281-MX-35.html>
 - \$25.50
- 1 AA battery pack
 - <http://www.acroname.com/robotics/parts/R122-4XAABATT-PACK.html>
 - Includes header for easy power connection
 - \$3.50
 - [RadioShack Pack](#)
 - Does not include header, but does include power switch

- \$1.89
- 1 plastic spoon
- 1 pair of chopsticks (or similar)
- 2 Wheels
 - <http://www.acroname.com/robotics/parts/R156-YELLOW-ORING-WHEEL.html>
 - 2 x \$4
- 2 servo horns (if wheels need adaptation)
- 2 crimp terminals for batter pack (optional)
- 1 header for battery pack (optional)

We used the following tools:

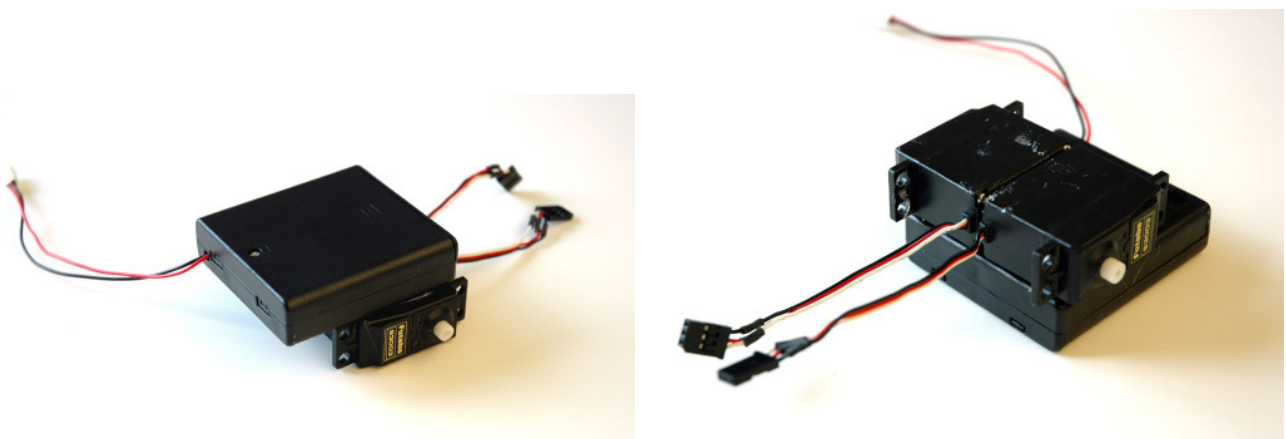
- Hot Glue Gun
- Philips Screw Driver
- Cutters (for cutting chopsticks)
- Soldering Iron (if battery pack needs header)

Step 1: Glue the Two Full Sized Servos Together



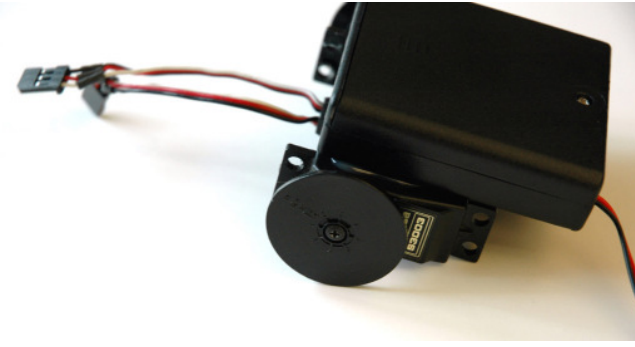
In the picture, the servo wires have been shortened. You can do this if you like, but it is just as easy to tie them up when you are done.

Step 2: Glue the servos to the battery case



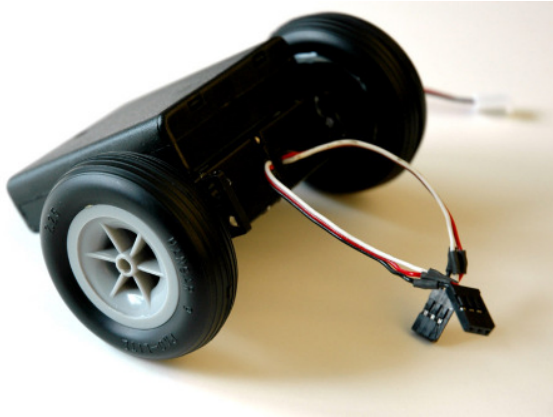
Radioshack battery pack shown above. For Acroname battery pack, mount such that AA batteries face up.

Step 3: Attach Servo Horns as Wheel Base Connection



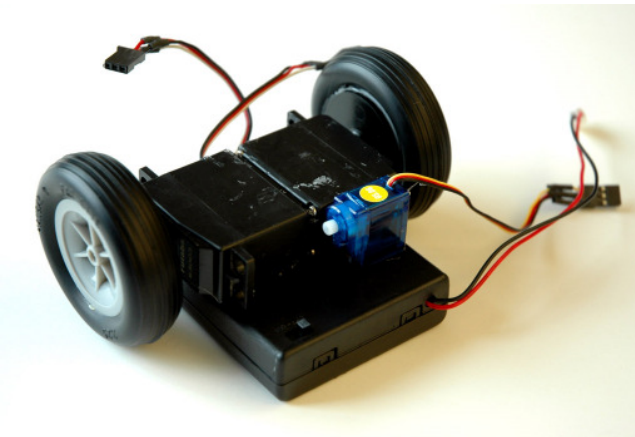
This step may not be required if you have wheels that directly connect to servos.

Step 4: Glue Wheels to Servo Horns



Again, this may not be required if you have wheels with direct servo connections.

Step 5: Glue Micro-Servo to Base



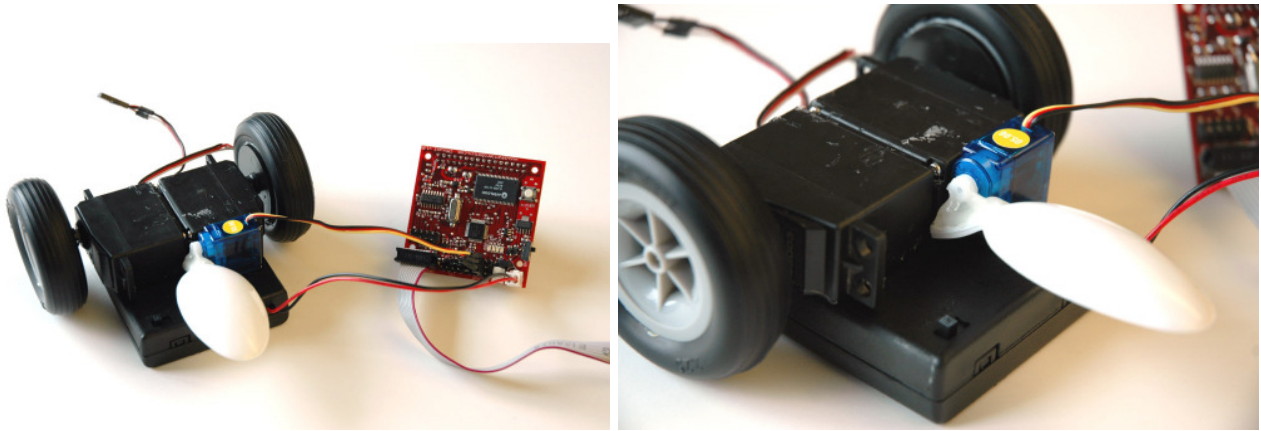
Step 6: Glue Micro-Servo Horn to Cut Spoon



In this step, you must glue the micro-servo horn onto the spoon. Make sure you note the orientation of the servo horn when connected to the spoon. This needs to be able to connect to the servo with the smooth part of the spoon facing down.

First, tack the horn in place with a small amount of glue. Once it is secure, liberally apply glue and let dry making a strong connection.

Step 7: Calibrate Micro-Servo Position and Attach Spoon



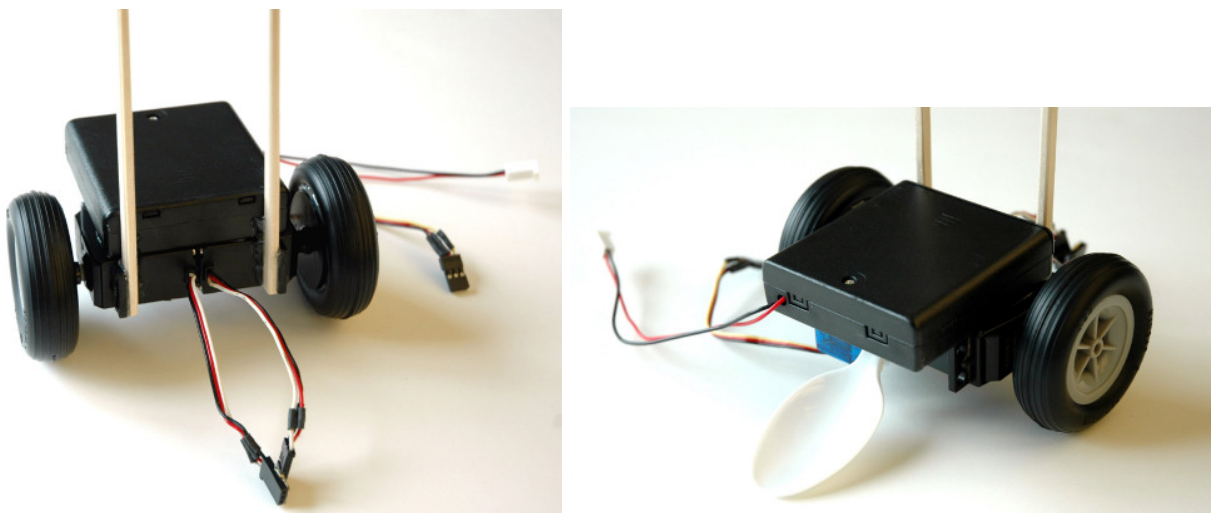
Before connecting the servo horn with the spoon to the micro-servo, it is important to calibrate the servo position. This can be done by loading the CMUcam2 emulation firmware and then using the CMUcam3 Frame Grabber program. You can also use the SV servo command from a terminal program. Set the servo to the most extreme direction that would correspond to the spoon being placed in the lowest position. For our servo, this was servo value 255. In this position, it should not be possible for the spoon to push back against the base of the spoonBot.

Note, you may need to connect the external servo power jumper if it is not already installed.

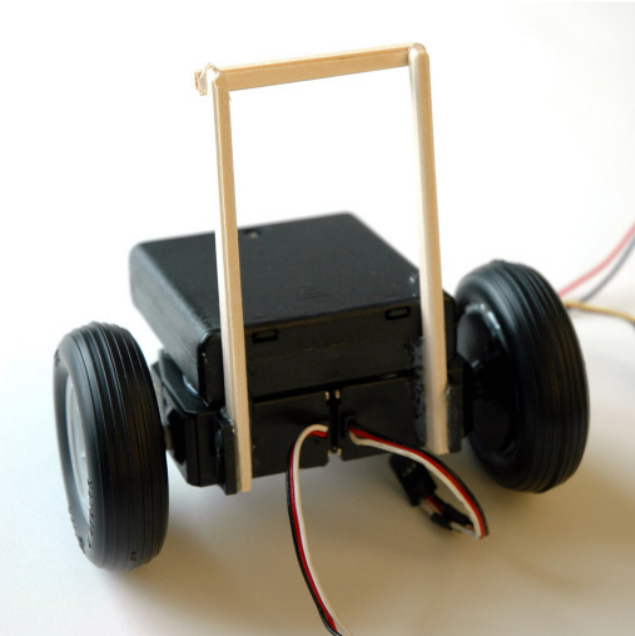
See [hardware-power](#) for more details on servo power jumper.

See [hardware-servo](#) for information on connecting servos. The black wire should connect to the ground pin.

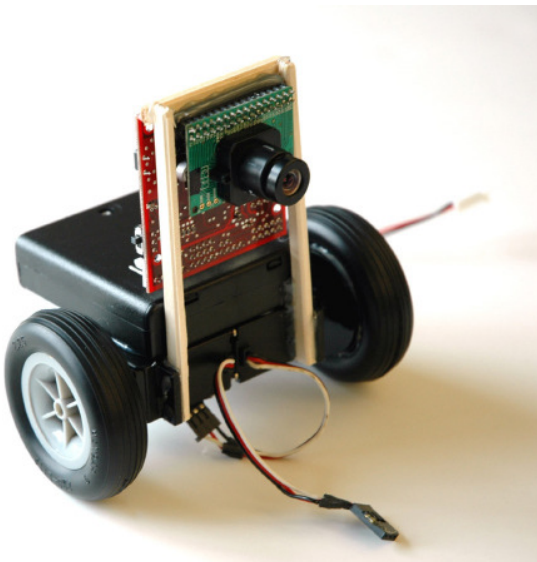
Step 8: Glue Two Chopstick Posts



Step 9: Trim Chopsticks and Glue on Top Crossbar

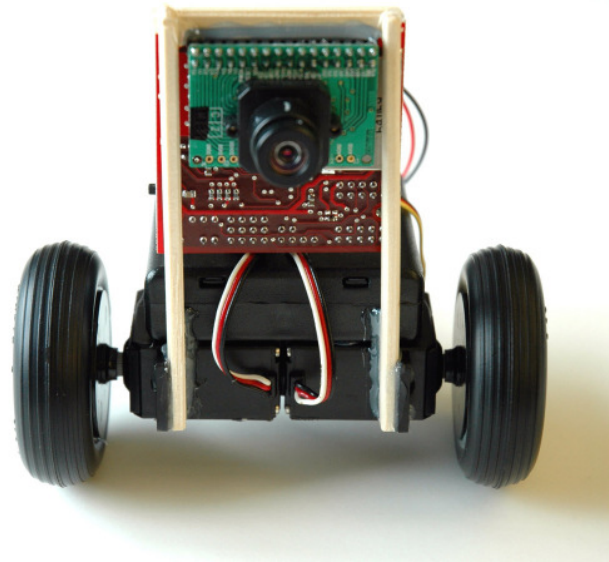
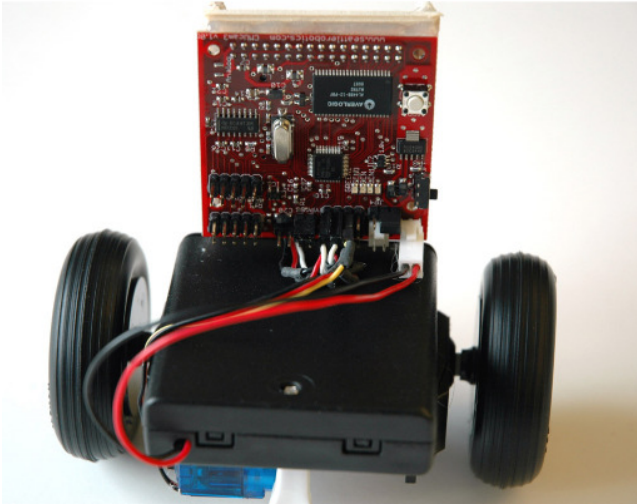


Step 10: Attach CMUcam3



Liberaly glue the CMUcam3 to the top chopstick bar. We used glue on both sides to make sure it was secure.

Step 11: Connect Power and Servo Wires



- Connect the right wheel servo (as viewed from front) to Servo Port 0.
- Connect the left wheel servo to Servo Port 1.
- Connect the spoon actuation servo to Servo Port 2.
- See [hardware-servo](#) for servo port numbers.

Next step: [Run the spoonBot Firmware](#)

***Note: Unless you have the RadioShack battery pack with the off switch, remember to unplug spoonBot when it is off. The servos will slowly drain the battery otherwise.**

Attachments

- [tools.jpg](#) (85.8 kB) - "spoonBot Tools", added by agr on 06/04/07 23:41:00.
- [parts.jpg](#) (107.5 kB) - "spoonBot Parts", added by agr on 06/04/07 23:41:56.
- [step-1.jpg](#) (65.6 kB) - added by agr on 06/04/07 23:45:28.
- [step-1-b.jpg](#) (60.6 kB) - added by agr on 06/04/07 23:45:36.
- [step-2.jpg](#) (65.2 kB) - added by agr on 06/04/07 23:45:44.
- [step-2-b.jpg](#) (84.8 kB) - added by agr on 06/04/07 23:45:54.
- [step-3.jpg](#) (71.9 kB) - added by agr on 06/04/07 23:46:02.
- [step-4.jpg](#) (95.8 kB) - added by agr on 06/04/07 23:46:09.
- [step-5.jpg](#) (139.8 kB) - added by agr on 06/04/07 23:46:17.
- [step-6.jpg](#) (111.4 kB) - added by agr on 06/04/07 23:46:26.
- [step-7.jpg](#) (108.9 kB) - added by agr on 06/04/07 23:46:38.
- [step-7-b.jpg](#) (122.5 kB) - added by agr on 06/04/07 23:46:46.
- [step-8.jpg](#) (104.1 kB) - added by agr on 06/04/07 23:46:54.
- [step-8-b.jpg](#) (91.6 kB) - added by agr on 06/04/07 23:47:02.
- [step-9.jpg](#) (131.1 kB) - added by agr on 06/04/07 23:47:10.
- [step-10.jpg](#) (127.4 kB) - added by agr on 06/04/07 23:47:19.
- [step-11.jpg](#) (158.1 kB) - added by agr on 06/04/07 23:47:32.
- [step-11-b.jpg](#) (166.9 kB) - added by agr on 06/04/07 23:47:40.