Testing a spoonBot
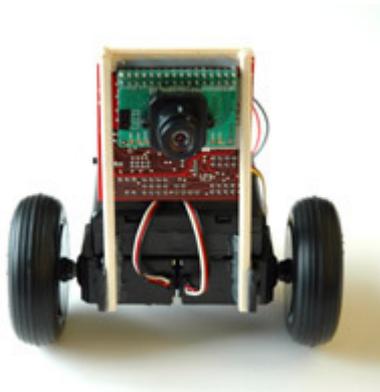

spoonBot is a simple differential drive robot with a spoon connected to a servo that allows it to pan and tilt. See the spoonBot-Construction page for information about building spoonBot. The sample program that comes with the latest cc3 distribution contains sample code demonstrating how to move spoonBot as well as run spoonBot Demo mode. spoonBot Demo mode is similar to the CMUcam2 demo mode only it uses spoonBot to pan and tilt.

Calibrating spoonBot

Before using spoonBot, you need to calibrate your servo settings. This is done by setting the following data structure at the top of main:

```
// SpoonBot Calibration Points
//   Assume Left = Servo 0
//   Assume Right = Servo 1
//   Assume Spoon = Servo 2
my_cal.left_mid = 71;
my_cal.right_mid = 77;
my_cal.spoon_down = 100;
my_cal.spoon_mid = 202;
my_cal.spoon_up = 255;
my_cal.left_dir = 1;
my_cal.right_dir = -1;
my_cal.spoon_dir = 1;
// Set the calibration points
spoonBot_calibrate (my_cal);
```

- Flash the cmucam2 emulation firmware onto the camera
- Open either the CMUcam3 Frame Grabber or a Terminal Program
  - Using the Frame Grabber, go to the "Settings" panel and drag the servo bars to change values
  - In a terminal, type "sv <servo-id> <servo-value>" to set the servos for example:

    ```
    :sv 0 77
    ACK
    ```

- Find the middle position of Servo's 0 and 1 by adjusting them until the wheels stop
  - *my_cal.left_mid* = <value from servo 0>
  - *my_cal.righ_mid* = <value from servo 1>
- Now you need to find the sign of the directions
  - Looking at spoonBot from the back (spoon towards you) try lowering the servo 0 number which should be the left wheel
    - if the servo spins clockwise / backwards (toward you) then *left_dir* should be set to 1
    - if the servo spins counter clockwise, *left_dir* should be set to -1
  - Repeat for servo 1 (which should be the right wheel from spoonBot's point of view)
    - if the servo spins clockwise / backwards (toward you) then *right_dir* should be set to 1
    - if the servo spins counter clockwise, *right_dir* should be set to -1

- Usually, one servo should be set to negative!
- Now find the Min, Middle and Max spoon positions by adjusting Servo 2
  - Min should be the smallest value that pushes the spoon down and hence tilts spoonBot forward
    - Set *spoon_down* accordingly
  - Max is usually 255 and should position spoonBot looking as far up as possible
    - Set *spoon_up* accordingly
  - Middle is the value that makes the servo level
    - Set *spoon_mid* accordingly
  - If Min and Max appear to be reversed, change *spoon_dir* to -1

Once the calibration is done, recompile the project and FLASH the CMUcam3. spoonBot will first go through a sequence of scripted motions to make sure the servos are setup correctly. Then spoonBot will wait for a button press to begin tracking a color. Text is displayed over the serial port notifying you of the various stages of operation.

The scripted motion should be as follows:

- Sit Still
- Look Down
- Look Up
- Back to Middle Position
- Rotate Clockwise (looking from above)
- Rotate Counter-Clockwise
- Red-Led off while camera gets ready
- Red-Led turns on when ready to track

If this looks correct, then try holding a brightly colored object a few inches in front of the camera and then press the button. As you pull the object away, spoonBot should rotate towards it. Use brightly colored objects that are as uniform in color as possible. An object like a bright red cloth would work well since it reflects very little light (other than the pure red). Make sure there is enough lighting in the room. Try grabbing a frame to see what the conditions look like.

Note: If you wish to disable servos without unplugging them, disconnect the servo-power-jumper.