Boe-Bots use Continuous Rotation Servos

- Use analog signal to encode rotation rate
- Protocol: Pulse Width Modulation (PWM)

PWM
- Controlling analog circuits with a processor's digital outputs
- Voltage source is supplied to the analog load (e.g., motors) by means of a repeating series of on and off pulses
- The on-time is the time during which the DC supply is applied to the load, and the off-time is the period during which that supply is switched off

Servo Internals
- Control circuitry and potentiometer that is connected to the output shaft
- Potentiometer allows control circuitry to monitor the current angle of the shaft
- Angle is correct
  - Then motor shuts off
- Angle is not correct
  - Then motor is turned to the correct direction until the angle is correct

Pulse Width and Angle
- The angle is controlled by duration of pulse
- Pulse width of 1.5
  - Neutral Position
- < 1.5 – clockwise movement
- > 1.5 – counter clockwise movement

Source: http://www.seattlerobotics.org/guide/servos.html
**void pulseOut(int length, int portPin)**

- Generate a pulse of a specific duration
  - If the pin is an input then it will be changed to be an output and remain as an output when complete

- The time is measured in 8.68us units
  - With a maximum value of 32767 giving a maximum pulse time of 284.4ms.
  - A time of 0 will not cause a pulse

- `pulseOut` can be used to generate the control pulses for a servo motor

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**Connections on Boe-Bot**

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**Calibrating a servo**

- Send a pulse with a pulse width of 1.5ms (i.e. centering pulse width) continuously

- On the back of each servo by the battery pack there is a small hole giving access to a yellow and blue potentiometer

- While running your calibration program, use a Philips screwdriver to the potentiometer until the servo stops turning
  - Make sure you do not turn them too fast