Notes on the SG90 Small Servomotor

The SG90 is a standard servomotor. Its rotation arc (how it moves) is 0-180 degrees. The SG90 connections on the header it is shipped with are:

Red: +5V (VCC)

Brown: GND or 0V

Orange: Control Signal

The control signal can be driven from a microcontroller output.

Servomotor Period:

Typically, servomotors are driven by a pulse train, which can be derived from PWM, as in the ET4047 project. The PWM frequency should be 50Hz, so the PWM time period should be T=1/f

For this case, 1/f = 1/50 = 0.02s or 20ms

Therefore 20ms is our target PWM period.

Setting the servo position:

You can set the servomotor position by varying the PWM duty cycle to generate a pulse width. For the SG90:

Position 0 is the middle position and occurs when the servomotor receives a pulse of 1.5ms

Position 90 degrees (furthest right position) is set when the servomotor receives a pulse of 2ms

Position -90 degrees (furthest left position) is set when the servomotor receives a pulse of 1ms

ATMega328P Timer2 PWM and the SG90:

Timer2 is an 8-bit counter (0-255 counts) and you can use phase correct PWM and fast PWM with a number of different options. In ET4047 Project 2, we have an additional constrain that Timer2 is also used to control the speed of a DC motor. This means that the same PWM setting has to be used for both applications. The result will be a compromise.

For PWM period:

Prescaler value of 1024 gives a 64us Timer2 clock input signal. With Phase Correct PWM, the PWM period is set by the time take to count to 510 (0 to 255 and 255 to 0). With Fast PWM, the PWM period is set by the time take to count to 256 (0 to 255 with rollover back to 0).

This gives two possible PWM periods, neither of which is perfect, but the servomotor has a good tolerance for a range of PWM periods, as long as the pulse width is in the correct region. This is the explanation for the Timer2 setting for Project 2. We then set the servo position by varying the pulse width and this is done by writing to the OCR2A register.

See the SG90 datasheet.

See also: https://learn.sparkfun.com/tutorials/hobby-servo-tutorial