Servo Motor Operating Characteristics

Specifications
The Servo Motors used in the Sumo Robot project are manufactured by Hitec, HT300. The specifications for these servo’s are as follows:

- **Signal Pulse**: +ve pulse 1520us neutral
- **Power Supply**: 4.8V
- **Speed**: 0.19s @ 60 degrees
- **Output Torque**: 3.0kg-cm
- **Dimensions**: 41mm x 20mm x 36mm
- **Weight**: 49g
- **Current Draw (Idle)**: 9.7mA
- **Current Draw (Moving)**: 130mA

NB. where Hitec servo’s are not fitted the replacement servo has similar specifications.

Servo Motors used as Positioning Devices
Servo motors are controlled via a pulse train and are generally used in positioning applications. The pulse train to the servo can have a period somewhere in the range of 15ms to 20ms. It is the time period that the pulse remains HI that determines the angle to which the shaft is rotated. This is illustrated below in figure 1.

![Figure 1: Servo’s used for Positioning](image)

If a servo receives a 1.5ms pulse the shaft will remain in its centre position. If a servo receives a 2.0ms pulse the shaft will rotate 45° clockwise. A 2.5ms pulse will rotate the shaft to 90° clockwise, its maximum position. The relationship between the pulse width and the shafts rotation is approximately linear. A potentiometer is internally fitted to the servo’s shaft, this provides feedback to the servo’s control loop as to the shafts current position.

Servo Motors operating as Variable Speed Motors
The servo motors used for the SumoRobot project have been modified so that they can rotate through a full 360°. This modification required both mechanical and electrical
modifications. Electrically, this was achieved by removing the feedback potentiometer that was connected to the servo’s shaft and replacing this with a standard multi-turn potentiometer. Using this configuration it is possible to control the direction and speed of the motor simply by varying the pulse width sent to the servo motor.

After the servo has been modified it may be necessary to reset the servo’s centre position. This is easily done by sending a 1.5ms pulse to the servo and then adjusting the potentiometer such that the servo does not rotate.

After the centre position has been set,

- a pulse width between 1.5ms and 2.5ms will cause the motor to rotate in one direction, whilst
- a pulse width between 0.5ms and 1.5ms will cause the motor to rotate in the other direction.