Oscillating Movement

Task #1
Somehow make the device oscillate position between 45° and -45°.

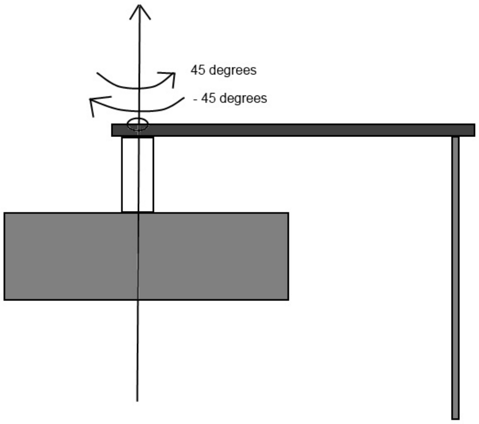

Figure 1: Overview of oscillating movement around center pivot between 45° and -45°

Background (relay)

In simple terms, a relay is a device that uses an electromagnet to mechanically pull two connections together to complete a circuit, in the exact same way your finger mechanically pushes two contacts together in a toggle switch.

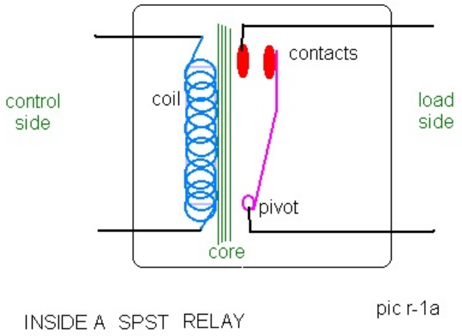

Figure 2: Makeup of a simple mechanical spst relay.

A relay is used wherever a small low power device or power supply needs to switch on a much larger one, usually completely isolated from the signals power source, or at a much higher voltage than the signal could provide. A relay can provide isolation in a circuit.

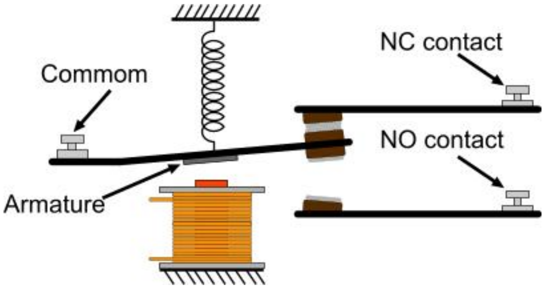

Figure 3: How a simple relay works.

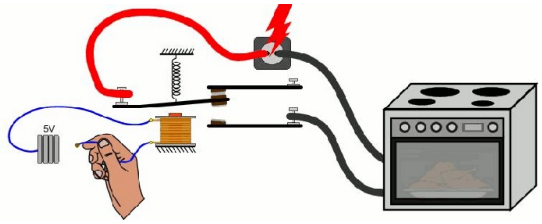

Figure 4: How a simple relay works.

Method

Accomplished by reading info (position) from the encoder.
Will most likely use the following blocks...

1. control switch: like a multiplexer, similar behavior to physical analog ”relay”.

2. compare: provides a boolean answer in response to a comparison query

3. memory: acts like a register, delays a single clock cycle. Allows the storing of values to feed backwards in the flowchart of a simulink model.

Procedure (task 1)

Built a simplistic controller based around 2 boundary conditions:

1. less than 45°

2. less than -45°

and a knowledge of the current direction of movement (positive or negative).

The controller spits out a constant value of 1 or -1 volts to control the direction of oscillation. Therefore inside the range [-45°:45°], the controller will do literally nothing but continue to apply a constant (either 1 or -1 volts). This means the waveform inside [-45°:45°] can take any form it wants...

ex: someone bumps into the robot and it jostles the direction of movement.

The only function of the simplistic controller is to flip the applied voltage when it encounters a boundary condition and the last known direction change is congruent with a flip in oscillation direction. IE: this is a very rudimentary controller that has little dynamic function and 0 dynamic function inside the range of movement.

Observations

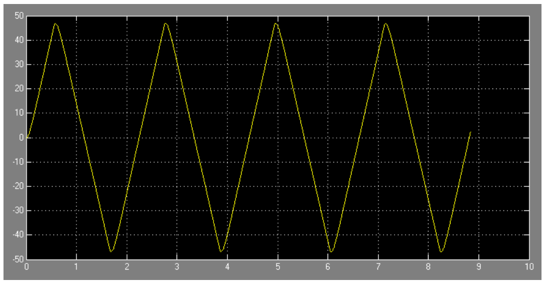

Figure 5: Scope output for Position.

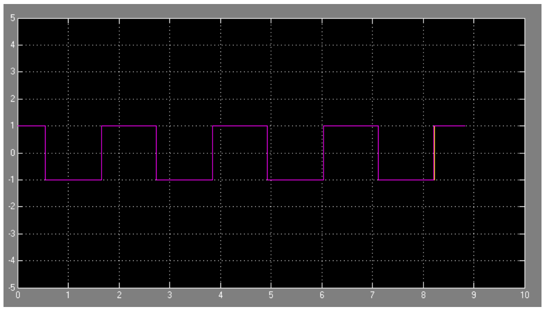

Figure 6: Scope Output for Voltage.

Final Palette Schematic

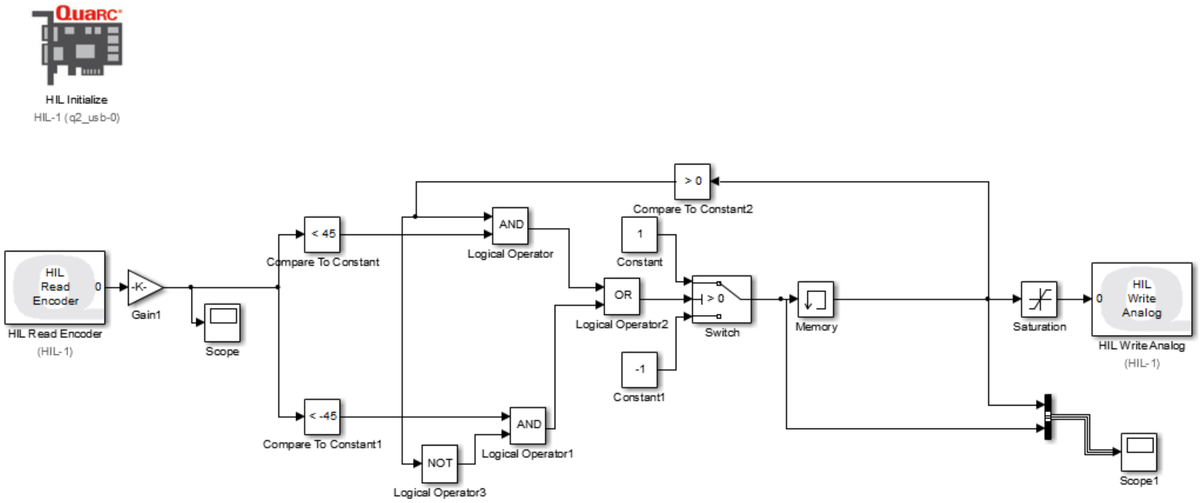

Figure 7: Final Simulink Palette Schematic for Task #1.