Grafton Cook

Joe Tobbe

Project 2: Ready, Get Set, Go!

## Introduction

This is a paragraph introducing the project.

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| **Figure 1.** BOE Bot chassis and Arduino |

This is another paragraph introducing the project.

## Physical System and Model

### Stepper motor and optical encoder

### System analysis

The system model is shown in Equation [1].

I determined the window-passing speed at various inputs to writeMicroseconds() and plotted them.

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| **Figure 2.** Window-passing times as a function of writeMicroseconds() input |

Noting the steady-state window-passing speed, I zoomed in on the linear regions of the plot to find a fit for coefficient .

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| **Figure 3.** Linear Region of window-passing-time plot with linear curve fit. |

Both linear regions were plotted, fitted, and averaged. Because speed and time are inversely proportional, the coefficient was determined by Equation 2:

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| --- | --- |
|  | [2] |

To identify τ, a program was written to cumulate the time the system took to reach steady state, and fitted to an equation modeling exponential decay. (Equation 3.)

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| --- | --- |
|  | [3] |

The right-hand servo motor transfer function is shown in Equation 4.

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| --- | --- |
|  | [4] |

This is right after the equation.

## PID Controller

### Original System

Here is some info about the original system.

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| **Figure 4.** r to y plot of untuned system. |

The is greater than 80%, which is a problem.

### PID coefficient selection

I used MATLAB to autotuned a PI controller, then experimented with a derivative term. The final block equation is shown in Equation 5.

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|  | [5] |

### Final system

Here is some stuff about the final system. The tuned response is shown in Figure 5.

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| **Figure 5.** Tuned transient and steady-state response of the system. |

Additionally, the du-to-y trends toward zero, as illustrated in Figure 6.

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| **Figure 6.** Tuned du-to-y response of the system. |

This is placeholder text, change me.

## Conclusion

Here is placeholder text, telling you what I just told you.