7146CEM: Automotive Software Engineering - Design and Development

Coursework

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Table of Contents

[Introduction 3](#_Toc87468768)

[Software Development Life Cycle 3](#_Toc87468769)

[Requirement Gathering 3](#_Toc87468770)

[PID controller 3](#_Toc87468771)

[Cruise Control 3](#_Toc87468772)

[Motor Speed 3](#_Toc87468773)

[Code 3](#_Toc87468774)

[Design 3](#_Toc87468775)

[PID Controller 3](#_Toc87468776)

[PID Tuning Algorithm 3](#_Toc87468777)

[Cruise Control 3](#_Toc87468778)

[Motor Speed 3](#_Toc87468779)

[Coding 3](#_Toc87468780)

[Testing 3](#_Toc87468781)

[Validation 3](#_Toc87468782)

[Advantages of the used SDLC model 4](#_Toc87468783)

[GitHub Workflow 4](#_Toc87468784)

[References 4](#_Toc87468785)

[Table 1 Cruise Control Model Validation 3](#_Toc88564699)

[Table 2 Motor Speed Model Validation 4](#_Toc88564700)

# Introduction

This document contains information and details regarding the workflow used to create the PID controller, Tuning of PID and Generation of Code. GitHub is used as version control system for the project. It is integrated with MATLAB to easily facilitate the GitHub process.

# Software Development Life Cycle

This section gives an over all view of the software development process used to develop the cruise control and motor speed model.

## Requirement Gathering

### PID controller

* To design the PID controller using the following equations

Where,

* PID Controller block should contain discrete blocks.

### Cruise Control

To design the cruise control model with the following specifications

Table Cruise Control Model Requirement

|  |  |
| --- | --- |
| S.No | Requirements |
| 1 | Rise time < 10s |
| 2 | Overshoot < 10% |
| 3 | Stead state error <1% |

### Motor Speed

To design the motor speed control model with the following specifications

|  |  |
| --- | --- |
| S.No | Requirements |
| 1 | Rise time < 5s |
| 2 | Overshoot < 5% |
| 3 | Stead state error <1% |

### Code

To develop the code in accordance with ISO26262 and following Misra Guidelines

Code for the controlled should have the following:

* Code should be optimized for RAM Efficiency.
* Code should follow the MISRA C guidelines.

## Design

### PID Controller

-Mention the process used to design the PID controller like creating the transfer function, converting transfer function to Z Transform

### PID Tuning Algorithm

-mention the script which is used to Tune the PID for the models

-mentionthe script path to refer.

Script ‘PID\_Turning\_Script.mlx’ is created to obtain Kp, Ki, Kd values to satisfy the requirements. Script uses trial and error method to find the values.

### Cruise Control

-UML diagrams, block diagrams

### Motor Speed

-UML diagrams, Block diagrams

## Coding

-Autocode generation procedures, Documentation procedures used.

- code advisor report details

## Testing

-Unit testing results, Polyspace statics analysis result. Cpp Check result

## Validation

-Comparing requirements and output of Testing to validate.

-add risetime graphs

Table Cruise Control Model Validation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Requirements | Input | Expected Output | Actual Output | Pass/Fail |
| 1 | Rise time < 10s |  |  |  |  |
| 2 | Overshoot < 10% |  |  |  |  |
| 3 | Stead state error <1% |  |  |  |  |

Table Motor Speed Model Validation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Requirements | Input | Expected Output | Actual Output | Pass/Fail |
| 1 | Rise time < 5s |  |  |  |  |
| 2 | Overshoot < 5% |  |  |  |  |
| 3 | Stead state error <1% |  |  |  |  |

# Advantages of the used SDLC model

* Mention the advantages of the SDLC model used with the development of the pid.

# GitHub Workflow

* Mention the github links.
* Paste the flow chart of comits and branches as a picture

GitHub is integrated with Matlab, and all the versioning process is done within matlab itself.

# References