Assignment 1, Bonus

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Table of Contents

[1 Introduction 2](#_Toc55125342)

[2 Bonus 2](#_Toc55125343)

[2.1 Description 2](#_Toc55125344)

[2.2 Variables 2](#_Toc55125345)

[2.2.1 Measured 2](#_Toc55125346)

[2.2.2 Constant 2](#_Toc55125347)

[2.2.3 Controlled 2](#_Toc55125348)

[2.2.4 Internal 3](#_Toc55125349)

[2.3 Initial values 3](#_Toc55125350)

[2.4 Requirements 3](#_Toc55125351)

[2.5 State Transitions 3](#_Toc55125352)

[2.6 State details 3](#_Toc55125353)

[2.7 Future changes 3](#_Toc55125354)

[2.8 Testing 3](#_Toc55125355)

# Introduction

The bonus implements functionality allowing the pacemaker to be inhibited by quickly pressing switch 3.

# Bonus

## Description

## Variables

### Measured

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Units/Type** | **Description** | **Range** |
| t | ms | time since button depressed | – |
| m\_button\_pressed | boolean | Button depressed | {true, false} |

### Constant

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Units/Type** | **Description** | **Range** |
| p\_max\_press\_length | ms | Maximum valid button press time | – |

### Controlled

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Units/Type** | **Description** | **Range** |
| h\_pulse\_detected | boolean | Simulates pulse in atrium or ventricle | {true, false} |

### Internal

No internal values

## Initial values

h\_pulse\_detected = false

## Requirements

|  |  |  |
| --- | --- | --- |
| **t** | **m\_button\_pressed** | **h\_pulse\_detected** |
| t < p\_max\_press\_length | false | true |
| true | false |
| t > p\_max\_press\_length | false | false |
| true | false |

## State Transitions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Next State  Current State | IDLE | BUTTON\_DOWN | VALID\_PULSE | INVALID\_PULSE |
| IDLE | – | m\_button\_pressed | – | – |
| BUTTON\_DOWN | – | – | t < p\_max\_press\_length  ~m\_button\_pressed | t = p\_max\_press\_length |
| VALID\_PULSE | ~m\_button\_pressed | – | – | – |
| INVALID\_PULSE | automatic | – | – | – |

## State details

|  |  |
| --- | --- |
| **State** | **Description** |
| IDLE | Waits for button press |
| BUTTON\_DOWN | Measures time of button press |
| VALID\_PULSE | Sends 1 ms pulse on h\_pulse\_detected |
| INVALID\_PULSE | Waits for button release |

## Future changes

There are no foreseeable changes to this design

## Testing

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Case** | **Expected Result** | **Actual Result** | **Pass/Fail** |
| p\_mode: AAI  p\_lower\_rate\_limit: 60 BPM  Atrium PW: 10.0 ms  Heart Rate: 30 BPM  Button pressed halfway between natural pulses | No pace between natural pulses | No pace between natural pulses | Pass |
| p\_mode: VVI  p\_lower\_rate\_limit: 60 BPM  Ventricle PW: 10.0 ms  Heart Rate: 30 BPM  Button pressed halfway between natural pulses | No pace between natural pulses | No pace between natural pulses | Pass |

Test 1

Graphical user interface, text, application

Description automatically generated

Test 2

Graphical user interface, text, application

Description automatically generated