LED String Animation

PO5\_LSAN

**Software Requirements Specification Document**

Document status

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Document history

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| v.01 | Mohanad Sallam | 23/1/2020 | Create initial draft |
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| v.03 | Sarah Abdelrahman | 29/01/2020 | Adding requirements, System features and system interfaces |
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| v.08 | Mohanad Sallam | 15/02/2020 | Adding Reference Table |
| V1.0 | Sarah Abdelrahman | 21/02/2020 | Remove requirements from 004 to 010  Edit all requirements  Add new requirements from 018 to 021  Add software context  add software context sections |
| V1.1 | Sarah Abdelrahman | 21/2/2020 | Update requirement 011 |
| V1.2 | Sarah Abdelrahman | 26/2/2020 | Add requirement 022 |
| V1.3 | Mohanad Sallam | 27/02/2020 | Update SW context  Add Sections to requirements tables |

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# Introduction

## Purpose

This is a v.02 of the requirements specifications for a LED String Animation.

## Project Description

This project consists of strings of LEDs in a certain pattern. The LEDs turn on/off based on input signals. The LEDs structure consists of two parts Tail and TI. Each Part will be activated according to the corresponding switches.

At Startup Mode there are two options (Modes):

First mode: LEDs shall turn-on from L6 to L1, then from R1 to R6 and vice versa, and then all LEDs are ON and OFF.

Second mode: LEDS from R1 to R6 are ON LED by LED and also the left branch at the same time, and then repeat the scenario again.

## Block diagram



# 2.0 The Overall Description

## 2.1 User Needs

- Control the system through buttons

- Change the startup mode when needed

## 2.2 Product perspective

### 2.2.1 System interfaces

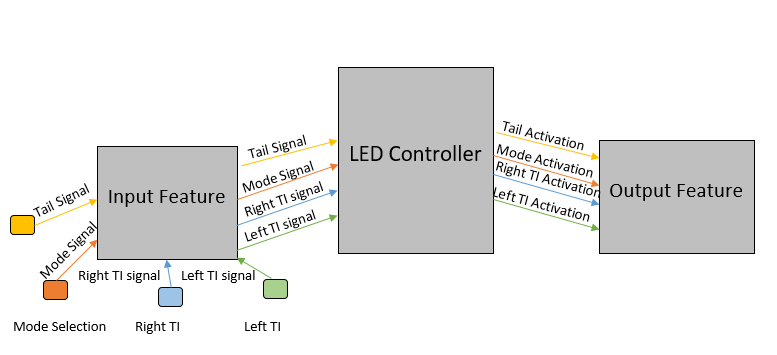
The system consists of 3 subsystems each has its own functionality:

1. Controls TI LEDs
2. Controls Tail LEDs
3. Sets the Startup mode

### 2.2.2 Interfaces

A unique signal is sent to the controller each controls one of the functionality.

# 3.0 Software context



# 4.0 Specific Requirements

## 4.1 Requirements Tables

### 4.1.1 Input features

We have no filtering feature

### 4.1.2 LED controller

#### 4.1.2.1 Initialization

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 022 \_ v02 | | |
| **Covers** | Req\_PO5\_LSAN\_HSI\_001\_V01 | **Test Scope** | ITD |
| **Input** | N/A | **Output** | N/A |
| **Author** | Sarah | **Date** | 26/02/2020 |
| **Description** | Initialize the following pins with the direction and initial values as stated   |  |  |  | | --- | --- | --- | | **PIN NUMBER** | **PIN DESCRIPTION** | **PIN DIRECTION** | | 1 | PB0 | O/P | | 2 | PB1 | O/P | | 3 | PB2 | O/P | | 4 | PB3 | O/P | | 5 | PB4 | O/P | | 6 | PB5 | O/P | | 7 | PB6 | I/P pull up | | 8 | PB7 | I/P pull up | | 14 | PD0 | O/P | | 15 | PD1 | O/P | | 16 | PD2 | O/P | | 17 | PD3 | O/P | | 18 | PD4 | O/P | | 19 | PD5 | O/P | | 20 | PD6 | O/P with initial value = 0 | | 21 | PD7 | O/P with initial value = 0 | | 22 | PC0 | O/P | | 23 | PC1 | O/P | | 24 | PC2 | O/P | | 25 | PC3 | O/P | | 26 | PC4 | O/P | | 27 | PC5 | O/P | | 28 | PC6 | O/P with initial value = 0 | | 29 | PC7 | O/P with initial value = 0 | | 33 | PA7 | I/P pull up | | 34 | PA6 | I/P pull up | | 35 | PA5 | O/P | | 36 | PA4 | O/P | | 37 | PA3 | O/P | | 38 | PA2 | O/P | | 39 | PA1 | O/P | | 40 | PA0 | O/P | | | |

#### 4.1.2.2 Mode Selection

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 023 \_ v02 | | |
| **Covers** | Req\_PO5\_LSAN\_HSI\_001\_V01 | **Test Scope** | ITD |
| **Input** | Mode Signal | **Output** | Mode Activation |
| **Author** | Mohanad | **Date** | 27/02/2020 |
| **Description** | Software shall change MODE\_FLAG to MODE-1 if the switch is on. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 002 \_ v02 | | |
| **Covers** | Req \_PO5\_CYRS \_ 001 \_ v01 | **Test Scope** | ITD |
| **Input** | Mode Signal | **Output** | Mode Activation |
| **Author** | Mohanad | **Date** | 27/02/2020 |
| **Description** | Software shall change MODE\_FLAG to MODE-2 if the switch is off. | | |

#### 4.1.2.3 Tail Function Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 012 \_ v02 | | |
| **Covers** | Req \_PO5\_CYRS \_ 004 \_ v01 | **Test Scope** | ITD |
| **Input** | Tail Switch Signal | **Output** | Tail Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TAIL\_FLAG to TAIL\_FLAG\_ACTIVE when tail switch is pressed. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 02 \_ v01 | | |
| **Covers** | Req \_PO5\_CYRS \_ 004 \_ v01 | **Test Scope** | ITD |
| **Input** | Tail Switch Signal | **Output** | Tail Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TAIL\_FLAG to TAIL\_FLAG\_DEACTIVE when tail switch is released. | | |

#### 4.1.2.4 Right TI Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 019 \_ v01 | | |
| **Covers** | Req \_PO5\_CYRS \_ 005 \_ v01 | **Test Scope** | ITD |
| **Input** | TI Right Switch Signal | **Output** | Right TI Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TI\_R\_FLAG to TI\_R\_FLAG\_ACTIVE when TI Right switch is pressed. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 015\_ v03 | | |
| **Covers** | Req \_ PO5\_CYRS \_ 005 \_ v01 | **Test Scope** | ITD |
| **Input** | TI Right Switch Signal | **Output** | Right TI Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TI\_R\_FLAG to TI\_R\_FLAG\_DEACTIVE when TI Right switch is released. | | |

#### 4.1.2.5 Left TI Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 020 \_ v01 | | |
| **Covers** | Req \_PO5\_CYRS \_ 005 \_ v01 | **Test Scope** | ITD |
| **Input** | TI Left Switch Signal | **Output** | Left TI Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TI\_L\_FLAG to TI\_L\_FLAG\_ACTIVE when TI Left switch is pressed. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 021 \_ v01 | | |
| **Covers** | Req \_PO5\_CYRS \_ 006 \_ v01 | **Test Scope** | ITD |
| **Input** | TI Left Switch Signal | **Output** | Left TI Activation |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall change TI\_L\_FLAG to TI\_L\_FLAG\_DEACTIVE when TI Left switch is released. | | |

### 4.1.3 Output feature

#### 4.1.3.1 Mode Selection

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 003 \_ v02 | | |
| **Covers** | Req \_ PO5\_CYRS \_ 002 \_ v01 | **Test Scope** | ITD |
| **Input** | Mode Activation | **Output** | L LEDs sequence |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | MODE\_FLAG = MODE\_1  Left leds sequence-1 activated  All left and right leds OFF  Right leds sequence-1 activated  **1200ms**  **2400ms**  **T = 0ms**  Left leds sequence-2 activated  All left and right leds OFF  All left and right leds ON  All left and right leds OFF  Right leds sequence-2 activated  **2600ms**  **3800ms**  **5500ms**  **5000ms**  **5200ms**  Right leds sequence-1:   1. R1 will only turn-on for 200ms. 2. R2 will only turn-on for 200ms. 3. R3 will only turn-on for 200ms. 4. R4 will only turn-on for 200ms. 5. R5 will only turn-on for 200ms. 6. R6 will only turn-on for 200ms.   Right leds sequence-2:   1. R6 will only turn-on for 200ms. 2. R5 will only turn-on for 200ms. 3. R4 will only turn-on for 200ms. 4. R3 will only turn-on for 200ms. 5. R2 will only turn-on for 200ms. 6. R1 will only turn-on for 200ms.   Left leds sequence-1:   1. L6 will only turn-on for 200ms. 2. L5 will only turn-on for 200ms. 3. L4 will only turn-on for 200ms. 4. L3 will only turn-on for 200ms. 5. L2 will only turn-on for 200ms. 6. L1 will only turn-on for 200ms.   Left leds sequence-2:   1. L1 will only turn-on for 200ms. 2. L2 will only turn-on for 200ms. 3. L3 will only turn-on for 200ms. 4. L4 will only turn-on for 200ms. 5. L5 will only turn-on for 200ms. 6. L6 will only turn-on for 200ms. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 011 \_ v02 | | |
| **Covers** | Req \_PO5\_CYRS \_ 003 \_ v01 | **Test Scope** | ITD |
| **Input** | Mode Activation | **Output** | L LEDs and R LEDs sequence |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall turn-on L LEDs in the following sequence 2 times:   1. L1 and R1 will only turn-on for 200ms. 2. L2 and R2 will only turn-on for 200ms. 3. L3 and R3 will only turn-on for 200ms. 4. L4 and R4 will only turn-on for 200ms. 5. L5 and R5 will only turn-on for 200ms. 6. L6 and R6 will only turn-on for 200ms. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 017\_ v02 | | |
| **Covers** | Req \_ PO5\_CYRS \_ 006 \_ v01 | **Test Scope** | ITD |
| **Input** | Mode Activation | **Output** | L LEDs status |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall stop the pattern when the TI\_L\_FLAG is equal to TI\_L\_FLAG\_DEACTIVE. | | |

#### 4.1.3.2 Tail Function Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 018 \_ v01 | | |
| **Covers** | Req \_PO5\_CYRS \_ 004 \_ v01 | **Test Scope** | ITD |
| **Input** | Tail Activation | **Output** | Tail LEDs status |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall turn-on tail LEDs if TAIL\_FLAG equal to TAIL\_FLAG\_ACTIVE. | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_PO5\_SRS \_ 013 \_ v02 | | |
| **Covers** | Req \_PO5\_CYRS \_ 004 \_ v01 | **Test Scope** | ITD |
| **Input** | Tail Activation | **Output** | Tail LEDs status |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall turn-off tail LEDs if TAIL\_FLAG equal to TAIL\_FLAG\_DEACTIVE. | | |

#### 4.1.3.3 Right TI Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 014\_ v03 | | |
| **Covers** | Req \_ PO5\_CYRS \_ 005 \_ v01 | **Test Scope** | ITD |
| **Input** | Right TI Activation | **Output** | R LEDs status |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall turn-on the R LEDs, if right TI\_R\_FLAG is equal to TI\_R\_FLAG\_ACTIVE based on the following sequence:   1. R1 will only turn-on for 200ms. 2. R2 will only turn-on for 200ms. 3. R3 will only turn-on for 200ms. 4. R4 will only turn-on for 200ms. 5. R5 will only turn-on for 200ms. 6. R6 will only turn-on for 200ms. 7. Repeat. | | |

#### 4.1.3.4 Left TI Activation

|  |  |  |  |
| --- | --- | --- | --- |
| **Req ID** | Req \_ PO5\_SRS \_ 016 \_ v03 | | |
| **Covers** | Req \_ PO5\_CYRS \_ 006 \_ v01 | **Test Scope** | ITD |
| **Input** | Left TI Activation | **Output** | L LEDs status |
| **Author** | Sarah | **Date** | 21/02/2020 |
| **Description** | Software shall turn-on the L LEDs, if right TI\_L\_FLAG is equal to TI\_L\_FLAG\_ACTIVE based on the following sequence:   1. L1 will only turn-on for 200ms. 2. L2 will only turn-on for 200ms. 3. L3 will only turn-on for 200ms. 4. L4 will only turn-on for 200ms. 5. L5 will only turn-on for 200ms. 6. L6 will only turn-on for 200ms.   Repeat. | | |

## 4.2 Reference Documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Reference Number** | **Document Name** | **Version** | **Status** |
| 1 | Req \_ PO5\_CYRS | 2.2 | Released |
| 2 | Req \_ PO5\_HSI | 1.5 | Released |