Software Requirements Specification

for

traffic lights system (TLS)

Version 1.0 approved

Prepared by 404 Team Name Not Found

HireMe Software Ltd.

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Table of Contents

Revision History

Name	Date	Reason For Changes	Version
Arun Woosaree	12/02/18	Section 1 - Introduction	0.1
Arun Woosaree	12/03/18	Sections 2.4 - 3.4	0.2
Zhi Shen	12/03/18	Section 2.3	0.3
Arun Woosaree	12/03/18	Section 5 - Nonfunctional Requirements	0.4
Liyao Jiang	12/03/18	Sections 2.2 Product Functions	0.5
Liyao Jiang	12/03/18	Section 4 (4.1-4.8) - System Features	0.6
Zhi Shen	12/03/18	Section 6	0.7
Liyao Jiang	12/11/18	Reorder sections	0.8
Arun Woosaree	12/11/18	Formatting	0.9
All authors	12/11/18	Finalizing document	1.0 approved

1. Introduction

1.1 Purpose

This SRS describes the software functional and nonfunctional requirements for release 1.0 of the traffic lights system (TLS) which shall direct traffic at a simple intersection. Unless otherwise noted, all requirements specified here are high priority and committed for release 1.0. This document is intended to be used by the members of the project team that will implement and verify the correct functioning of the system.

1.2 Product Scope

The software will be used to control the traffic lights system at a simple intersection. The software controls the sequence of the traffic going through the intersection and provides signals for vehicles and pedestrians to cross the intersection safely. The system implements a sensor which can detect a car waiting at a light, and a button which a pedestrian can press. A detailed description of the project scope can be found in *traffic lights system (TLS) Vision and Scope*. Financial and scheduling matters are disregarded.

1.3 Document Conventions

Abbreviations used are defined as follows:

Labels ***1,2,3,P1,P2,P3,B3,S2,G1,G3*** *can be found in Figure 1.*

1. **1**: Light on Road 1
2. **2**: Light on Road 2
3. **3**: Light on Road 3
4. **TLMS**: Traffic Light Monitoring System
5. **RB**: Reset Button
6. **M**: Hardware malfunction: 1 indicates a malfunction, 0 for normal operation
7. **P1**: Pedestrian light on Road 1
8. **P2**: Pedestrian light on Road 2
9. **P3**: Pedestrian light on Road 3
10. **t1**: Timer for **1**
11. **t2**: Secondary timer for everything else
12. **G1**: Left turn signal on Road 1
13. **G3**: Left turn signal on Road 3
14. **S2**: Magnetic sensor which detects if a car/motorcycle is waiting for **2**. Outputs: 1 if vehicle waiting, 0 otherwise
15. **B3**: Button on Road 3 which a pedestrian can hit to request to cross the intersection
16. **BG**: Blinking Green
17. **BR**: Blinking Red
18. **D**: Day (6:00-19:59)
19. **N**: Night (20:00-5:59)
20. **Clock**: Can have value **D** or **N**

1.4 References

1. 404 Team Name Not Found. *traffic lights system (TLS) Vision Document*
2. Government of Canada. *Canadian Transportation Agency*

1.5 Overview

The rest of the document describes the overall functionality of the traffic lights system (TLS) according to the customer's requirements. Section 2 provides an overall description of the product while section 4 goes in-depth about the features. Section 3 outlines external interfaces, and section 5 outlines other non-functional requirements. The appendix contains figures which define the states and transitions of the system.

2. Overall Description

2.1 Product Perspective

The traffic lights system (TLS) is a new system for directing traffic at a simple intersection. The diagram in Figure 1 illustrates the layout of the intersection and most of the labels defined in the glossary. The system is not expected to evolve over time. Other features are specified more clearly in traffic lights system (TLS) Vision Document.

2.1.1 System interfaces

No system interface, because the system is to operate independently.

2.1.2 User interfaces

No user interface because the system is embedded.

2.1.3 Hardware interfaces

The hardware interface includes a button for the pedestrian to press and a sensor that can detect the presence of a car in road 2.

2.1.4 Software interfaces

No software interface because the system is embedded.

2.1.5 Communication interfaces

No communication interfaces because the system is not intended to be connected to the internet

2.1.6 Memory constraints

The system will be running on an embedded system with a 550KB hard drive and 50KB RAM.

2.1.7 Site adaptations requirements

No site adaptation requirements.

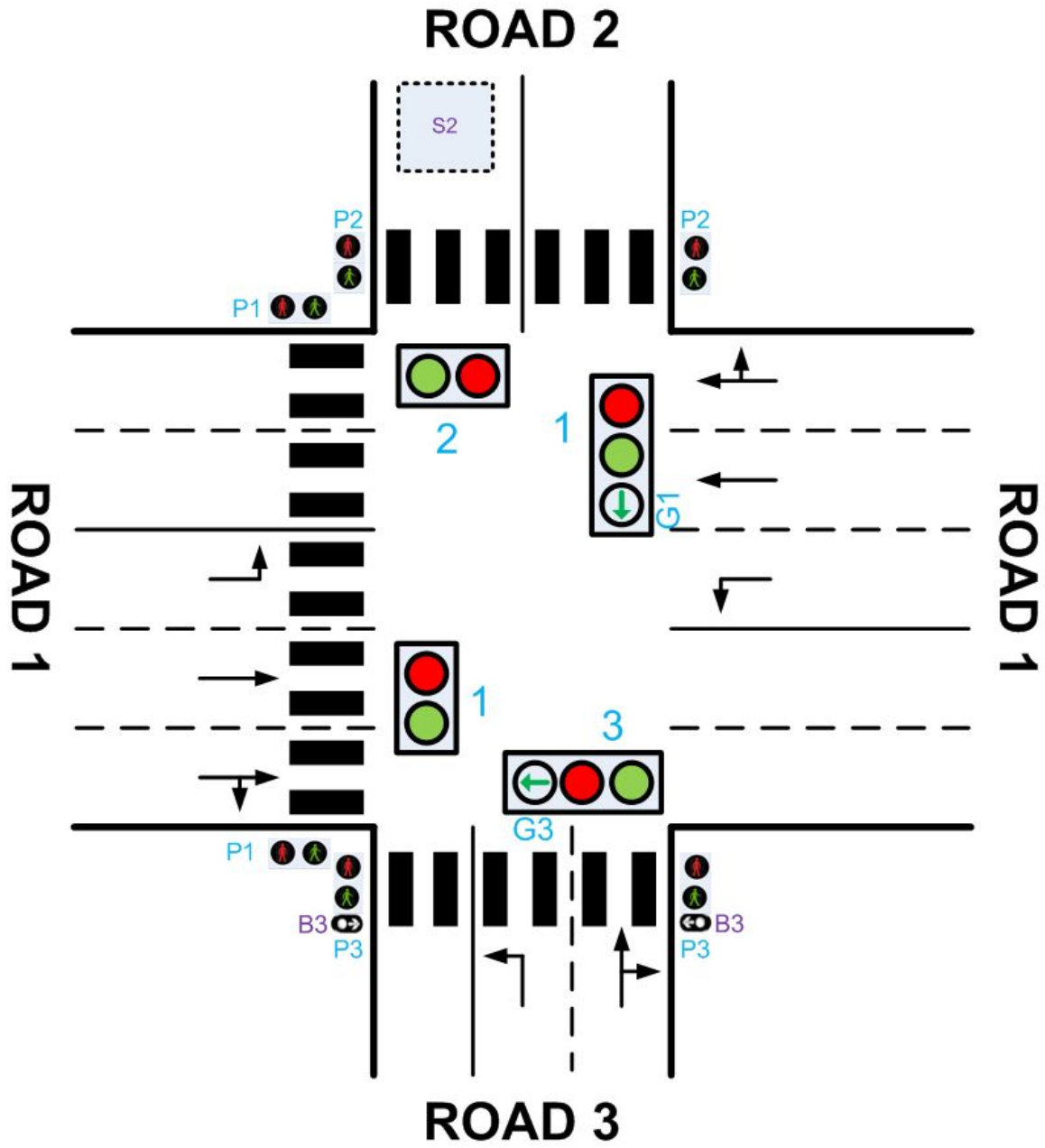

Figure 1

Intersection layout for traffic lights system (TLS)

2.2 Product Functions

FE-1: The default mode (operates in daytime)

FE-2: The emergency mode (operates at system startup and hardware malfunction)

FE-3: System reset button (resets the system)

FE-4: The night mode (operates in nighttime)

FE-5: Pedestrian crossing button P3 (after button press, system change signals when appropriate)

FE-6: Vehicle Sensor S2 (detects vehicles on Road 2, system change signals when appropriate)

FE-7: (Nice-to-have, not important feature) Configurable signal sequence timing (be able to change the timing)

See Figure 1 for a system overview diagram.

See Appendix B. Figure 2, the finite state machine model of the system

2.3 User Characteristics

Pedestrian:

A pedestrian is a person who crosses the intersection at where this traffic light control system is implemented. The use rate for pedestrians is dependent on time of day and nearby amenities. The pedestrian light timer should accommodate for different pedestrian walking speeds. A pedestrian is expected to have a sufficient literate level to be able to read signs at the intersections and be able to comply with local traffic laws. When a pedestrian desires to cross road 3 and pressed button B3, it is expected for the traffic light control system to be able to turn on pedestrian light 3 in the appropriate state.

Driver:

A driver is a person who enters this intersection while driving a car. A driver is expected to comply with local traffic laws. The frequency of use for drivers is dependent on time of the day, but it is expected that road 1 will have the highest frequency. When a driver is stopped on road 2, it is expected that sensor S2 will detect the car, and be able to states following the correct transitions.

Hardware Maintainer:

A hardware maintainer is a person who maintains the traffic light system periodically and fixes the system when an error occurs. The frequency of use is low.

2.4 Design and Implementation Constraints

CO-1: The software will run on an embedded system with the following limits: 550 KB hard drive and 50 KB RAM

CO-2: The system shall conform to local traffic laws

2.5 Assumptions and Dependencies

AS-1: The system will run continuously, with no downtime unless there is a hardware malfunction.

AS-2: Pedestrians and Drivers will comply with local traffic laws

2.6 Apportioning of Requirements

The customer has indicated that it would be nice to have traffic data logging as a feature, but it is not required.

3. Specific requirements

3.1 External Interface

3.1.1 User Interfaces

- UI-1: The lights which the system control shall direct traffic

3.1.2 Hardware Interfaces

- HI-1: A pedestrian can push the button B3 to request to cross Road 3. This will send a signal to the system, which will allow the pedestrian to cross when it is safe to do so.
- HI-2: A magnetic sensor S2 can detect if a vehicle is waiting for the light to change on Road 2. This will send a signal to the system, which will allow the vehicle to cross the intersection when it is safe to do so.

3.1.3 Software Interfaces

- No software interfaces have been identified as the system is intended to run independently on an embedded system.

3.1.4 Communications Interfaces

- No communication interfaces have been identified as the system is not meant to be accessed or used remotely.

3.2 Functions

3.2.1 Default Mode (operates in daytime, Day Mode):

The Default Mode is the main feature of the system. It should operate in the daytime. The system will be operating mostly in this mode. The system responds to the stimulus and switches states according to the finite state machine model, allowing traffic and pedestrians from each direction to go through the intersection in a appropriate sequence.

3.2.1.1 Pedestrian crossing button P3:

3.2.1.1.1 Functional Requirement 1.1.1

3.2.1.1.1.1 Introduction

Input from pedestrians (Button P3) will make the system switches to other states when appropriate.

3.2.1.1.1.2 Input

Pedestrians push Button P3

3.2.1.1.1.3 Processing

Input from pedestrians (Button P3) during the Default Mode will make the system switches to other states according to the transition table, which signals the pedestrians waiting to cross road 3 to go cross when appropriate.

3.2.1.1.1.4 Output

System remains in Default Mode, switches to corresponding states.

3.2.1.2 Vehicle Sensor S2:

3.2.1.2.1 Functional Requirement 1.2.1

3.2.1.2.1.1 Introduction

The sensor on road 2 should be able to detect if a vehicle is waiting for a light change and change the light when appropriate

3.2.1.2.1.2 Input

Vehicles waiting on Sensor S2 (on Road 2)

3.2.1.2.1.3 Processing

Input from vehicles (Sensor S2) during the Default mode will make the system switch from the current state, to a specific state specified by the finite state machine model Figure 4 Transition Table, which signals the vehicles in road 2 to go through the intersection when appropriate.

3.2.1.2.1.4 Output

System remains in Default Mode, switches to corresponding states.

3.2.1.3 Timer T1:

3.2.1.3.1 Functional Requirement 1.3.1

3.2.1.3.1.1 Introduction

Timer T1 will count down and switch the system between different states, based on the finite state machine model Figure 2 in Appendix B.

3.2.1.3.1.2 Input

Timer T1 fires as it finishes counting down

3.2.1.3.1.3 Processing

As Timer T1 fires, the system will switch from the current state, to a specific state specified by the finite state machine model Figure 4 Transition Table.

3.2.1.3.1.4 Output

System remains in Default Mode, switches to corresponding states.

3.2.1.4 Timer T2:

3.2.1.4.1 Functional Requirement 1.4.1

3.2.1.4.1.1 Introduction

Timer T2 will count down and switch the system between different states, based on the finite state machine model Figure 2 in Appendix B.

3.2.1.4.1.2 Input

Timer T2 fires as it finishes counting down

3.2.1.4.1.3 Processing

As Timer T2 fires, the system will switch from the current state, to a specific state specified by the finite state machine model Figure 4 Transition Table.

3.2.1.4.1.4 Output

System remains in Default Mode, switches to corresponding states.

3.2.1.5 Clock C:

3.2.1.5.1 Functional Requirement 1.5.1

3.2.1.5.1.1 Introduction

The Clock C will signal the system everyday without intervention to switch to night mode between 8pm and 6am, and signal the system to remain in day mode (the Default Mode) outside this time period.

3.2.1.5.1.2 Input

Clock C indicates time between 8pm and 6am, or the rest time period.

3.2.1.5.1.3 Processing

As the Clock C indicates time between 8pm and 6am, system switches to night mode. As the Clock C indicates time outside 8pm and 6am, system remains in day mode (the Default Mode).

3.2.1.5.1.4 Output

System remains in day mode (the Default Mode) or switches to Night Mode.

3.2.1.6 Hardware Malfunction M:

3.2.1.6.1 Functional Requirement 1.6.1

3.2.1.6.1.1 Introduction

As Hardware Malfunction M occurs, system will switch from Default Mode to the Emergency Mode.

3.2.1.6.1.2 Input

Hardware Malfunction M occurs

3.2.1.6.1.3 Processing

As Hardware Malfunction M occurs, system will switch from default mode to emergency mode.

3.2.1.6.1.4 Output

System changes to the Emergency mode.

3.2.2 Night Mode:

The system should switch to night mode at night. It makes light 2 and 3 Flashing Red, and turns everything off else except the clock. It allows traffic and pedestrians in road 1 to go through the intersection, while gives Flashing Red warnings to the other directions.

3.2.2.1 Clock C:

3.2.2.1.1 Functional Requirement 2.1.1

3.2.2.1.1.1 Introduction

The Clock C will signal the system everyday without intervention to remain in Night Mode between 8pm and 6am, and signal the system to switch back to day mode (the Default Mode) outside this time period.

3.2.2.1.1.2 Input

Clock C indicates time between 8pm and 6am, or the rest time period.

3.2.2.1.1.3 Processing

As the Clock C indicates time between 8pm and 6am, system remain in night mode. As the Clock C indicates time outside 8pm and 6am, system switches to day mode (the Default Mode).

3.2.2.1.1.4 Output

System switches to day mode (the Default Mode) or remains in night mode.

3.2.2.2 Hardware Malfunction M:

3.2.2.2.1 Functional Requirement 2.2.1

3.2.2.2.1.1 Introduction

As Hardware Malfunction M occurs, system will switch from Night Mode to the Emergency Mode.

3.2.2.2.1.2 Input

Hardware Malfunction M occurs

3.2.2.2.1.3 Processing

As Hardware Malfunction M occurs, system will switch from Night mode to emergency mode.

3.2.2.2.1.4 Output

System changes to the Emergency mode.

3.2.3 Emergency Mode:

The system should switch to emergency mode briefly when starting up, and in case of a hardware malfunction. It makes light 2 and 3 Flashing Red, and turns off everything else except the clock. It allows traffic and pedestrians in road 1 to go through the intersection, while gives Flashing Red warnings to the other directions.

3.2.3.1 System Reset Button:

3.2.3.1.1 Functional Requirement 3.1.1

3.2.3.1.1.1 Introduction

The system must be able to be reset with a button, the button should only be accessible by authorized personnel.

3.2.3.1.1.2 Input

Authorized personnel press Reset Button R.

3.2.3.1.1.3 Processing

After pressing the physical Reset Button R, the system will reset by changing from the emergency mode back to Default Mode or Night Mode based on the time in Clock C.

3.2.3.1.1.4 Output

System changes from the emergency mode to Day Mode (the Default Mode) during daytime; System changes from the Emergency Mode to Night Mode during night time.

3.2.3.2 Hardware Malfunction M:

3.2.3.2.1 Functional Requirement 3.2.1

3.2.3.2.1.1 Introduction

As Hardware Malfunction M occurs, the rest button is not pressed yet, system will remain in Emergency Mode.

3.2.3.2.1.2 Input

Hardware Malfunction M occurs, system haven't been reseted by the Reset Button R

3.2.3.2.1.3 Processing

As Hardware Malfunction M occurs, the rest button is not pressed yet, system will remain in Emergency Mode.

3.2.3.2.1.4 Output

System remains in Emergency mode.

3.3 Performance Requirements

PE-1: Any form of lag is unacceptable, since the users' safety is at stake

3.4 Logical database requirements

This section is not applicable, since no data about the users is stored.

3.5 Design constraints

the software must be written in a low level language such as c++ or c, that can be supported by the hardware.

3.6 Software system attributes

SQ-1: The software shall run 24/7 continuously

SQ-2: The software shall be thoroughly tested in a simulated environment before being deployed to the actual system

4. Other Nonfunctional Requirements

4.1 Performance Requirements

PE-1: Any form of lag is unacceptable, since the users' safety is at stake

4.2 Logical Database Requirements

This section is not applicable, since no data about the users is stored.

4.3 Safety Requirements

SE-1: If any hardware malfunctions, a signal **M** will be sent to the system, which will activate an emergency mode for the system

SE-2: The system shall only direct a user to cross the intersection when it is safe to do so

4.4 Security Requirements

SC-1: The embedded system itself should be physically locked so that only the Hardware Maintainer can access it. Unauthorized persons may not tamper with the system as this will affect the safety of Pedestrians and Drivers.

4.5 Software System Quality Attributes

SQ-1: The software shall run 24/7 continuously

SQ-2: The software shall be thoroughly tested in a simulated environment before being deployed to the actual system

4.6 Business Rules

BR-1: Only the Hardware Maintainer should be able to access the system physically, so that no one can tamper with it, as per Security Requirement 1.

5. Other Requirements

OE-1: The software design should obey regulations on traffic lights posted by the Canadian Transportation Agency (CTA)

OE-2: The timing of the traffic lights changing state should be in sync with nearby intersections to relieve congestion.

Appendix A: Analysis Models

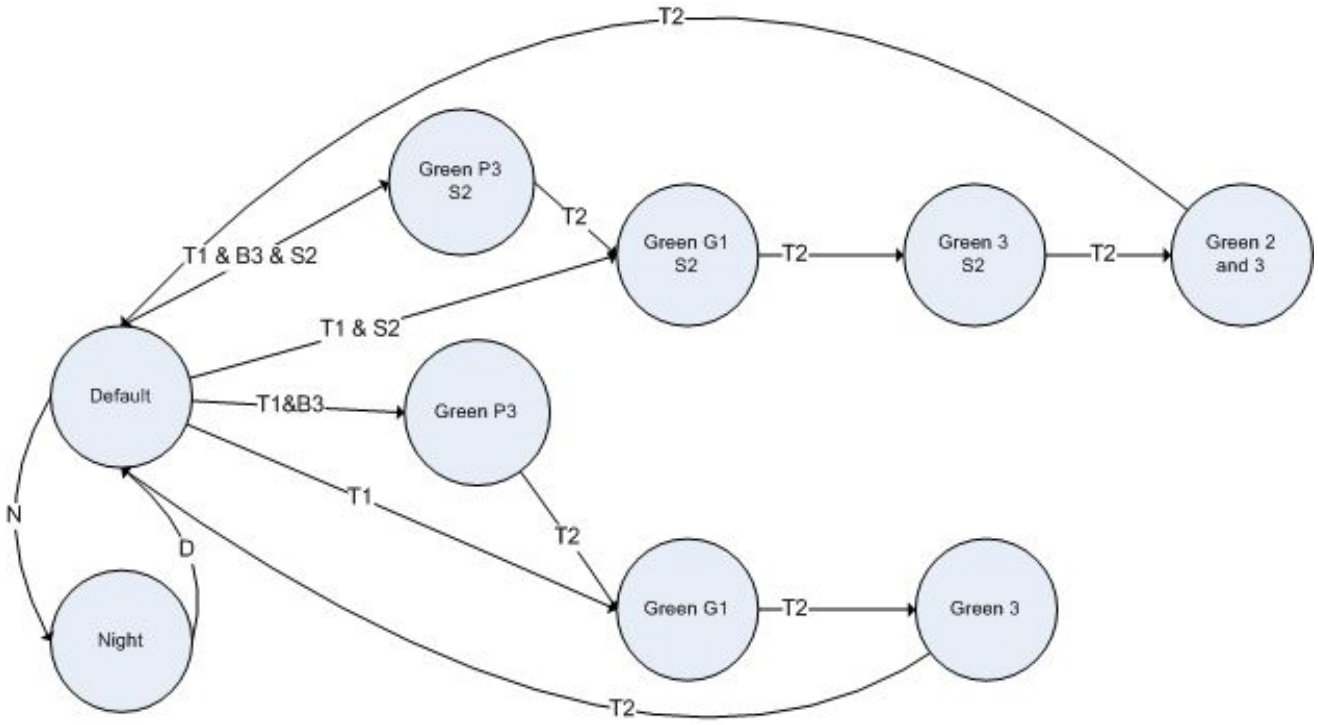

Figure 2
Finite state machine (FSM) model of the traffic lights system (TLS)

Inputs	1	2	3	G1	G3	P1	P2	P3	M	C	T1	T2	B3*	S2**
Valid states for given input / System states	G, R, Off	G, R, FR	G, R, FR	On, Off	On, Off	G, R, Off	G, R, Off	G, R, Off	On, Off	D, N	On, Off	On, Off	On, Off	On, Off
Default	G	R	R	Off	Off	R	G	R	Off	D	On	Off	Off	Off
DefaultB3	G	R	R	Off	Off	R	G	R	Off	D	On	Off	On	Off
DefaultS2	G	R	R	Off	Off	R	G	R	Off	D	On	Off	Off	On
DefaultB3S2	G	R	R	Off	Off	R	G	R	Off	D	On	Off	On	On
GreenP3	G	R	R	Off	Off	R	G	G	Off	D	Off	On	On	Off
GreenP3S2	G	R	R	Off	Off	R	G	G	Off	D	Off	On	On	On
GreenG1	R	R	R	On	Off	G	R	R	Off	D	Off	On	Off	Off
GreenG1S2	R	R	R	On	Off	G	R	R	Off	D	Off	On	Off	On
Green3	R	R	G	Off	On	R	R	R	Off	D	Off	On	Off	Off
Green3S2	R	R	G	Off	On	R	R	R	Off	D	Off	On	Off	On
Green2and3	R	G	G	Off	Off	R	R	R	Off	D	Off	On	Off	Off
Emergency	Off	FR	FR	Off	Off	Off	Off	Off	On	D/N	Off	Off	Off	Off
Night	Off	FR	FR	Off	Off	Off	Off	Off	Off	N	Off	Off	Off	Off

M denotes malfunction flag; C clock (day vs. night); T1 and T2 are timers
* "B3 = On" only if B3 was pressed before leaving the Default state
** "S2 = On" only if S2 was active before leaving the Default state

Figure 3
Description of all states and inputs of the FSM model.

System inputs / States	Timer T1 fires	B3 pressed	S2 activated	Timer T2 fires	Clock C indicates Daytime	Clock C indicates Nighttime	Malfunction M occurs	Reset button R is pressed and no malfunction M and Clock C indicates Daytime	Reset button R is pressed and no malfunction M and Clock C indicates Nighttime
Default	GreenG1	DefaultB3	DefaultS2			Night	Emergency		
DefaultB3	GreenP3		DefaultB3S2			Night	Emergency		
DefaultS2	GreenG1S2	DefaultB3S2				Night	Emergency		
DefaultB3S2	GreenP3S2					Night	Emergency		
GreenP3				GreenG1			Emergency		
GreenP3S2				GreenG1S2			Emergency		
GreenG1				Green3			Emergency		
GreenG1S2				Green3S2			Emergency		
Green3				Default			Emergency		
Green3S2				Green2and3			Emergency		
Green2and3				Default			Emergency		
Emergency							Emergency	Default	Night
Night					Default		Emergency		

Figure 4
Transition function table of the FSM

Appendix B: Use Cases

Use cases:

- UC-1 Return to Default Mode
- UC-2 Make G1 Green
- UC-3 Make Light 3 Green
- UC-4 Make P3 Green
- UC-5 Make Lights 2 and 3 Green
- UC-6 Activate Emergency Mode
- UC-7 Activate Night Mode

Primary Actor	Use cases
Pedestrian	UC-1, UC-2, UC-4, UC-5
Vehicle	UC-1, UC-2, UC-3, UC-4, UC-5, UC-6, UC-7
Maintenance Worker	UC-6
Malfunction input	UC-6
Timer t1	UC-1, UC-2, UC-4
Timer t2	UC-1, UC-2, UC-3, UC-4, UC-5

Use case ID: UC-1	**Use case name: Return to Default Mode**

Description/Story:

Story:

System signals the traffic on road 1 and pedestrians on P2 to go

Includes:

- UC-3 Make Light 3 Green
- UC-5 Make Lights 2 and 3 Green

Frequency of Use:

Every 60 to 90 seconds.

Special Requirements:

None.

Assumption:

None.

Notes/Issues:

None.

Pre-condition:

System in Green 3 mode and t2 has ended

System in Green 2&3 mode and t2 has ended

On system startup, after the brief emergency state

Post-condition:

Go to State Green P3 if t1 ends and B3 is pressed before switching state

Go to State Green G1 if t1 ends and no button was pressed

Actor(s):	**Package: N/A**
● Drivers ● Pedestrians	
Status: In Progress	**Priority:** Medium
Created by: Zhijie Shen	**Created Date: Oct 15th**

Normal flow:

1. Green 3 state
2. t2 counts down
3. Return to default mode

Alternative flow:

1. Green 2&3 state
2. t2 counts down
3. Return to default mode

Exceptions:

Hardware malfunctions -> Emergency Mode

Software issues

Business Requirements:

BO-1

Use case ID: UC-2	**Use case name: Make G1 Green**

Description/Story:

Story:

During day time, system signals traffic waiting at G1 to go by making G1 green.

At the same time, System signals pedestrians waiting at P1 to go by making P1 green. Everything else should turn red. The system stays in mode G1 Green until timer T2 finishes.

Includes:

UC-1 Return to Default Mode

UC-4 Make P3 Green

Frequency of Use:

Every couple minutes

Special Requirements:

None.

Assumption:

- All devices (traffic lights, magnetic sensor and pedestrian button) and malfunction input function correctly in all weather conditions.
- Current time is during the day (6:00-22:00)

Notes/Issues:

None.

Pre-condition:

System in Default Mode, and timer T1 finishes

or System in P3 Green Mode, and timer T2 finishes

Post-condition:

G1 and P1 turns green, everything else turns red

Timer T2 starts.

Actor(s):

- Pedestrian
- Vehicle
- Malfunction input
- Timer T2

Status: In Progress	**Priority:** Medium
Created by: Liyao Jiang	**Created Date:** Oct 15, 2018

Normal flow:

1. Green P3 state
2. t2 counts down
3. Make G1 Green (Green G1 state)

Alternative flow:

1. Default state
2. Vehicle is detected on S2 and t1 counts down
3. Make G1 Green (Green G1 state)

Exceptions:

Hardware malfunctions -> Emergency Mode

Software issues

Business Requirements:

Satisfies BO-1, BO-4, BO-5

Use case ID: UC-3	**Use case name: Make Light 3 Green**

Description/Story:

Story:

During daytime, the system signals the drivers waiting on road 3 to go. When this happens, G3 also switches green, while all other lights are red. The system remains in this state until timer t2 finishes.

Includes:

UC-2 Make G1 Green

Frequency of Use:

Very frequent (Every couple of minutes, depends on t1 and t2)

Assumption:

Current time is during the day (6:00-21:59)

Pre-condition:

System was in Green G1 state (i.e. G1 was green) and timer t2 finished

Post-condition:

Lights 3, G3 are green, everything else red

Timer t2 starts

Actor(s):

- Vehicles
- t2

Status: In Progress	**Priority:** Medium
Created by: Arun Woosaree	**Created Date: Oct 15, 2018**

Normal flow:

1. Green G1 state
2. t2 counts down
3. Make light 3 green (Green 3 state)

Alternative flow:

N/A

Exceptions:

Exception 1.0.E.1

Hardware malfunction -> Activate Emergency Mode

Business Requirements:

Component of BO-1

Use case ID: UC-4	**Use case name: Make P3 Green**

Description/Story:

Story:

When a pedestrian wants to cross road 3, a button B3 must be pressed. The pedestrian is then allowed to cross if pedestrian light P3 is green

Includes:

UC-1 Return to default state

Frequency of Use:

Frequently, every couple of minutes (depends on timers t1 and t2)

Assumption:

Current time is during the day (6:00-21:59)

Pre-condition:

System in default state, a pedestrian pressed B3, and timer t1 has counted down

Post-condition:

Lights 1, P2, P3 are green, rest are red

Timer t2 starts

Actor(s):

- Vehicles
- Pedestrians
- t2

Status: In Progress	**Priority:** Medium
Created by: Arun Woosaree	**Created Date: Oct 15 2018**

Normal flow:

1. Default state
2. B3 pushed by pedestrian, and t1 counts down
3. Make P3 Green (Green P3 state)

Alternative flow:

N/A

Exceptions:

Hardware malfunction -> Activate Emergency Mode

Software issues

Business Requirements:

BO-1, BO4

Use case ID: UC-5	**Use case name: Make Lights 2**

	and 3 Green
Description/Story: **Story:** When a vehicle is present at road 2, the system is expected to detect that and be able to turn light 2 green when it is safe to do so. **Includes:** UC-3 Make Light 3 Green **Frequency of Use:** Low frequency **Special Requirements:** None **Assumption:** S2 is functioning correctly **Notes/Issues:** None	
Pre-condition: S2 detected vehicle and in State Green 3	
Post-condition: Default state	
Actor(s): Drivers	**Package:**

Status: In Progress	**Priority:** Medium
Created by: Zhijie Shen	**Created Date: Oct 15**

Normal flow:

1. Green 3 state (with vehicle detected on S2)
2. Vehicle detected on S2 and t2 counts down
3. Make lights 2 and 3 green (Green 2&3 state)

Alternative flow:

N/A

Exceptions:

Hardware malfunction -> Activate Emergency Mode

Software issues

Business Requirements:

N/A

Use case ID: UC-6	**Use case name: Activate Emergency Mode**

Description/Story:

Story:

Simple description of the use case

Includes:

UC-1 Return to Default state

Frequency of Use:

Rarely, only in case of emergencies

Assumption:

None

Pre-condition:

Malfunction input received

Post-condition:

Return to default state if hardware is fixed by maintenance worker

Actor(s):

- Vehicles
- Pedestrians
- Maintenance Worker

Status: In Progress	**Priority:** High
Created by: Arun Woosaree	**Created Date: Oct 15, 2018**

Normal flow:

1. Hardware malfunction (Malfunction signal received)
2. Activate Emergency Mode (Maintenance worker will fix later)

Alternative flow:

1. System starts up after hardware malfunction is fixed
2. Emergency mode is briefly activated before returning to default state

Exceptions:

Software issues

Business Requirements:

BO-1, BO-3

Use case ID: UC-7	**Use case name: Activate Night Mode**

Description/Story:

Story:

The system enters night mode without the external intervention between 8pm am and 6 am every day.

Includes:

None.

Frequency of Use:

Everyday

Special Requirements:

None.

Assumption:

All devices (traffic lights, magnetic sensor and pedestrian button) and malfunction input function correctly in all weather conditions.

Notes/Issues:

Noen.

Pre-condition:

Time is at 8:pm am

Post-condition:

Time is after 6:00 am

Actor(s):

- Vehicles
- Pedestrians
- Maintenance Worker

Status: In Progress	**Priority:** Medium
Created by: Liyao Jiang	**Created Date:** Oct 20, 2018

Normal flow:

1. Clock changes from Day (6:00-21:59) to Night (22:00-5:59)
2. Activate Night Mode

Alternative flow:

N/A

Exceptions:

Hardware malfunction -> Activate Emergency Mode

Software issues

Business Requirements:

- BO-2