System Design for 4TB6 - Mechatronics Capstone

Team #5, Locked & Loaded
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1 Revision History

Date	Version	Developer
January 16, 2023	1.0	Steffi

2 Reference Material

This section records information for easy reference.

2.1 Abbreviations and Acronyms

symbol	description
4TB6 - Mechatronics Capstone	Explanation of program name
[... —SS]	[... —SS]

Contents

List of Tables

List of Figures

3 Introduction

[Include references to your other documentation —SS]

4 Purpose

[Purpose of your design documentation —SS]
[Point to your other design documents —SS]

5 Scope

[Include a figure that show the System Context (showing the boundary between your system and the environment around it.) —SS]

6 Project Overview

6.1 Normal Behaviour

6.2 Undesired Event Handling

[How you will approach undesired events —SS]

6.3 Component Diagram

6.4 Connection Between Requirements and Design

[The intention of this section is to document decisions that are made "between" the requirements and the design. To satisfy some requirements, design decisions need to be made. Rather than make these decisions implicit, they are explicitly recorded here. For instance, if a program has security requirements, a specific design decision may be made to satisfy those requirements with a password. —SS]

7 System Variables

7.1 Monitored Variables

Variable Name	Description	Type	Units
m_SignalEngaged	Monitors whether or not the locking mechanism is engaged	Digital	Boolean
m_SignalDisengaged	Monitors whether or not the locking mechanism is disengaged	Digital	Boolean
m_SignalClosed	Monitors whether or not the physical mechanism is closed	Digital	Boolean
m_Location	Monitors the location of the bike when it is locked	Analog	Coordinates
m_BatteryPower	Monitors the current battery percentage	Analog	Percentage

7.2 Controlled Variables

Variable Name	Description	Type	Units
c_LockEngaged	Engages the lock	Digital	Boolean
c_LocklDisengaged	Disengages the lock	Digital	Boolean
c_LockClosed	Indicates to the user that the latch is closed	Digital	Boolean
c_BikePosition	Marks the location of the bike when it is locked	Analog	Coordinates
c_BatteryPercentStatus	Indicates what the percentage of the battery is	Analog	Percentage

7.3 Constants Variables - NA

8 User Interfaces

There are two user interfaces related to our product. The first is through an application (SmartLock) and the second is the lock itself where the user will be required to manually open/close the chain to secure the bike.

The application is where the user will be able to disengage their lock and locate where it was left with the Geotagging feature.

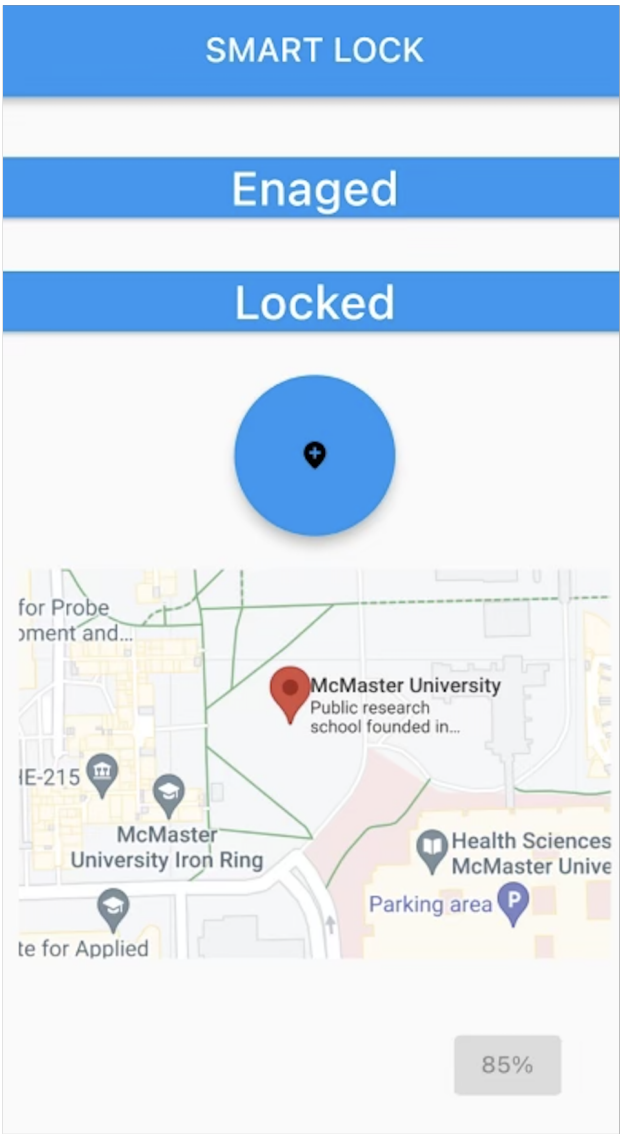

Figure 1: Application User Interface

The hardware will be mounted to the bike, which will require user interaction upon the purchase of the SmartLock. Additionally, the user must push the locking pin into the hole to engage the lock, and disengage the lock with their phone to be able to remove the pin.

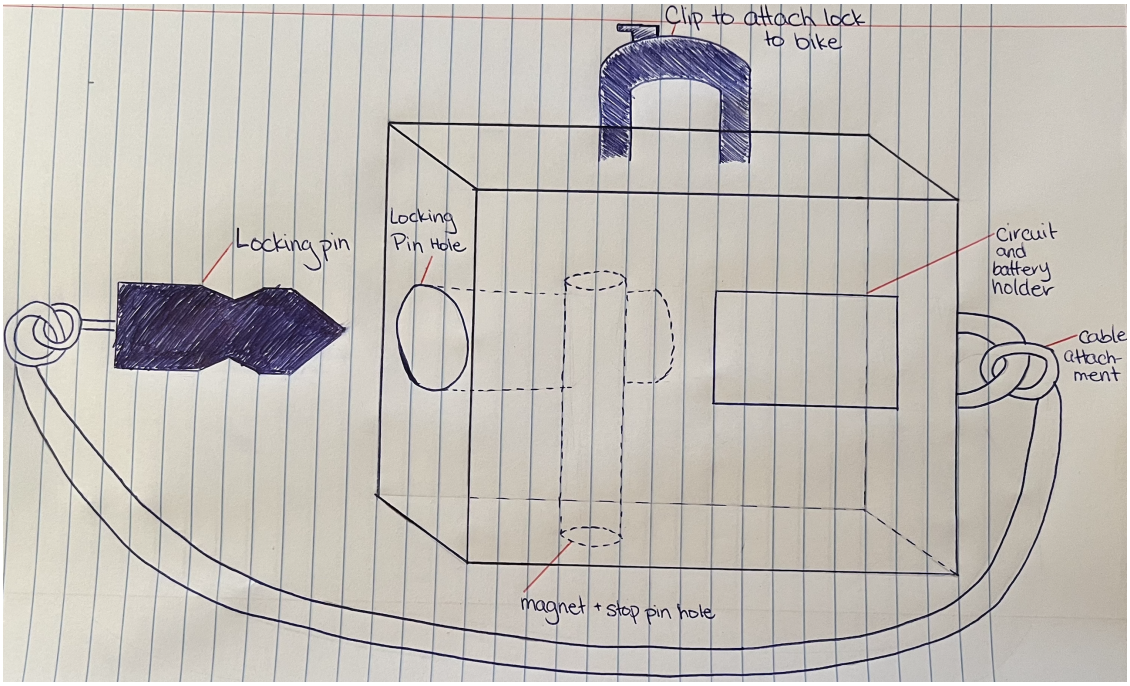

Figure 2: Hardware User Interface

9 Design of Hardware

[Most relevant for mechatronics projects —SS] [Show what will be acquired —SS] [Show what will be built, with detail on fabrication and materials —SS] [Include appendices as appropriate, possibly with sketches, drawings, CAD, etc —SS]

10 Design of Electrical Components

[Most relevant for mechatronics projects —SS] [Show what will be acquired —SS] [Show what will be built, with detail on fabrication and materials —SS] [Include appendices as appropriate, possibly with sketches, drawings, circuit diagrams, etc —SS]

11 Design of Communication Protocols

[If appropriate —SS]

12 Timeline

Date	Description	Group Member Assigned
January 16	Housing Design	Abi, Elsa & Steffi
January 18	Design Documentation	MG - Elsa MIS - Abi & Anthony SystDes - Steffi
January 22	CAD of Housing Design	Steffi
January 22	Circuit	Stephen
January 22	App	Anthony
January 22	Arduino Coded	Abi
January 25	Arduino and Circuit Testing	Abi & Stephen
January 29	Housing 3D Printed	Abdul
February 1	Assemble Housing and Circuit	Steffi & Stephen
February 1	All Documentation has been updated to reflect current project including Git issues & battery calculations	Elsa
February 4	Rev 0 Testing	Everyone
February 6	Rev 0 Demonstration	App & Arduino - Anthony & Abi Circuit - Stephen Housing - Steffi & Elsa Documentation Elsa & Steffi
March 8	V & V Report Rev 0	Everyone (Reqs divided by area of expertise on Rev 0 Demonstration)
March 20	Final Demonstration	Everyone (Divided by areas of work)
April 5	Final Documentation	Everyone (Divided by areas of work)
TBD	EXPO	Everyone (Divided by areas of work)

13 Appendix

13.1 Interface - included in section 8

13.2 Mechanical Hardware

13.3 Electrical Components

13.4 Communication Protocols

13.5 Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Problem Analysis and Design. Please answer the following questions:

1. What are the limitations of your solution? Put another way, given unlimited resources, what could you do to make the project better? (LO_ProbSolutions)

2. Give a brief overview of other design solutions you considered. What are the benefits and tradeoffs of those other designs compared with the chosen design? From all the potential options, why did you select documented design? (LO_Explores)