**Keyless Door Locking System**

**Project Design Specification and Requirements Document**

*Version 1.1*

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**By**

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1. **Background**

Keys are small and very easy to lose. They are also a hassle to use in the dark because the key hole cannot be seen and insertion of the key is not easy in such a situation. To top that off if they are not physically present in the same location as the door it is not possible to unlock it.

According to IKEA, if the key were to be eliminated from the equation we could save an average of 6 minutes in the morning, which is the amount of time we spend looking for our keys. We could also solve other problems like allowing our kids into the house even when we are not at home, or giving access to a delivery person so they can place our package inside the house among other things. The possibilities are endless.

1. **Needs Statement**

Today, to lock or unlock doors either we are using physical keys or cards. The limitations of the current practice is that if a key or card is lost, the door can’t be unlocked. According to IKEA, We spend an average of 6 minutes in the morning looking for our keys. We often lose items because of “a breakdown at the interface of attention and memory” says Daniel L. Schacter, a psychology professor at Harvard University. A solution must be found to alleviate some of the burden of looking for lost items in particular keys which cost the average person roughly 36 hours per year.

1. **Objective**

In order to solve the problems presented by the locking mechanism used in most residences today we propose to create a keyless door locking system which is cheap, durable, and easy to use.

1. **Requirements** 
   1. **Hardware Requirements**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Use a two layer PCB that is between 9 and 900 cm2 | Must | External constraint |
| Have a PCB with no side of the board being less than 2 cm or more than 30 cm. | Must | External constraint |
| Have Digital or Analogue processor | Must | External constraint |
| Have the processor on the PCB | Must | External constraint |
| Have one or more sensors | Must | External constraint |
| Have one or more actuators | Must | External constraint |
| Must use components that can be hand soldered or easily soldered in a crude reflow oven. | Must | External constraint |
| Must have at least 25% surface mount components | Must | External constraint |

* 1. **Functional Requirements**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Unlock and lock without the use of a key | Must | The purpose of the project is to eliminate the use of a key to unlock and lock doors |
| Only permit access to authorized users | Must | If anyone can unlock the door then it wouldn’t be safe |
| Stay locked if power is lost to system | Must | It wouldn’t be safe otherwise |
| Allow entry in case of power outage | Must | No one would buy it otherwise because they would get locked out in a power outage |
| Provide a log of when the lock was locked or unlocked | Should | To allow the owner to check when someone entered the house |
| Provide a log of who locked/ unlocked the door | should | To allow the owner to check who entered/left the house |
| Be connected to the internet | May | So it can be integrated with surveillance systems |
| Notify user if lock has been physically damaged | May | To allow the user to know that the lock has been compromised |
| Have an EDs that illuminates when door is opened | May | To visually alert the user that the door is unlocked |

* 1. **Performance Requirements**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Successfully lock and unlock 99.5% of the time | Must | No one would want to use it otherwise |
| Can receive multiple lock and unlock requests from authorized users without glitching | Must | In case the user accidently sends too many requests |

* 1. **Economic and Marketing Requirements**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Must be less than $70 per unit | Must | Otherwise it would be too expensive / to increase sales |
| Should not use non-standard components | Must | They are more expensive to buy and are harder to find in case a repair is needed |

* 1. **Power Requirements**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Be connected to the power grid | Must | So that the user doesn’t have to worry about forgetting to replace the battery and getting locked out |
| Have a battery in case of a power outage | May | One possible solution for entry when there is a power outage |

* 1. **Maintainability**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Can be replaced by a novice in 20 minutes | Must | In case the unit becomes defective |
| Have Code and engineering documentation | Must | External constraint |
| Allows replacement of worn parts | Should | So the user doesn’t have to buy a new unit every time something goes wrong |
| Can be maintained with readily available tools | Should | Otherwise it would be more costly to the user |

* 1. **Operational Environment**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| Can operate from a temperature of | Must | So that it can work in all weather conditions |

* 1. **Usability**

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| --- | --- | --- |
| **Requirement** | **Priority** | **Justification** |
| User can figure out how to use the device in 5 minutes by reading the instructions the first time around | Must | If it is too complicated people won’t buy it |