

Software Requirements Specification for SE 4G06, TRON 4TB6: subtitle describing software

Team 26, STRONE

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Contents

1	Project Drivers	1
1.1	The Purpose of the Project	1
1.2	The Stakeholders	1
1.2.1	The Client	1
1.2.2	The Customers	1
1.2.3	Other Stakeholders	1
1.3	Constraints	1
1.3.1	Solution Constraints	1
1.3.2	Implementation Environment of the Current System	1
1.3.3	Partner or Collaborative Applications	1
1.3.4	Anticipated Workplace Environment	1
1.3.5	Schedule Constraints	1
1.3.6	Budget Constraints	1
1.3.7	Enterprise Constraints	1
1.4	Naming Conventions and Terminology	1
1.4.1	Definitions of All Terms, Including Acronyms, Used by Stakeholders Involved in the Project	1
1.4.2	Relevant Facts and Assumptions	1
1.4.3	Relevant Facts	1
1.4.4	Assumptions	1
2	Functional Requirements	1
2.1	The Scope of the work and the Product	2
2.1.1	Context Diagram	2
2.1.2	Individual Product use Cases	3
2.2	Functional Requirements	3
3	Non-Functional Requirements	4
3.1	Look and Feel Requirements	4
3.1.1	Appearance Requirements	4
3.1.2	Style Requirements	4
3.2	Usability and Humanity Requirement	5
3.2.1	Ease of Use Requirements	5
3.2.2	Personalization and Internationalization Requirements	5
3.2.3	Learning Requirements	5
3.2.4	Understandability and Politeness Requirements	6
3.2.5	Accessibility Requirements	6
3.2.6	Convenience Requirements	6
3.3	Performance Requirements	7
3.3.1	Speed and Latency Requirements	7
3.3.2	Safety-Critical Requirements	7

3.3.3	Precision or Accuracy Requirements	7
3.3.4	Reliability and Availability Requirements	8
3.3.5	Robustness or Fault-Tolerance Requirements	8
3.3.6	Capacity Requirements	8
3.3.7	Scalability or Extensibility Requirements	9
3.3.8	Longevity Requirements	9
3.4	Operational and Environmental Requirements	9
3.4.1	Expected Physical Environment	9
3.4.2	Requirements for Interfacing with Adjacent Systems	10
3.4.3	Productization Requirements	10
3.4.4	Release Requirements	10
3.5	Maintainability and Support Requirements	10
3.5.1	Maintenance Requirements	10
3.5.2	Supportability Requirements	10
3.5.3	Adaptability Requirements	11
3.6	Security Requirements	11
3.6.1	Access Requirements	11
3.6.2	Integrity Requirements	11
3.6.3	Privacy Requirements	12
3.6.4	Audit Requirements	12
3.6.5	Immunity Requirements	12
3.7	Cultural Requirements	12
3.7.1	Cultural Requirements	12
3.8	Legal Requirements	13
3.8.1	Legal Compliance Requirements	13
3.8.2	Standards Compliance Requirements	13
3.9	Health and Safety Requirements	13
4	Monitor and Control variables - Taranjit	14
5	Traceability Everyone at end, needs 2 and 3 done first	14
5.1	Traceability Matrix	14
6	Project Issues Taranjit Jordan	14
6.1	Requirements Likely/Unlikely to Change	14
6.2	Off-the-Shelf Solutions	14
6.3	Tasks	14
6.3.1	Project Planning	14
6.3.2	Planning of the Development Phases	15
6.4	Costs	15
6.5	User Documentation and Training	16
6.6	Risks	16
6.7	Future Developments	16

Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

1 Project Drivers

1.1 The Purpose of the Project

1.2 The Stakeholders

1.2.1 The Client

1.2.2 The Customers

1.2.3 Other Stakeholders

1.3 Constraints

1.3.1 Solution Constraints

1.3.2 Implementation Environment of the Current System

1.3.3 Partner or Collaborative Applications

1.3.4 Anticipated Workplace Environment

1.3.5 Schedule Constraints

1.3.6 Budget Constraints

1.3.7 Enterprise Constraints

1.4 Naming Conventions and Terminology

1.4.1 Definitions of All Terms, Including Acronyms, Used by Stakeholders Involved in the Project

1.4.2 Relevant Facts and Assumptions

1.4.3 Relevant Facts

1.4.4 Assumptions

2 Functional Requirements

Definitions of All Terms, Including Acronyms, Used by Stakeholders Involved in the Project.
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2.1 The Scope of the work and the Product

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2.1.1 Context Diagram

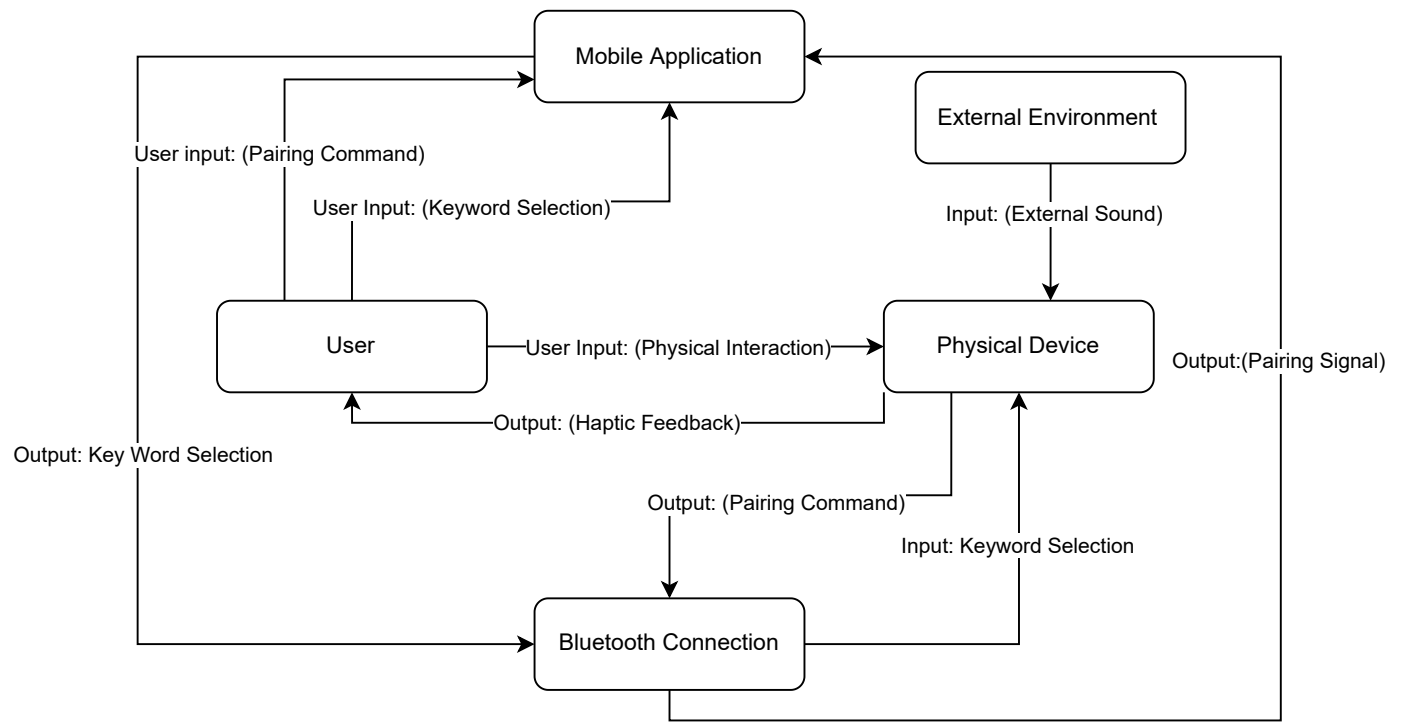


Figure 1: Context Diagram

2.1.2 Individual Product use Cases

2.2 Functional Requirements

Requirement No	FR-1
Description	The device is able to pick up sounds in the environment of the user.
Fit Criterion	The data received by the device shall match the sounds supplied to the device's surroundings.
Dependencies	N/A

Requirement No	FR-2
Description	The device has to be able to classify different sounds.
Fit Criterion	Will compare test sounds and the device classifications shall match the true classification of the sounds.
Dependencies	FR-001, FR-003

Requirement No	FR-3
Description	The device has to be able to set or change its classification.
Fit Criterion	The sound classifications shall match the sent classifications.
Dependencies	N/A

Requirement No	FR-4
Description	The device is able to provide feedback to the user.
Fit Criterion	The feedback should alert the user that the device is trying to communicate some information.
Dependencies	N/A

Requirement No	FR-5
Description	The feedback provided is the appropriate feedback.
Fit Criterion	The feedback shall convey what signal classification was detected.
Dependencies	FR-002, FR-004

3 Non-Functional Requirements

3.1 Look and Feel Requirements

3.1.1 Appearance Requirements

Requirement No	NFR-1
Description	<ul style="list-style-type: none">• The UI of the application will contain a home page that displays the company logo and an option to pair the device.• The UI of the application will have buttons which will have different colors for different functionalities.• The UI will have a separate page for pairing the device and a page for configuring which voices you want to be alerted by.• The device will be a uniform material finish and contain an on button and Bluetooth pairing button.• The device will have a distinguished charging port built into the finished material.
Fit Criterion	Check that the UI and Device satisfy mandated requirements.
Dependencies	NFR-2

3.1.2 Style Requirements

Requirement No	NFR-2
Description	<ul style="list-style-type: none">• The UI will use consistent buttons, fonts, and color palette.• The device will automatically begin the pairing process when button is pressed• Buttons on the UI should be easily identified and responsive.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	NFR-1

3.2 Usability and Humanity Requirement

3.2.1 Ease of Use Requirements

Requirement No	NFR-3
Description	<ul style="list-style-type: none">• The Device shall be usable by any user with basic understanding of mobile applications and bluetooth devices.• The product should provide support that assists users in avoiding mistakes.
Fit Criterion	90% of a sample group can go through the application without a manual.
Dependencies	NFR-4, NFR-1

3.2.2 Personalization and Internationalization Requirements

Requirement No	NFR-4
Description	<ul style="list-style-type: none">• Devices should allow users to pick and choose their desired sounds to be notified by.• Application of the product should allow users to choose preferred language• User Manual for the device will be written in primary language of each region device is sold
Fit Criterion	A sample group shall be able to change and manage their preferences.
Dependencies	FR-3

3.2.3 Learning Requirements

Requirement No	NFR-5
Description	This Device and the corresponding application shall be able to be used by users with no prior training within 5 minutes.
Fit Criterion	A sample group shall take less than 5 minutes to start using the product.
Dependencies	NFR-3

3.2.4 Understandability and Politeness Requirements

Requirement No	NFR-6
Description	The device and the application will use icons when the icon is commonly associated with a standard action such as a blue-tooth logo for pairing.
Fit Criterion	Check that the UI and Device satisfy mandated requirements.
Dependencies	N/A

3.2.5 Accessibility Requirements

Requirement No	NFR-7
Description	Anybody who can operate a mobile device and is capable of wearing a ring/bracelet will be able to operate the device.
Fit Criterion	Same fit criteria as NFR-3
Dependencies	NFR-3

3.2.6 Convenience Requirements

Requirement No	NFR-8
Description	If the phone falls out of range, the device should automatically re-pair to a known device when the device is back in range.
Fit Criterion	POC testing when a phone gets disconnected it should connect back when back in range.
Dependencies	N/A

3.3 Performance Requirements

3.3.1 Speed and Latency Requirements

Requirement No	NFR-9
Description	<ul style="list-style-type: none">• The device shall process sound and react, with haptic feedback, if keywords are found in 1 second of response time• Interactions between the user and UI should have a response time of 1ms• First time pairing of the device should take no longer than 1 minute• Recurring connections of the device should take no longer than 10 seconds.
Fit Criterion	Check that the device satisfies the above requirements.
Dependencies	FR-1, FR-2, FR-4, FR-5, NFR-3, NFR-8

3.3.2 Safety-Critical Requirements

Requirement No	NFR-10
Description	Battery of the device should be shielded to prevent any direct contact with the user.
Fit Criterion	When the device is worn there is no way to directly touch the hardware components other than the buttons and ports.
Dependencies	N/A

3.3.3 Precision or Accuracy Requirements

Requirement No	NFR-11
Description	Devices shall only miss-process noise or give a false haptic feedback once in every x amount of processes (Where x is determined by the team).
Fit Criterion	Check that the device satisfies the above requirements.
Dependencies	FR-2, FR-5, NFR-9

3.3.4 Reliability and Availability Requirements

Requirement No	NFR-12
Description	<ul style="list-style-type: none">• Battery life of the device should last for 12 hours of use.• Sound sensor should be listening for keywords at all times while the device is powered on.• Application should have an uptime of 24 hours a day, 365 days a year.
Fit Criterion	Check that the device satisfies the above requirements.
Dependencies	FR-1, NFR-9

3.3.5 Robustness or Fault-Tolerance Requirements

Requirement No	NFR-13
Description	<ul style="list-style-type: none">• Device should be able to filter out noise in loud environments while still picking up on keywords.• Device should still function even if the bluetooth gets disconnected from the user's mobile device.
Fit Criterion	Testing of accuracy in different environments
Dependencies	FR-1, NFR-11

3.3.6 Capacity Requirements

Requirement No	NFR-14
Description	<ul style="list-style-type: none">• System should only record the 5 keywords as chosen by the user of the device.• Application should record the inputted keywords by the user even if the application is closed.
Fit Criterion	Check that the device satisfies the above requirement.
Dependencies	NFR-9

3.3.7 Scalability or Extensibility Requirements

Requirement No	NFR-15
Description	The device should be capable of processing the current 5 keywords and upwards of 5 additional keywords two years after launch.
Fit Criterion	NFR-14 shall be achieved along with scope that more words can be added.
Dependencies	NFR-14

3.3.8 Longevity Requirements

Requirement No	NFR-16
Description	The Device should have an expected lifetime of 5 years considering regular maintenance and use cases.
Fit Criterion	The estimated battery lifecycle shall be above 5 years.
Dependencies	NFR-12

3.4 Operational and Environmental Requirements

3.4.1 Expected Physical Environment

Requirement No	NFR-17
Description	<ul style="list-style-type: none">• The device will be used by individuals in normal day to day activities.• The product dimensions should allow fitment on either wrist or finger of the user.• The application shall run on any mobile device that is using an IOS or Android operating system.
Fit Criterion	Using a study group check that the device operates during normal day activities, fits on all users, and runs on their desired phones.
Dependencies	N/A

3.4.2 Requirements for Interfacing with Adjacent Systems

Requirement No	NFR-18
Description	The device will be able to interface with an application running on the user's mobile device.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.4.3 Productization Requirements

N/A

3.4.4 Release Requirements

Requirement No	NFR-19
Description	Yearly software releases will be deployed to improve the signal processing of the device as well as to maintain the corresponding application of the device.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.5 Maintainability and Support Requirements

3.5.1 Maintenance Requirements

Requirement No	NFR-20
Description	Updates to the software of the device should only require the application to be down for one day at a time.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.5.2 Supportability Requirements

N/A

3.5.3 Adaptability Requirements

Requirement No	NFR-21
Description	Product is expected to interface with Android and IOS mobile devices.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.6 Security Requirements

3.6.1 Access Requirements

Requirement No	NFR-22
Description	<ul style="list-style-type: none">• Nobody will have access to the signals being processed. Sounds should be processed and deleted in real time.• Any user will have access to the UI of the application but only developers will have access to the backend of the code.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.6.2 Integrity Requirements

Requirement No	NFR-23
Description	The device will filter out redundant external noise in order to improve the integrity of our signal processing.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.6.3 Privacy Requirements

Requirement No	NFR-24
Description	The product will protect the users right to privacy by not keeping a record of the data it takes in for the signal processing.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.6.4 Audit Requirements

N/A

3.6.5 Immunity Requirements

N/A

3.7 Cultural Requirements

3.7.1 Cultural Requirements

Requirement No	NFR-25
Description	<ul style="list-style-type: none">• The product will only support English at launch but will strive to include more languages based on regions of purchase.• The application and the device will both have zero references pertaining to religions, ethnic groups or any cultures.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.8 Legal Requirements

3.8.1 Legal Compliance Requirements

Requirement No	NFR-26
Description	The product will comply with all laws and regulations pertaining to regions where it is sold and distributed.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.8.2 Standards Compliance Requirements

Requirement No	NFR-27
Description	Product will adhere to any Open License agreements.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

3.9 Health and Safety Requirements

Requirement No	NFR-28
Description	<ul style="list-style-type: none">• Product will use certified batteries.• Product will use haptic feedback that is not intrusive to the user.
Fit Criterion	Check that all buttons of the UI and the Device correctly communicate back.
Dependencies	N/A

4 Monitor and Control variables - Taranjit

5 Traceability Everyone at end, needs 2 and 3 done first

5.1 Traceability Matrix

6 Project Issues Taranjit Jordan

6.1 Requirements Likely/Unlikely to Change

6.2 Off-the-Shelf Solutions

6.3 Tasks

6.3.1 Project Planning

- The Life Cycle will take on the V-Model
- Development approach will utilize CI/CD Pipeline

6.3.2 Planning of the Development Phases

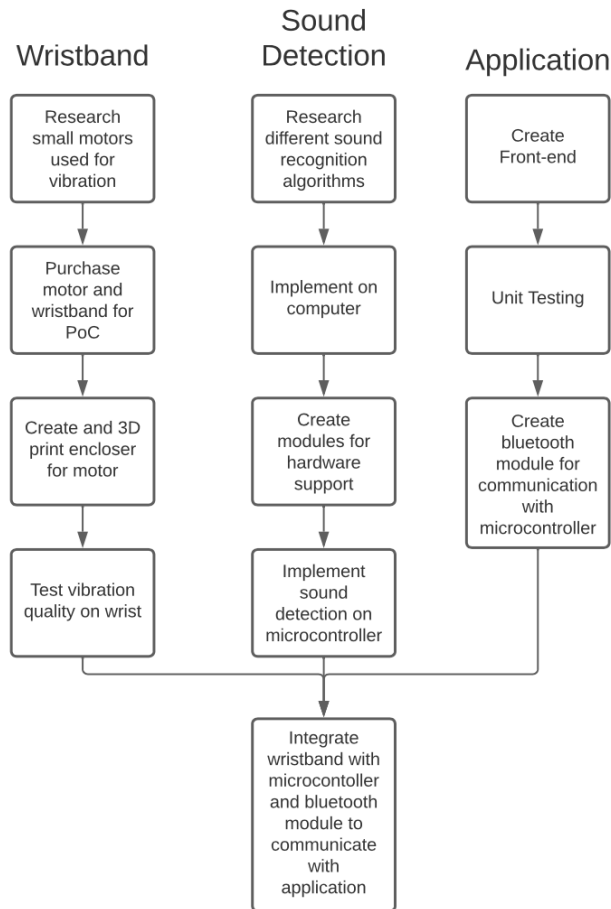


Figure 2: Tasks Diagram

6.4 Costs

Highlighted below are the cost estimates for the project's physical system. Avoidable costs are the environmental set up and software, this is due to universal resource availability.

Project Cost	
Description	Cost (in Canadian Dollars)
FLORA Arduino Microcontroller	14.95
SparkFun Analog MEMS Microphone	6.95
Tatoko DC Motor	25.04
Silicone Watch Strap	15.50
5V Battery	20.20
Memory Card Reader	6.94

Table 1: Project Cost

6.5 User Documentation and Training

Documentation of the features and user application of the product will be provided in written and video format enabled with a unique QR code, which will be provided in packaging of the product. Required training of the product will be needed to record initial sound detection. This is provided in the same user documentation used in the set-up stages.

6.6 Risks

- Inaccurate sound detection - retrain that particular sound to increase accuracy of product
- Wrong vibration pulse - reselect how many pulses required for particular sound
- Incorrect application signals - reboot device and user application to re sync user settings

6.7 Future Developments

Future developments will be conducted in different versions, listed below are the corresponding order from version 1.0 - version 4.0.

- Double the microphones for improved sound detection
- Controlled vibration sensitivity through user application
- User LED display
- Compact design to fit in a wearable ring or necklace

References

Reflection Appendix

Jordan Bierbrier - Knowledge of signals/systems along with memory management Azriel Gingoyon - Knowledge of electrical circuitry Taranjit Lotey - Knowledge of object-orientated programming for application development Udeep Shah - Abraham Taha - The two methods of acquiring this knowledge will be textbooks and the web. Textbooks will be used to grasp general knowledge or concepts where as the web will be needed to put our knowledge into practice.

Taranjit Lotey - Will be utilizing the web to master skills needed to have a deployable application. Main focus will be on retaining information on certain functions and header files needed to create a user interface. Proxy communication will be required to communicate between the backend embedded system and frontend application.

Please include an Appendix in your SRS documents that reflects on the graduate attribute of lifelong learning. The reflection should answer two questions:

What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain-specific knowledge from the domain of your application, software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, writing, presentation, team management, etc. You should look to identify at least one item for each team member.

For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? From the identified approaches, which will each team member pursue, and why did they make this choice?

The Appendix does not need to be long. One or two pages should be adequate.