

# Team Project: Developing and testing a simulation of RaDoTech health monitoring device<sup>1</sup>

**Due Fri Dec 6th**

Team work submitted individually on Brightspace as a tar or zip file named teamX.tar or teamX.zip, where X is your team number. **Mandatory design-code reviews will be individual starting on Monday Dec 9<sup>th</sup>.** The scheduling details will be announced the week before and the project review-demo times will be arranged between you and your assigned TA. The implementation and testing are to be in C++ using the Qt framework on the course VM (COMP3004-F24). **You are required to use GitHub:** make sure your repository is private and that you provide access to your assigned TA. You are encouraged to check your progress on a weekly basis with myself and the TAs. **Do not wait until the last minute.**

## Deliverables (5 parts)

- **Use cases**
- **Design documentation** – structure and behavior
  - UML Class diagram
  - UML Sequence diagrams for scenarios covering normal and safety operation, to be determined
  - UML State machine diagrams
    - For any control entities
  - Textual explanation of your design decisions that can include references to any conversation with your assigned TA or myself to clarify requirements or check your documentation artifacts.
- **Implementation**
  - Source code of your Qt C++ project that builds and runs on the course VM (COMP3004-F24.ova found at <https://carleton.ca/scs/tech-support/virtual-machines/>)
  - Execution of tests based on the above scenarios
- **Video:** record a video of running your simulation through the above specified scenarios
- **Requirements traceability matrix**

## Objectives

- Analyze requirements based on provided material and develop use case(s).
- Develop a software architecture that supports data collection, processing, and visualization.
- Test your implementation.
- Relate the modeling, design, implementation and testing through a Requirements Traceability Matrix.

---

<sup>1</sup> This project has been specified with help of Igor Radonjić.

## Project Overview

This project involves designing and implementing a simulation of a health monitoring device called RaDoTech. RaDoTech uses Japanese Ryodoraku technology to measure electrical output from various points on the body, providing insights into the functional health of the user. Your program should simulate use of the device similar to the following

“Here’s How to Perform Your First Scan With RaDoTech”

[https://www.youtube.com/watch?v=Hpl\\_sljE0HI](https://www.youtube.com/watch?v=Hpl_sljE0HI)

## Project Requirements

### 1. Functional Requirements:

- **User Management:** Create, update, and delete user profiles. Each device should support multiple profiles (up to five).
- **Data Collection:** Interface with RaDoTech hardware to collect health data.
- **Skin contact:** Show the device contacting or not contacting the skin. Successive measurements require lifting the device off the skin and putting it back on the next point.
- **Data Processing:** Process raw data to generate health metrics as you understand it based on 1) answers you received from the Product Owner, and/or 2) from your own research. Specify this in your documentation.
- **Data Visualization:** Display health metrics in an easy-to-understand, visual format within the application.
- **Recommendations:** Provide a place-holder for specialists’ recommendation.
- **Historical Data:** Store and allow users to access historical health data for trend analysis.
- **Device battery power:** Show charge depletion and low power indication.

### 2. Non-Functional Requirements:

- **Scalability:** Ensure the system can handle a growing number of users and data points.
- **Usability:** Ensure the application is intuitive and user-friendly.

## RaDoTech background

RaDoTech is a personal health monitoring device that uses Japanese Ryodoraku technology to measure the electrical output from various points on the body. This technology, developed over 60 years ago, enables the device to create a snapshot of the body’s functional health by

sending ultra-low electrical currents through 24 specific points on the body and measuring the returned signals. This process helps evaluate the performance of vital organs and overall body function in just a few minutes.

The device is non-invasive, quick, and easy to use at home, offering an alternative to more traditional and often more cumbersome medical tests like blood work or CAT scans. Data collected by RaDoTech is processed using sophisticated algorithms, and results are accessible via a mobile app or web portal. The app provides detailed insights into each organ's performance, identifies potential issues, and offers suggestions for improving health ([RaDoTech](https://radotech.com/en-ca/pages/science-page)). More on the science behind it can be found here:

<https://radotech.com/en-ca/pages/science-page>.

## Data collection

Each of the 24 measurements is some number in the range of values as shown in the Ryodoraku Chart below:

良導絡専用カルテ Specially designed Ryodoraku chart.

姓名	殿		年令	才職	発病	年月日
病名	住所		年 月 日生	業	初診	年 月 日
			電話			

平均値	H. 肺		H. 心		H. 小腸		H. 肝		H. 脾		F. 腎		F. 胆		F. 胃		F. 腸		F. 腎		F. 胆		F. 胃		平均値
	左	右	左	右	左	右	左	右	左	右	左	右	左	右	左	右	左	右	左	右	左	右	左	右	
160	190	170	140	170	200	200	160	130	150	150	130	150	130	150	130	150	130	150	130	150	130	150	130	150	160
150	180	160	130	160	190	190	150	120	140	140	120	140	120	140	120	140	120	140	120	140	120	140	120	140	150
140	170	150	120	150	180	180	140	110	130	130	110	130	110	130	110	130	110	130	110	130	110	130	110	130	140
130	160	140	110	140	170	170	130	100	120	120	100	120	100	120	100	120	100	120	100	120	100	120	100	120	130
120	150	130	100	130	160	160	120	90	110	110	90	110	90	110	90	110	90	110	90	110	90	110	90	110	120
110	140	120	90	120	150	150	110	80	100	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100	110
100	130	110	80	110	140	140	100	70	90	90	70	90	70	90	70	90	70	90	70	90	70	90	70	90	100
90	120	100	70	100	130	130	90	60	80	80	60	80	60	80	60	80	60	80	60	80	60	80	60	80	90
80	110	90	60	90	120	120	80	50	70	70	50	70	50	70	50	70	50	70	50	70	50	70	50	70	80
70	100	80	50	80	110	110	70	40	60	60	40	60	40	60	40	60	40	60	40	60	40	60	40	60	70
60	90	70	40	70	100	100	60	30	50	50	30	50	30	50	30	50	30	50	30	50	30	50	30	50	60
55	85	65	35	65	95	95	55	25	45	45	25	45	25	45	25	45	25	45	25	45	25	45	25	45	55
50	80	60	30	60	90	90	50	20	40	40	20	40	20	40	20	40	20	40	20	40	20	40	20	40	50
45	75	55	25	55	85	85	45	15	35	35	15	35	15	35	15	35	15	35	15	35	15	35	15	35	45
40	70	50	20	50	80	80	40	10	30	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	40
35	65	45	15	45	75	75	35	5	25	25	5	25	5	25	5	25	5	25	5	25	5	25	5	25	35
30	60	40	10	40	70	70	30	0	20	20	0	20	0	20	0	20	0	20	0	20	0	20	0	20	30
25	55	35	5	35	65	65	25	-5	15	15	-5	15	-5	15	-5	15	-5	15	-5	15	-5	15	-5	15	25
20	50	30	0	30	60	60	20	-10	10	10	-10	10	-10	10	-10	10	-10	10	-10	10	-10	10	-10	10	20
15	45	25	-5	25	55	55	15	-15	5	5	-15	5	-15	5	-15	5	-15	5	-15	5	-15	5	-15	5	15
10	40	20	-10	20	50	50	10	-20	0	0	-20	0	-20	0	-20	0	-20	0	-20	0	-20	0	-20	0	10
5	35	15	-15	15	45	45	5	-25	-5	-5	-25	-5	-25	-5	-25	-5	-25	-5	-25	-5	-25	-5	-25	-5	5

測定日時 年 月 日 時 室温 度 体温 度

主訴

① palpitation

② headache, abnormalities of the lower abdomen

③ ringing ears,

④ stiff and painful shoulder muscles,

⑤ general weakness of the stomach, knee joint pain

⑥ insomnia

⑦ stiffness and painful neck muscles, lumbar pain,

For meaning of H1, H2, etc. refer to [1].

For a good high-level explanation of the principles see [2].

#### References:

[1] *Ryodoraku-Nakatani-Oiso.pdf* (in Team Project-> Background on Ryodoraku module)

[2] *Ryodoraku\_History\_and\_Research.pdf* (in Team Project-> Background on Ryodoraku module)