

System Design for MECHTRON 4TB6

Team 25, Formulate

Ahmed Nazir, nazira1

Stephen Oh, ohs9

Muhanad Sada, sadam

Toluwalayomi Babayeju, babayejt

January 17, 2023

1 Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

2 Reference Material

This section records information for easy reference.

2.1 Abbreviations and Acronyms

symbol	description
MECHTRON 4TB6	Explanation of program name

Contents

1	Revision History	i
2	Reference Material	ii
2.1	Abbreviations and Acronyms	ii
3	Introduction	1
4	Purpose	1
5	Scope	1
6	Project Overview	1
6.1	Normal Behaviour	1
6.2	Undesired Event Handling	1
6.3	Component Diagram	1
6.4	Connection Between Requirements and Design	1
7	System Variables	1
7.1	Monitored Variables	1
7.2	Controlled Variables	2
7.3	Constants Variables	2
8	User Interfaces	2
8.1	Desktop Application	2
9	Design of Hardware	3
10	Design of Electrical Components	3
11	Design of Communication Protocols	3
12	Timeline	3
A	Interface	4
B	Mechanical Hardware	4
C	Electrical Components	4
D	Communication Protocols	4
E	Reflection	4

List of Tables

List of Figures

1	Basic layout of GUI	4
2	GUI design in Qt Designer	5

3 Introduction

4 Purpose

5 Scope

6 Project Overview

6.1 Normal Behaviour

6.2 Undesired Event Handling

6.3 Component Diagram

6.4 Connection Between Requirements and Design

7 System Variables

7.1 Monitored Variables

Monitored Variable	Type	Units	Description
m_vibration	Analog	V	A signal monitoring the vibration resistance of the motor
m_humidity	Analog	V	A signal monitoring the humidity of the motor's environment
m_temperature	Analog	V	A signal monitoring the temperature of the motor's environment
m_shock	Analog	V	A signal monitoring the shock resistance of the motor
m_conv_vibration	Digital	g	Converted vibration values that are in useful units
m_conv_humidity	Digital	%	Converted humidity values that are in useful units
m_conv_temperature	Digital	°C	Converted temperature values that are in useful units
m_conv_shock	Digital	g	Converted shock values that are in useful units
m_data_accepted	Digital	T/F	Determines if user has accepted the results and wants to send it to the database

7.2 Controlled Variables

Controlled Variable	Type	Units	Description
c_green_light	Digital	1/0	Green LED light on testing device that indicates passed measurements
c_red_light	Digital	1/0	Red LED light on testing device that indicates failed measurements
c_sent_to_database	Digital	T/F	Determines if results displayed on the application are sent to the database

7.3 Constants Variables

Constant	Units	Value	Description
k_temperature_range	°C	5-40	Acceptable ambient temperature values for a Formula Electric motor
k_humidity_range	%	5-85	Acceptable relative humidity values for a Formula electric motor
k_max_shock	g	100	Maximum shock resistance for a Formula Electric motor
k_max_vibration	g	20	Maximum vibration resistance for a Formula Electric motor

8 User Interfaces

8.1 Desktop Application

The user interface for the desktop application is designed through Qt designer, a software for designing and building GUIs through the Qt library. Qt designer generates UI files which can be converted to python scripts that build the static design and layout of the GUI. The desktop application is essentially multiple pages stacked on each other that change based on which buttons are clicked. The GUI is comprised of a left bar menu, top bar, and content pages being in the center, refer to figure 1 and 2 in the Appendix. Navigation through the application is done using the sidebar menu, where users can toggle the full menu and press on which page they want to go. The top bar will be used for extra functionality such as accessing user details, minimizing screen, etc. Users interact with the application using buttons to perform a variety of functions and form fields in which they can enter test/user information.

- 9 Design of Hardware
- 10 Design of Electrical Components
- 11 Design of Communication Protocols
- 12 Timeline

A Interface

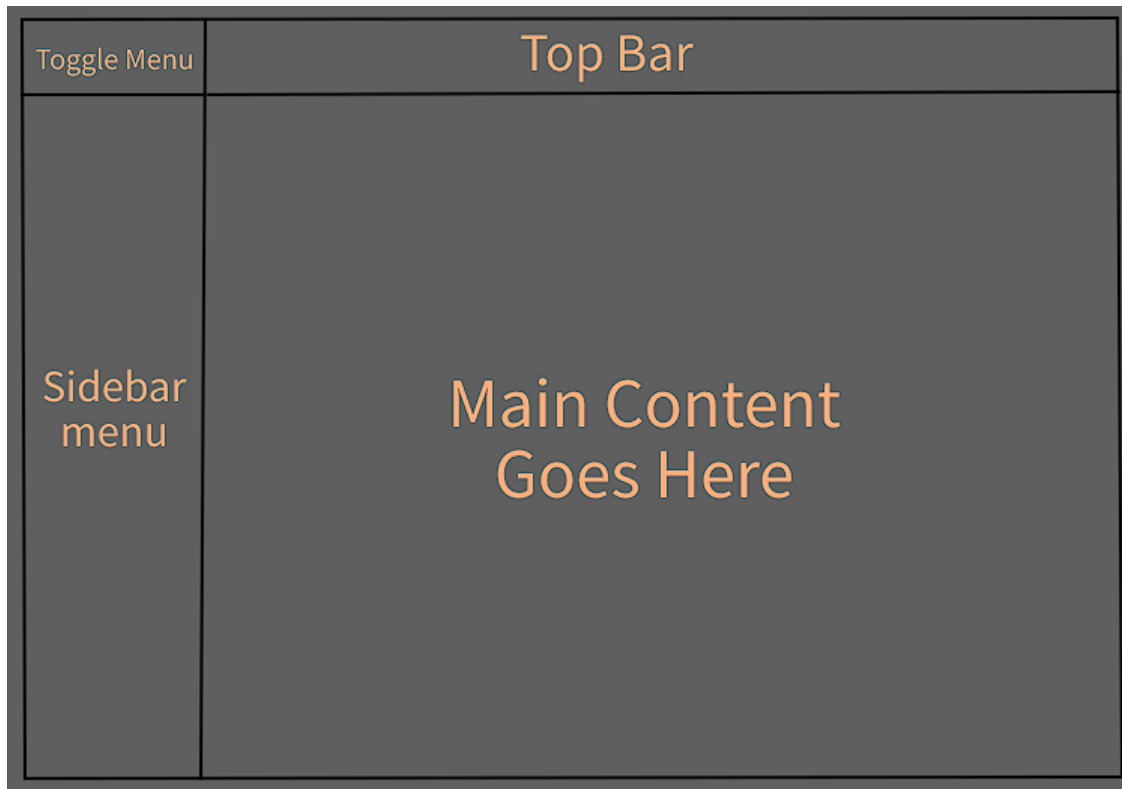


Figure 1: Basic layout of GUI

B Mechanical Hardware

C Electrical Components

D Communication Protocols

E 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)

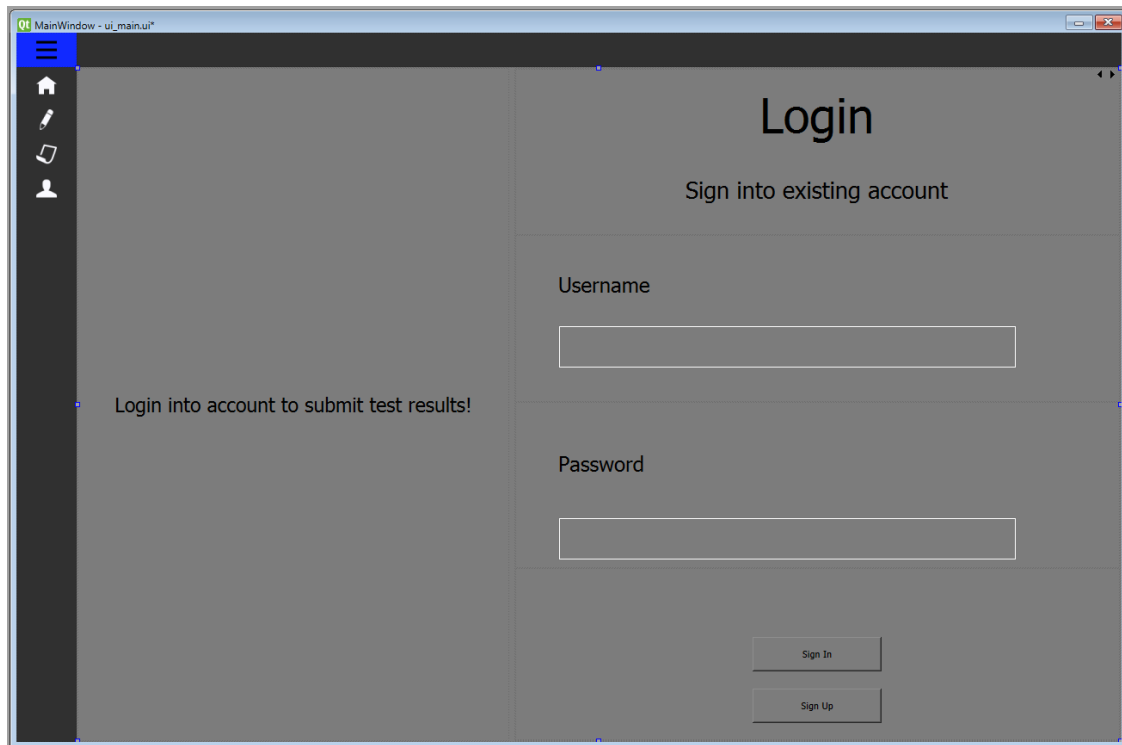


Figure 2: GUI design in Qt Designer

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)