Testing Document

Computer Engineering Project 2

A light guidance system

GROUP 4

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Contents

1 Introduction

This document covers the acceptance tests made for both functional and non-functional requirements of the Glow2Go system. It aims to ensure proper functionality of the Glow2Go distributed system. This document expands on the requirements document where acceptance tests are specified for the main flow and extensions of the different use cases.

2 Test criteria

The testing document ensures that the system meets the requirements specified in the Specification requirements document, Appendix 1. This means that the acceptance tests aim to pass all scenarios, which are encapsulated by the use-cases and use-case extensions, alongside tests made for the non-functional requirements.

2.1 Functional test requirements

Alongside the testings of all use-cases and use-case extensions, the testing of the functional requirements of the system should confirm the following:

- Sensor Motion Detection: The system should detect motion when a person enters a room with a sensor.

- LED Activation: Upon motion detection, the corresponding LED strip should turn on.

- Webpage: The system should successfully communicate with the webpage and log to the database.

- User Interface: The webpage should provide a interface for viewing events, trends and changing settings.

Note that the bullet-points above, should be seen as an evaluation by the person reviewing the tests. Not as pass non-pass tests as these properties are quite subjective.

2.2 Non-functional test requirements

Through the testing of the non-functional requirements, the performance and usability of the system should also be evaluated, which includes.

- Responsiveness: The system should respond to motion events, with minimal latency in LED activation.

• Reliability: The system should operate reliably under normal living conditions.

• Scalability: The system should be capable of scaling to incorporate additional sensors and LED strips without significant degrading of the performance.

• Usability: The webpage interface should be intuitive and easy to use for new users or admins.

Note that the bullet-points above, should be seen as an evaluation by the person reviewing the tests. Not as pass non-pass tests as these properties are quite subjective.

3 Unit testing

Unit testing in the Glow2Go project was primarily conducted through manual testing, peer reviewing of code, and peer programming practices during the development phase. These methods ensured that individual units or components of the system were evaluated for correctness, functionality, and adherence to coding standards.

3.1 Pair programming and code review

Pair programming and code review was a fundamental part of the Glow2Go system development. In this form of unit testing, developers worked together to code and review the program, to ensure good code correctness. This helped identify bugs, issues and overall inconsistencies in the code in an early stage, making it easy to fix. This collaborative approach ensured a deep understanding of the code for all developers and fostered a common agreement of coding standards.

It was especially useful for obtaining immediate feedback and to ensure that all parts of the code would work together seamlessly, as peers were able to reflect and tests their thoughts and ideas on the spot with immediate feedback.

While unit testing in Glow2Go primarily relied on manual testing, peer code review, and peer programming, developers may have also utilized code analysis tools, debugging tools, and testing frameworks specific to their segment of the code.

In summary the unit testing process in Glow2Go was iterative and continuously improved based on feedback and lessons learned during the development of the system.

4 Integration Testing

Developers performed manual testing of individual units or modules within the Glow2Go system to verify their behavior and functionality. This involved executing

specific test cases (the different use cases) and scenarios to validate the expected outcomes and identify any deviations or defects.
Afterwards, the integration testing was done in the same manner, where peers would validate the combinations of units and ensure that they worked together in unison and as intended.

5 Acceptance test specifications

The acceptance test specification is separated into functional and non-functional testing. They cover all scenarios in each of the use-cases, ensuring that both the main scenario and all extensions are thoroughly tested. They also covers all non-functional requirements specified in the specifications requirements document.

5.1 Functional requirements testing table:

The acceptance test table for the functional requirements is attached at the end of the document. Each test has a unique ID used as an identifier for test, alongside a short test description. All tests also have preconditions that must hold true for the test to be valid. The same preconditions may cover several test, as the table is sorted by use-cases. Steps in both the use-case and the test are numbered and accompanied by a short text, describing the flow of each use-case/test step, making it easier to follow the flow of the use-case being covered. Finally there is an expected result for each test and empty cells are left to be filled out for when the tests have been carried out.

5.2 Non-functional requirements testing table:

The non-functional requirements acceptance test table is shown below (figure 1). Since the tests are for testing the non-functional requirements, they do not follow a step-by-step testing method like the acceptance tests for the functional requirements did. Rather, they are constructed with only a test description and an expected result. If the expected result is met then the test will receive a "yes" in the "pass" column.

ID	Test description	Expected result	Pass
1	Pairing sensors: Aqara Motion Sensor model RTCGQ11LM or model MS-S02.	The system is compatible with the listed sensors.	
2	Pairing LED strip kit: Gledopto RGB+CCT LED Strip Light Kit model GL-MC-001PK.	The system is compatible with the listed LED strip kit.	
3	Guidance system operating with a non-responsive web server.	The guidance system works even if the system is unable to log to the web server	
4	System is set up in 5 or more rooms.	The system should be functional regardless of the number of rooms (i.e. should be able to pair at least 5 pairs of sensors and LEDs)	
5	System is running and no input is given from the user.	The system should operate fully without any input from the user.	
6	System is set up to run on a Raspberry PI 5.	System should operate fully when running on a Raspberry PI 5, meaning that the web server is hosted, and the light guidance system Is working.	
7	Database and webpage hosting	The database and webpage should be hosted on an external PC.	
8	Default system active hours.	The system should default to being active from 22:00 to 09:00.	
9	Guided walk that extends beyond the active hours.	If the resident starts a guided walk in the active hours, and said walk goes outside the active hours, the guiding will be finished before the systems shuts off.	

Figure 1: non-functional requirements acceptance test table

6 Conclusion

The testing approach outlined in this document offers a structured and robust framework, designed to guarantee complete coverage of the functional and non-functional requirements of the Glow2Go system.
Evaluating every part of the system from motion detection to scalability and usability ensures that the system has been tested, helps ensure that the Glow2Go system becomes a thoroughly tested system, tailored to the individual user's needs and requirements.
The acceptance test specifications for both functional and non-functional testing categories, serve to ensure the system's adherence to requirements across various scenarios. With test procedures and expected outcomes outlined.

ID	Test Description	Precondition	Use case covered	Use case step	Test step	Test steps	Expected result	Actual result	Approved
1	User leaves the bedroom	1. The user is in their bedroom 2. The time is between the specified hours in UC10.	UC1 - User leaves their bedroom - Main Scenario	1-2	1	Movement is detected in the bedroom	The sensor in the bedroom triggers, turning on the LED in the bedroom and in the next room.		
				3-5	2	User moves out of the bedroom	The sensor in the room next to the bedroom triggers, turning on the LED in the next room while LEDs in the bedroom and current room remain on.		
2	User does not leave the bedroom		UC1 - User leaves their bedroom - Extension 3a	3a	1	No movement is detected for 5 minutes	The LEDs in the bedroom and the next room are turned off.		
3	User enters a new room	1. UC1 is complete 2. Light in the current room is on 3. Light in the next room is on 4. Light in the previous room is on	UC2 - User enters a new room - Main Scenario	1-3	1	Movement is detected in the new room	The sensor in the room triggers and the LED in the room before the previous room turns off and the LED in the next room turns on.		
4	User enters the bathroom	1. UC1 is complete	UC3 - User enters the bathroom - Main Scenario	1	1	Movement is detected in the bathroom	The sensor in the bathroom triggers and the LED in the room before the previous room turns off.		
				2	2		The timer event is logged locally.		
5	User leaves the bathroom	1. UC3 is complete	UC4 - User leaves the bathroom - Main scenario	1 3	1	The user leaves the bathroom	The sensor in the room before the bathroom triggers and the LED in the room before the previous room turns off and the LED in the next room turns on.		
				2	2		The timer event is logged locally.		
6	User enters the bedroom and goes back to bed	1. UC1 is complete	UC5 - User enters the bedroom - Main scenario	1 3	1	Movement is detected in the bedroom	The sensor in the bedroom triggers and all other LEDs than the bedroom LED turn off.		
				2	2		The timer event is logged to the database.		
				4	3	No movement is detected for 5 minutes	The LED in the bedroom is turned off.		
7	User enters the bedroom and does not go back to bed		UC5 - User enters the bedroom - Extension 4a	4a	1	Movement continues to be detected for the next 5 minutes	The LED does not turn off and after 5 minutes the LED in the next room turns on as in UC1.		
8	The alarm is activated	1. UC1 has been completed 2. The time is between the specified hours in UC10 3. UC5 has not yet been completed	UC6 - The alarm is activated - Main scenario	1-3	1	No sensor detects movement by the user for two hours	The timer event is logged to the database and the alarm is activated.		
9	Movement is detected		UC6 - The alarm is activated - Extension 1a	1a	1	Movement is detected within the two hour time frame	The two hour timer for the alarm is reset.		
10	Logging into the webpage	UC7 has been completed and the user is logged in	UC7 - User logs on to the webpage - Main scenario	1	1	User enters the webpage URL in their browser	The webpage loads		
				2	2	The webpage opens	The user is prompted to enter their username and password		
				3-4	3	After entering correct credentials the user presses "login"	The homepage of the webpage opens up and shows three buttons ("Trends page Events page" and Settings page").		
11	Incorrect credentials when logging into the webpage		UC7 - User logs on to the webpage - Extension 3a	3a	1	After entering correct credentials the user presses "login"	The user is prompted with an error message informing that the user has entered wrong credentials.		
12	Checking the "Trends page" on the webpage	UC7 has been completed and the user is logged in	UC8 - User checks the trends page - Main scenario	1-3	1	While logged in to the homepage the user presses the "trends page" button	The trends page opens, showing a graph and two buttons ("Total time" and "Time in Bathroom") which change the data displayed on the graph. Total time shows the total from leaving the bed to coming back to bed. Time in bathroom shows the time spend in the bathroom for a given event. An average time spent in the bathroom and average time spent in total is also shown.		
				3(a)	2	User presses the "Total time" button	The data on the graph now displays the total time from leaving the bedroom to getting back to the bedroom.		
				3(b)	3	User presses the "Bathroom time" button	The data on the graph now displays the total time used in the bathroom.		

13	Checking the Events page on the webpage	UC7 has been completed and the user is logged in	UC9 - User checks the events page - Main scenario	1-2	1	User presses the events page" button.	The events page opens, showing a list of every trip that has been monitored by the system. Data for each trip is displayed alongside the respective trip. This includes (if applicable): (a). Event number (b). Start time and date (c). Time to reach toilet (d). Bathroom time (e). Time to reach bed (f). Total time Furthermore the event will be displayed in red if the alarm activated during the trip.		
14	User changes the active hours of the Glow2Go system		UC10 - User changes the active time of the guiding light system	1	1	User presses the "settings page" button.	The settings page opens displaying editable information about the current settings		
				2-3	2	User enters and saves a new start time and/or end time for the active hours of the system.	The active hours of the system are updated on the webpage as well as the system.		
15	User does no change the active hours of the Glow2Go system		UC10 - User changes the active time of the guiding light system - Extension 1a	1a	1	User does not change anything but instead exits the settings page	The active hours last applied will stay applied, meaning that no changes to the active hours are applied to the webpage or to the system.		
16	User changes the active hours without saving		UC10 - User changes the active time of the guiding light system - Extension 3a	3a	1	User changes the active hours and tries to exit the settings page without saving.	The user will be prompted with a reminder message, informing the user that the changes have not been saved and will be discarded if they proceed with exiting the settings page.		

7 References

[1] Software Engineering by Ian Sommerville, *Literature on Software Engineering by Ian Sommerville*, Ian Sommerville, Software engineering ISBN: 9781292096148 10th edition, 2016.

8 Appendix

Appendix 1 - Requirements specification rev 1
path: Appendix/Requirements specification rev 1.pdf