



Test Plans for Audolok

Project Team: Lexi Chor
Ellson Dai
Christy Tao
Chi Zhang

Contact Person: Lexi Chor

Submitted to: Dr. Andrew Rawicz - ENSC 440W
Steve Whitmore - ENSC 305W
School of Engineering Science
Simon Fraser University

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1. Test Plans

This document includes test plans for all systems and components of Audolok. These tests are to be used to ensure the components and systems behave as expected. First, unit tests will be listed, and then an overall integrated system test plan will be covered.

1.1 Unit Test Plans

Each subsystem will undergo unit tests prior to integration testing. The unit tests will cover microcontroller peripherals, power supply unit, Wi-Fi communication between the app and ESP8266, software units and mechanical components.

1.1.1 Software Unit Test

Subsystem	Test Procedure	Required Results	Pass/Fail
Component Tests			
Application Operation	Click on app icon on mobile device	Login page appears within 3 seconds or less. If the timeout is reached, app will quit itself asking for a reboot	
User Authentication	Input username and password	After authentication is confirmed, the view will change to the dashboard with submenus for owners to choose from	
Network Connection	Under Wi-Fi network conditions, try asking for a Wi-Fi network	Wi-Fi pop up should appear telling user to connect to Wi-Fi if not already done	
Information Security	Try to get into the dashboard or state of lock page without logging in through correct username and password	There should be no way to get into the dashboard or state page without logging in, the notifications asking users to log in should appear respectiv on users' screen	
Temporary Access(guests)	Try to extend the access time of the guest using guest account	No option is available, or the section will be greyed out. Guests should not be able to shorten or extend their temporary access	
Temporary Access(owner)	Try to extend the access time of a guest using Admin account	The owner should be able to shorten or extend temporary access assigned to any guests	
Assigning Access(guests)	Try to assign access to guests in contacts by sending them invitations when the user is a guest	The guest cannot assign access to any other guests. Option should be disabled	
Assigning Access(owner)	Try to assign access to guests in contacts by sending them invitations when the user is the owner	The owner can assign access to any guests already existed or new guests	
In-app Doorbell	Guests press in-app doorbell button	The owner receives notifications of guests ringing the virtual doorbell	
Lock State	Swipe right for lock, swipe left for unlock.	The page should show the current state of the lock	

1.1.2 Wi-Fi Communication System Test

The Wi-Fi Communication System will be achieved by using the COM Monitor from the Arduino IDE, the ESP8266 library and an app called UDP/TCP Server, which is available from Google Play.

Subsystem	Test Procedure	Required Results	Pass/Fail
ESP8266 Module	Check connection to Wi-Fi by Wi-Fi configuration command from the ESP8266 library	Message will be printed to the COM Monitor via serial port TX0 and RX0	
	Send message from UDP TCP Server to ESP8266 via Wi-Fi Router	Proper message received from app and printed on COM monitor. Received message should be identical to the sent message of the Cellphone	

1.1.3 Mechanical Unit Test

This section describes unit tests for each mechanical component. Several tests will be made for different stages of the development. The order of tests for each component is hierarchical. The first test is the most basic test, and then following are the tests leading to the desired function.

Subsystem	Test Procedure	Required Results	Pass/Fail
Motor	Upload Arduino "Sweep" sample code and run	Motor sweeps clockwise and then counter clockwise one full rotation	
	Run code to make motor sweep 90 degrees and then back to 0 degrees	start at 0 deg, motor rotates 90 degs and then returns to 0 deg	
	Run lock code several times to make sure the pin doesn't offset	After a few tests, motor still works properly and positions remain the same, without any shifting	
Linear Actuator	Run sample code for linear actuator	Linear actuator should extend and then retract	
	Run code to make linear actuator extend and retract at different lengths.	Linear actuator should extend and retract to the corresponding length, measured in ms (0.4inch/ms)	
Door	Use physical key to open the lock and push to open	Door unlocks and opens with no resistance	
Time Delay	Observer real time delay between each function	Observed time delay does not exceed 10% of preset delay from firmware	

1.2 Regression Test Plan

After unit tests on all subsystems and components are performed, related troubleshooting and debugging is performed to adjust all subsystems and components in order to reach the desired requirement. Several iterations will be required to satisfy the overall functional specification. For the mechanical parts, push buttons will take place of software commands and tests for checking the software outputs will be tested via an oscilloscope, Apptium and Matlab.

Subsystem	Test Procedure	Required Results	Pass/Fail
Phase 1: Each Individual System			
Lock	Press button 1 (unlock button)	Motor will rotate counter clockwise and turn the lock to unlock	
	Press button 2 (lock button)	Motor will rotate clockwise and lock the lock	
Linear Actuator (Door Control)	Press button 1 (extend)	Linear actuator will extend fully and door will close	
	Press button 2 (retract)	Linear actuator will fully retract and door will open	
Linear Actuator (Door Handle)	Press button 1 (extend)	Linear actuator will extend fully and door handle will be pushed down, retracting the mishandling device	
	Press button 2 (retract)	Linear actuator will retract fully and door handle will be released back up, extending the mishandling device	
Phase 2a: Integration of all Mechanical Parts			
Open Simulation	Button 1 pressed (unlock)	Lock unlocks, then after a short delay, linear actuator pushes the handle open, and finally the other linear actuator pulls the door open	
Close Simulation	Button 2 pressed (lock)	Linear actuator pushes door closed, second linear actuator retracts, allowing the handle to pull up and the mishandling device to extract, and finally lock will lock.	
Phase 2b: Software Communication			
Switch to lock from app	Use oscilloscope to observe output PWM wave and record time delay from consecutive procedures	PWM waveform and space ratio should satisfy desired outputs for the mechanical system. The delay from input time to output time should not exceed 1s	
Switch to unlock from app	Use oscilloscope to observe output PWM wave and record time delay from consecutive procedures	PWM waveform and space ratio should satisfy desired outputs for the mechanical system. The delay from input time to output time should not exceed 1s	
Set Aptium Scripts to perform 1000 times lock and unlock switches	Set Matlab Scripts to record data from Oscilloscope and analyze it to obtain PWM wave frequency and space ratio	The standard deviation from all sample data should not exceed 1, and the error between the mean value and desired value should not exceed 7%. The mean delay time should not exceed 1s	
Automate app on 2 cell phones and switches between lock and unlock states	Set Matlab Scripts to record data from oscilloscope and analyze it to obtain PWM wave frequency and space ratio	The standard deviation from all sample data should not exceed 1, and the error between the mean value and desired value should not exceed 7%. The mean delay time should not exceed 1s	

1.3 Prototype Integrated Test

After each subsystem has gone through and passed their regression tests, all systems are integrated together and tested. For the overall system, the test plan strictly for the software functions are in section 1.1.1 and the integrated software and hardware test plan is as follows.

Subsystem	Test Procedure	Required Results	Pass/Fail
Components Tests			
Unlock/Open	Swipe switch on app to the left (Unlock mode)	<ol style="list-style-type: none"> 1. App will display Unlock State 2. Motor will rotate counter clockwise unlocking the deadbolt 3. Handle linear actuator will push the door handle down 4. After lock and handle actions are complete, door linear actuator will pull the door open 	
Lock/Close	Swipe switch on app to the right (Lock mode)	<ol style="list-style-type: none"> 1. App will display Lock State 2. Door linear actuator will push the door closed 3. After the door closes, handle linear actuator will pull the door handle up 4. Motor will rotate clockwise locking the deadbolt 	