Keyless Entry Door Lock

Team #5

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Referenced Cooperation site and code: -

https://github.com/ECE411T5/Practicum

https://github.com/ECE411T5/Practicum/tree/main/src

Hierarchical Test Plan:

1. **Unit Test/Model Test**

   Equipment:

   - ATMEGA328P-PU
   - Stepper motor (JOYNANO)
   - A4988_STEPPER_MOTOR_DRIVER_CARRIER (1182)
   - Single Relay Board (27115)
   - LM7805S/NOPB
   - 16x2 White on Blue Character LCD
   - KEYPAD4X4
   - LEDCHIP-LED0805
   - 2 x SWITCH-MOMENTARY-2SMD
   - 16 MHz CRYSTALSMD-HC49UP
   - 12V to 5V DC-DC Buck Converter
   - Arduino IDE
   - Arduino Source/Test code (Shared on our cooperation site here: https://github.com/ECE411T5/Practicum/tree/main/src)

   Program and process:

   - Initialize the Arduino IDE setup and map the pins to keypad, stepper motor, LCD, relay, and buttons.
   - Test scrWrite function
   - Test writeCode function
   - Test the KeyPress function
   - Test StepperMotorTurn function
   - Test ButtonStatus function

- Test RelayPosition Function
- Test LockStatus function

In this test we are trying to make sure that we have all the components properly connected and recognized by the microcontroller (ATMega328P-PU). We can perform this test by work on each function of these separately. For example, the scrWrite function can test and verify that the LCD display is working and will display what the ATMega328P-PU will send to it.

2.   Function Test

Equipment:

- ATMEGA328P-PU
- Stepper motor (JOYNANO)
- A4988_STEPPER_MOTOR_DRIVER_CARRIER (1182)
- Single Relay Board (27115)
- LM7805S/NOPB
- 16x2 White on Blue Character LCD
- KEYPAD4X4
- LEDCHIP-LED0805
- 2 x SWITCH-MOMENTARY-2SMD
- 16MHz - CRYSTALSMD-HC49UP
- 12V to 5V DC-DC Buck Converter
- Arduino IDE
- Arduino Source/Test code (Shared on our cooperation site here: https://github.com/ECE411T5/Practicum/tree/main/src)

Program and process:

- Verify functionality and operation of the ATMEGA328P-PU
- Verify the outputs on the LCD Display
- Verify that the stepper motor is operating as intended
- Verify that the button pushes results in an input to the ATMEGA328P-PU
- Verify that the Keypad pushes result in an input to the ATMEGA328P-PU

In this part we will verify the functionality of some, or all of our components used in our design. Not only do we make that the components are recognized by the ATMEGA328P-PU, we verify that each component is actually working as intended, performing the function/task it was designed for.

3.   Integration Test

Equipment:

- ATMEGA328P-PU
- Stepper motor (JOYNANO)
- A4988_STEPPER_MOTOR_DRIVER_CARRIER (1182)
- Single Relay Board (27115)
- LM7805S/NOPB
- 16x2 White on Blue Character LCD
- KEYPAD4X4
- LEDCHIP-LED0805
- 2 x SWITCH-MOMENTARY-2SMD
- 16MHz - CRYSTALSMD-HC49UP
- 12V to 5V DC-DC Buck Converter
- Arduino IDE
- Arduino Source/Test code (Shared on our cooperation site here: https://github.com/ECE411T5/Practicum/tree/main/src)

Process:

- Test to see if pushing a button displays a message on the LCD display.
- Test to if pushing a keypad button turns the stepper motor on or off.
- Test the ATMEGA328P-PU connection to the LCD display, making sure that we are getting messaging asking for the passcode, etc.
- Test the LCD display connection to the keypad, making sure when a button is pushed, something changes on the LCD display.

In this part we test the integration of different components together. We need to verify that the ATMEGA328P-PU is communicating correctly to the "peripherals" we have such as the keypad, LCD display, stepper motor, etc. We test their integration together and we do this using the Arduino source code, and we do this in the Arduino IDE.

4. Parametric Test

Equipment:

- ATMEGA328P-PU
- Stepper motor (JOYNANO)
- A4988_STEPPER_MOTOR_DRIVER_CARRIER (1182)
- Single Relay Board (27115)
- LM7805S/NOPB
- 16x2 White on Blue Character LCD
- KEYPAD4X4
- LEDCHIP-LED0805
- 2 x SWITCH-MOMENTARY-2SMD
- 16MHz - CRYSTALSMD-HC49UP
- 12V to 5V DC-DC Buck Converter
- Arduino IDE
- Arduino Source/Test code (Shared on our cooperation site here: https://github.com/ECE411T5/Practicum/tree/main/src)
- Lab Oscilloscope or multimeter/voltmeter
- Stopwatch for timing
- Protractor to measure the angle.

Process:

- Record and verify if the stepper motor rotation degrees are correct.
- Verify the voltage outputted from the buck convertor.
- Test if the Resisters and Capacitors were connected properly, and check if both ends are shorted.
- Record and test for push button debounce and response time.
- Verify the stepper motor's ability to close and open a door.

In this part we verify that we are getting the expected parameters in our design. Those parameters include verifying the voltage input and output of the Buck converter, the push button debounce response time, the motor rotation angle, etc.

Test Case Descriptions

Test Writer : Team 5				
Test Case Name:	Stepper Motor Parametric Test #1		Test ID#	STMP-01
Description:	Test the stepper motor movement for locking and unlocking the door by measuring the rotation of the stepper motor. We need to measure the direction as well as the angle of rotation using a protractor.		Type:	
Test Information				
	Name of Tester:		Date:	
Hardware Ver:	2.3.1		Time:	
Setup:	**Materials:** Hardware/Equipment: Project BOM + Protractor Software: Source code at https://github.com/ECE411T5/Practicum/tree/main/src **Note:** The initial starting condition is with the system locked, and the stepper motor in the lock position.			

Step	Action	Expected Result	Pass	Fail	N/A	Comments
1	Enter "1234"	Screen Displays "Unlocked: Welcome"				
2	Wait	Stepper Motor turns 180 degrees CW to unlock position				
3	Press Lock Button	Stepper Motor turns 180degrees CCW to the lock position.				
4	Enter Wrong code	Clear the LCD Screen, Motor is in lock position.				
Overall Test Result:						

Test Writer : Team 5							
Test Case Name:	LCD Display and Keypad integration test #1				Test ID#	LCDKPI-01	
Description:	Verify that the user input on the Keypad is displaying correctly on the LCD Display				Type:		
Test Information							
	Name of Tester:				Date:		
Hardware Ver:	2.3.1				Time:		
Setup:	**Materials:** Hardware/Equipment: Projects BOM. Software: Source code at https://github.com/ECE411T5/Practicum/tree/main/src **Note:-** We need to make sure all the components are appropriately connected first and that our code compiles with no issues. We need to make sure that the display is cleared if the button "C" is pushed, and that the display will show whether or not the entered code is correct or incurred.						
Step	Action	Expected Result	Pass	Fail	N/A	Comments	
1	Enter any random pin/code	The entered pin or code is displayed on the LCD display correctly and is not overwritten or cropped, etc.					
2	Enter an incorrect pin	LCD message saying "Incorrect Pin" then "C" clears the pin.					
3	Enter the correct pin	LCD message saying "Correct Pin" then "C" clears the pin.					
4	Enter any pin then "C"	The LCD displays that pin then the code gets cleared quickly					
Overall Test Result							