Team #9
11/28/2023
ECE 411
Test Plan

Parking Counter Test Plans

Unit Tests

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- IR Sensors
    - Show that each sensor changes output voltage with object proximity
    - Show that each sensor operates correctly within specified operation range
- Solar Power Supply
    - Show that the battery can be charged with solar panel
    - Show that the 3.7V power module outputs nominal voltage of around 3.7V
    - Show that the output voltage of the boost converter is around 5V
- Microcontroller
    - Show that the uC can take in IR Sensor inputs
    - Show that the uC can control the display
    - Show that the uC can write to the uSD Card
- microSD Card
    - Show that the data written from the uC stays on the uSD Card
    - Show that devices other than the uC can read the data written to the uSD Card
- LCD Screen
    - Show that the data written from the uC is displayed on the LCD

Verification Tests

- Presence of an object in front of a IR sensor changes the number of available parking spots on LCD by 1
- Power supply can supply power to entire system (assuming battery is charged)
- Parking data log on uSD Card is formatted correctly

Validation Tests

- Logged parking data on uSD Card accurately tells the number of available parking spaces at a given time in the past
- Presence of objects in front of multiple IR sensors (within range) changes the number of available parking spots on LCD by number of occluded sensors

Test Author: Hunter Drake						
	Test Case Name:	uSD Card Data Persistence Test			**Test ID #:**	0001
	Description:	*This test is for determining if the data logged on the uSD Card is true to past parking events and that the data can be read off of it.*			**Type:**	x white box □ black box □_____
Tester Information						
	Name of Tester:				**Date:**	
	HW/SW Version:				**Time:**	
	Setup:	*uC hooked up to 4 verified IR sensors and a uSD Card Reader with code capable of logging the simulated parking data. Data log entries should occur periodically because of timing code. Employing a LED to determine when data is about to put into the uSD card could help ensure test accuracy.*				

STEP	**Action**	**Expected Result**	**PASS**	**FAIL**	**N/A**	**Comments**
1	Leave all parking spaces available for the first data log entry.	uSD Card has a single data log entry of all parking spaces being available.				
2	Occupy a single parking space for the second data log entry.	uSD Card has 2 data log entries. Most recent entry shows 1 taken parking space.				
3	Occupy all parking spaces for the third data log entry.	uSD Card has 3 data log entries. Most recent entry shows 4 taken parking spaces.				
4	Occupy only 3 parking spaces for the fourth data log entry.	uSD Card has 4 data log entries. Most recent entry shows 3 taken parking spaces.				
5	Occupy only 2 parking spaces for the fifth data log entry.	uSD Card has 5 data log entries. Most recent entry shows 2 taken parking spaces.				
6	Have no parking spaces be occupied for the sixth and last data log entry for the test.	uSD Card has 6 data log entries. Most recent entry shows no parking spaces taken.				
7	Power system off and read uSD Card on separate, capable computer/device.	uSD Card has a .txt file (the parking data log) which contains 6 entries with correct parking data (described above).				
	Overall test result:					

Test Author: Hunter Drake				
	Test Case Name:	IR Sensor Functionality Verification	**Test ID #:**	0002
	Description:	*This test is for verifying that each sensor intended to be used with the system operates predictably and within requirements. Each IR sensor needs to be able to detect objects within a range of 2 cm at a minimum.*	**Type:**	□ white box x black box □ _____
Tester Information				
	Name of Tester:		**Date:**	
	HW/SW Version:		**Time:**	
	Setup:	DUT hooked up to power with device to observe DATA pin voltage		

TEST	**INPUTS**	**EXPECTED OUTPUTS**	**PASS**	**FAIL**	**N/A**	**Comments**
1	Object 50 cm from sensor	Sensor DATA bit goes low (0V)				
2	Object 25 cm from sensor	Sensor DATA bit goes high (3.3V)				
3	Object 10 cm from sensor	Sensor DATA bit goes high (3.3V)				
4	Object 5 cm from sensor	Sensor DATA bit goes high (3.3V)				
5	Object 2 cm from sensor	Sensor DATA bit goes high (3.3V)				
6	Object 0 cm from sensor	Sensor DATA bit goes high (3.3V)				
	Overall test result:					

Integration test

Test Author: Team 9 -				
	Test Case Name:	Second test to the functionalities of the overall system	**Test ID #:**	1001
	Description:	*What is this test case testing? Which requirements, which specifications, etc.* *This is an integration test. Which will test each component when everything is turned on. This will help ensure that all the parts are integrated together correctly.*	**Type:**	□ white box ☑ black box □ _____
Tester Information				
	Name of Tester:		**Date:**	11/27/23
	HW/SW Version:	HW 1.0 / SW 1.2	**Time:**	4:00 pm
	Setup:	*The full project with all the components*		

STEP	**Action**	**Expected Result**	**PASS**	**FAIL**	**N/A**	**Comments**
1	Test solar panel	It produces a high voltage when exposed to light.	■			We can also see that by looking at the battery charger
2	Test code and functionality of microcontroller	It should produce correct data to the lcd screen as well as grab correct data from the sensors.	■			Code works perfectly fine
3	Test lcd screen	The lcd screen should produce data using the I2c interface. (provided by i2c adapter)	■			It produces the expected outputs produced by the code
4	Test IR sensors	The Ir sensor should detect a car when a car parks in the spot	■			The light on the sensor turns on as soon as a car parks in that spot
5	Test voltage regulator	It should produce 5 volts from 3.7v	■			I measured it ,and it was 4.98 volts
6	Test SD card reader	We should be able to create directories ,create files,read, write and modify files on the micro SD card		■		We had multiple attempts ,but unfortunately, no luck in getting it to work.
7	Test battery charger	It should be charging the battery. We need to measure the voltage across the battery charger while the solar panel is hooked up as well as the solar panel receiving light	■			We can also see an led on the charger turn on when there is strong enough light on the solar panel
8	**Test PCB**	It should be connecting power and signal				
9						
	Overall test result:					