Willburg Outdoor PTY(ltd.)

AMBITIOUS DESIGNS

Smart Image Identifier

Version 1.0

Unit Test Plan & Report

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Contents

1 Introduction

1.1 Purpose

The purpose of the document is to give an overview of the test performed on the Smart Image Identifier project and the overall test coverage provided by these tests.

1.2 Scope

The scope of this document is structured as follows. The features that are considered for testing are listed in section 3. Tests that have been identified from the requirements are discussed in detail in section section 4. Furthermore, this document outlines the test environment and the risks involved in the testing approaches that will be followed. Assumptions and dependencies of this test plan will also be mentioned. Section 7.1, 7.2 and 9 outlines, discusses and concludes on the results of the tests, respectively.

1.3 Testing Environment

1.3.1 Programming Languages

- Java

1.3.2 Testing Frameworks

- J-Unit

1.3.3 Coding Environment

- Eclipse

1.3.4 Operating System

- Works on any operating system such as Windows and Linux

1.4 Assumptions and Dependencies

1. Assumptions:
    - A server that handles images exists.
    - All dependencies work and are up to date.
    - The client has infrastructure to run the system on.
2. Dependencies:
    - JUnit
    - mongo-java-driver
    - OpenCV

Unit Test Plan

2 Test Items

- Mat object
- BufferedImage object

3 Functional Features to be Tested

Features:

- Resizing of image
- Grey-Scale of Image
- Equalization of Image
- Generate Mat Object
- Test Output/Result Image
- Class Instantiation and Performance

Feature ID	RDS Source	Summary	Test Case ID
1		Resizing	1
2		Grey-Scale	2
3		Equalization	3
4		Generate Mat	4
5		Output/Result Image	5
6		Instantiation and Performance	6

4 Test Cases

4.1 Test Case 1: Resize Image

4.1.0.1 Objective: The purpose of this test is to resize an image before processing.

4.1.0.2 Input: The following inputs will be used to test this functionality:

- An image contained in a .jpg format

4.1.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image has successfully be resized to the requested dimensions.

4.2 Test Case 2: Grey-Scale of Image

4.2.0.1 Objective: The purpose of this test is to strip all colour from the image before processing.

4.2.0.2 Input: The following inputs will be used to test this functionality:

- An image contained in a .jpg format

4.2.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image has successfully be stripped of all its' colour except black and white.

4.3 Test Case 3: Equalization of Image

4.3.0.1 Objective: The purpose of this test is to enhance the contrast within the image.

4.3.0.2 Input: The following inputs will be used to test this functionality:

- A .jpg image in presented in a grey-scaled format.

4.3.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image's contrast has been successfully enhanced.

4.4 Test Case 4: Generate Mat Object

4.4.0.1 Objective: The purpose of this test is to use a given image and create a Mat object of it which allows us to process the image pixel by pixel.

4.4.0.2 Input: The following inputs will be used to test this functionality:

- An image contained in a .jpg format

4.4.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image has successfully been converted into a non-null Mat object.

4.5 Test Case 5: Test Output/Result Image

4.5.0.1 Objective: The purpose of this test is to ensure the existence of the the generated image containing the result after being processed by the human detection algorithm.

4.5.0.2 Input: The following inputs will be used to test this functionality:

- An image contained in a .jpg format
- A local, pre-defined directory

4.5.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image was successfully stored generated from the processed Mat object in the appropriate directory.

4.6 Test Case 6: Class Instantiation and Performance

4.6.0.1 Objective: The purpose of this test is to ensure the required classes have been successfully instantiated and perform correctly.

4.6.0.2 Input: The following inputs will be used to test this functionality:

- An image contained in a .jpg format
- A local, pre-defined directory

4.6.0.3 Outcome: The following is the expected outcomes for a pass result for the functionality:

- The image has successfully be stripped of all its' colour except black and white.

5 Item Pass / Fail Criteria

A request is considered successful when it passes any of the following 2 tests.

- Normal human detection test
- Grey-scaled human detection test
- Equalised human detection test

If more than 2 of the above criteria are not met, the item will be considered failed

6 Test Deliverables

6.1 Test Plan

Each test is run individually and tested multiple times against various images to ensure the results are constant and return the desired results. If a test is failed a better inspection would take place as to why the test had failed and steps on rectifying any problem would follow.

6.2 Test code

Link to test code

Unit Test Report

7 Detailed Test Results

7.1 Overview of Test Results

- All unit tests were successful.
- J-Unit was used to create our unit tests for Smart Image Identifier as it is a strong unit testing framework for the Java programming language.

7.2 Functional Requirements Tests Results

The tests we have created for this module are contained within the file PeopleDetect_Test.java and Link to Github project.

The following results were obtained from the tests conducted. The tests to produce the follow results have passed/failed and the reasons are stated below

7.2.1 Resize Image (TC 4.1.1)

- The image's dimensions were correct according to the size requested in the method.

7.2.1.1 Result: Pass

7.2.2 Grey-Scale Image (TC 4.1.2)

- The image was successfully stripped of all colours except black and white.

7.2.2.1 Result: Pass

7.2.3 Equalisation of Image (TC 4.1.3)

- The contrast within the image was successfully increased.

7.2.3.1 Result: Pass

7.2.4 Generate Mat Object (TC 4.1.4)

- A Mat object was successfully created which contains the pixels of a given image.

7.2.4.1 Result: Pass

7.2.5 Test Output/Result Image (TC 4.1.5)

- Images are stored correctly in the respective folders based on the type of image it is (normal, grey-scaled, equalised) after it has been processed.

7.2.5.1 Result: Pass

7.2.6 Class Instantiation and Performance (TC 4.1.6)

- All classes were correctly instantiated and the result is a running version of Smart Image Identifier.

7.2.6.1 Result: Pass

8 Other

- Smart Image Identifier has a success rate of 68%.
- The contract in place stipulates how the system operates and procedures used.
- Mock objects portray results of each image that has been successfully processed.
- Reasons why the tests failed include:
  - Non-consistent quality of images being processed. The environment from with each image originates is unique.
  - Day time images have a higher success rate than night time pictures.
  - Pixel quality per image is dependent on the model of trail camera purchased by the project owner (Willburg)'s client.

9 Conclusions and Recommendations

- We will approach these problems by further inspection of the source code to where possible tweaks may be made and perhaps the addition of new test cases.
- Limitations of the test cases include: image formats are restricted to be in .jpg format for processing.
- The largest contributing factor to failed or inaccurate tests is the initial quality of the image before it has been altered. Images who's dimensions are smaller than that of the the image produced after resizing get pixelated and thus this stretches the pixels which will highly reduce the accuracy of the human detection.
- The restrictions are limited to the hardware components used by clients of Willburg (trail cameras) as they range in picture quality between the various models of trail cameras they provide. One way of addressing the problem would providing additional tests for images to pass.