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**School of Computing**

*Department of Computing*

**Bachelor of Science in Computing**

**Programme Code: DT211C/4**

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| Room Occupancy Measurement using Image Processing | | |
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# Project statement

The purpose of this project is to count the number of people in a room using image processing techniques. This application could be used to monitor the elderly people in their homes. The reason for monitoring them could be for example to detect a fall. To detect people in a room, a raspberry pi NoIR camera will be used. This camera will be combined with super bright infra red LED's to shine light on the room making people visible. Once an image has been captured, the result will be posted to a web server. The web server will display the image of the room and the number of people in the room. The image and result posted to the server will be stored in a database until the end of the next day.

# What research has been done and what are the outputs?

## 2.1 Background research

2.1.1 Digital Image Processing

Digital Image processing is the ability to manipulate images through the use of a computer. The purpose of digital image processing is to create applications to generate a specific output on an image. There are some elements which can affect the quality of an image or video such as noise or blurring. These elements can be found in old images or videos and a user can use image processing to reduce or even remove them.[[1]](#footnote-2)

[[2]](#footnote-3)

2.1.2 Infrared VS digital camera

<https://www.raspberrypi.org/documentation/hardware/camera/>

<http://ivrl.epfl.ch/research/infrared/imaging>

<https://thepihut.com/products/raspberry-pi-camera-module>

<https://www.raspberrypi.org/products/camera-module-v2/>

<https://pimylifeup.com/raspberry-pi-camera-vs-noir-camera/>

<https://www.raspberrypi.org/products/pi-noir-camera-v2/>

2.1.3 Thresholding

2.1.4 Flesh Detection

2.1.5 Contouring

2.1.6 Object Detection

2.1.7 Conclusion

## 2.2 Alternative existing solutions to the problem you are solving

(Focussing on the architecture and user/functional requirements

2.2.1 Project 1

2.2.2 Project 2

2.2.3 Project 3

## 2.3 Technologies researched

What candidate technologies did you examine? What criteria did you use for selection? What experience you have in the chosen technologies? If new to you, what have you done to familiarise yourself with the new technology?

2.3.1 OpenCV VS Mat Lab

There are two main independent development environments (IDE) to use when developing an image processing application. For this application I chose OpenCV, OpenCV (Open Source Computer Vision) is an open source library of methods used for image processing.[[3]](#footnote-4)

2.3.2 Python VS C++

2.3.3 Raspberry PI

2.3.4 Web Server Technology

2.3.5 Database Technology

## 2.4 Resultant findings/requirements

For example, a list of requirements for your solution – based on your research and analysis

## 2.5 Bibliography (research sources)

https://karanjthakkar.wordpress.com/2012/11/21/what-is-opencv-opencv-vs-matlab/

# Analysis: Describe clearly what your solution will do

3.1.1 Problem and solution created

The problem to be solved is the use of Infrared image processing to measure room occupancy, and to display this information in a user friendly way. The solution to this problem was to design a system which connected all stages through a web server. The web server receives connections from both the user and the raspberry pi but the two never meet. The raspberry pi receives an image from the IR camera, runs an algorithm to count the people in a room and posts it to the web server, the web server stores this in a database where it analyses the data to present it in a user friendly format. The user can then log into the web server, and view the images and data analysed.

3.1.2 Person Detection Algorithm

3.1.3 Hosting the Web Server

3.1.4 Storing Data

3.1.5 Security

3.1.6 Accessing the Data

# Approach and Methodology

What is your approach to this project? Are you using any particular software methodology? Eg. Are you delivering design/ code in phases, or are you completing all design up front, followed by all coding? Have you some sections lower priority if time runs short?

# Design

## Technical architecture diagram:

Insert the architecture for your solution

## Other design documents

Insert other design artefacts that explain your system: e.g. Use cases/ ERDs/ Class diagrams

# Prototyping and Development

The camera I am using for this project is the raspberry pi NoIR camera. The reason for choosing this camera is that it has no infrared filter attached. The lack of an IR filter allows the taking of lowlight and infrared images. For this camera to take infra red(IR) images, IR LEDS must be shined onto the target area.

https://www.raspberrypi.org/blog/infrared-camera-you-asked/

https://www.amazon.co.uk/Raspberry-Pi-1080p-Camera-Module/dp/B01ER2SMHY

# Testing

Explain your planned testing approach: For example: who will be involved, what test scripts are planned, how will the testing be executed.

# Issues and risks

Explain the main issues / challenges that are unresolved on your project. – and your suggested approach to solving them. This is a critical part of your report to show that you understand what is required to complete the project.

# Plan and future work

What are the key deliverables and date for the remainder of the project?

# Conclusions

Identify interim conclusions viz. summary of findings thus far, plausibility of the proposed system and personal development conclusions.

1. https://www.tutorialspoint.com/dip/ [↑](#footnote-ref-2)
2. http://www.bogotobogo.com/python/OpenCV\_Python/python\_opencv3\_Image\_Non-local\_Means\_Denoising\_Algorithm\_Noise\_Reduction.php [↑](#footnote-ref-3)
3. https://karanjthakkar.wordpress.com/2012/11/21/what-is-opencv-opencv-vs-matlab/ [↑](#footnote-ref-4)