**Student Risk Assessment**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Risk Analysis Matrix  Level of Risk | | | | | | Likelihood | Severity |
| Likelihood | 4 | 4 | 8 | 12 | 16 | 1. Unlikely | 1. Insignificant/No Injury |
| 3 | 3 | 6 | 9 | 12 | 1. Possible | 1. Minor Injury |
| 2 | 2 | 4 | 6 | 8 | 1. Likely | 1. Moderate Injury |
| 1 | 1 | 2 | 3 | 4 | 1. Certain | 1. Major Injury/Fatality |
| × | | 1 | 2 | 3 | 4 | *Score likelihood* | *Score severity* |
| Severity | | | |  |  |

|  |  |
| --- | --- |
| **Activity title:** | **Experiment 1 3D Microscope** |
| **Location:** | **1.57** |
| **Name:** | **Todd Blacklaw** |
| **Date Assessed:** | **23/07/23** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hazard** | Persons Affected | **Likelihood** of incident | Potential **Severity** | **Risk control already in place** | **RISK ASSESSMENT** | **Further Action required to control risk** |
| Mains electrical supply | User | 1 | 4 | Don’t put things in plug | 4 |  |
| Small voltage circuit | User | 2 | 2 | Check all wires and connections are good and no missing insulation | 4 |  |

clc;

clear all;

% Define Constants

wavelength = 550e-9; % Wavelength of white led in meters

numerical\_aperture = 0.2425; % NA of microscope worked out in lab book

known\_object\_size = 22.1e-6; % size of Thorlabs test target group 4 element 4 from Thorlabs documentation

% Calculate Theoretical Resolution

theoretical\_resolution = wavelength / (2 \* numerical\_aperture);

% Load Microscope Image

image = imread('image11.jpg');

% Convert the Image to Grayscale

gray\_image = rgb2gray(image);

% Display the Grayscale Image

imshow(gray\_image);

title('Grayscale Microscope Image');

% Prompt User to Select a Region of Interest (ROI)

roi = imrect;

position = wait(roi); % Wait for the user to draw ROI and press enter

% Crop the Selected ROI from the Grayscale Image

cropped\_image = imcrop(gray\_image, position);

% Calculate the width of the cropped region in pixels

[height, width] = size(cropped\_image);

% Display the Cropped ROI

figure;

imshow(cropped\_image);

title('Cropped ROI');

% Calculate Theoretical Magnification based on a Known Object

theoretical\_magnification = ((height/2) \* 1.12e-6) / known\_object\_size;

% Display Results

fprintf('Theoretical Resolution: %.2f micrometers\n', theoretical\_resolution \* 1e6);

fprintf('Experimental Magnification: %.2fX\n', theoretical\_magnification);

fprintf('Width of the Cropped Region (pixels): %d\n', height);

% Close the previous figure

close(gcf);

% Prompt User to Select a Region of Interest for Gaussian Plot

figure; % Open a new figure

imshow(gray\_image);

title('Select a Region for Gaussian Plot (Original Image)');

roi = imrect;

position = wait(roi); % Wait for the user to draw ROI and press enter

% Crop the Selected ROI for Gaussian Plot from the original image

gaussian\_roi = imcrop(gray\_image, position);

% Create Gaussian Profile for Bright Pixels

bright\_pixels = gaussian\_roi > mean(gaussian\_roi(:)); % You can adjust the threshold if needed

bright\_profile = sum(bright\_pixels, 2); % Sum along the rows

% Create Gaussian Profile for Dark Pixels (complement of bright)

dark\_pixels = ~bright\_pixels;

dark\_profile = sum(dark\_pixels, 2); % Sum along the rows

% Fit Gaussian Curves to Bright and Dark Profiles

bright\_fit = fit((1:length(bright\_profile))', bright\_profile, 'gauss1');

dark\_fit = fit((1:length(dark\_profile))', dark\_profile, 'gauss1');

% Calculate Full Width at Half Maximum (FWHM) for Bright and Dark Profiles

bright\_fwhm = 2 \* sqrt(2 \* log(2)) \* bright\_fit.c1;

dark\_fwhm = 2 \* sqrt(2 \* log(2)) \* dark\_fit.c1;

% Calculate the Average FWHM as an estimate of resolution

resolution\_estimate = (bright\_fwhm + dark\_fwhm) /2;

% Display the Gaussian Fits

figure;

plot(bright\_fit, (1:length(bright\_profile))', bright\_profile);

title('Gaussian Fits for Bright and Dark Pixels');

xlabel('Pixel Position');

ylabel('Intensity');

legend('Bright Profile', 'Dark Profile');

A graph showing the dark and dark pixels

Description automatically generated with medium confidence

close all

resolution = resolution\_estimate \* theoretical\_resolution \*1e-5;

% Display Resolution Estimate

fprintf('Resolution Estimate: %.2f pixels\n', resolution\_estimate);

fprintf('Resolution Estimate (meters): %.2f meters\n');

disp(resolution)

Console

Theoretical Resolution: 1.13 micrometers

Experimental Magnification: 5.50X

Width of the Cropped Region (pixels): 217

Resolution Estimate: 120720.33 pixels

Resolution Estimate (meters): 1.3690e-06