Melanoma Long-term monitoring presentation prep

Slide 1: Cover page

Good evening, my name is Ciaran Carroll. I am studying Electronic and Computer Engineering here at UL. My Final Year Project is titled "Melanoma Long-term Monitoring.". In this presentation, I will talk briefly Melanoma skin cancer, my project and the steps required to complete it.

Slide 2: Introduction

Melanoma is a group of skin cancer that starts in pigment cells (melanocytes) in the skin. It is the deadliest form of skin cancer as it can spread to other parts of the body. Although it accounts for only 3-4% of all skin cancers, it is responsible for 75% of all the skin cancer deaths. Skin cancer is well suited for image processing techniques as the abnormal moles are visible on the skin.

Slide 3: Introduction cont.

In this project, I will develop a system that will be able to monitor the progress of Melanoma (Skin cancer) on a patient's arm over a couple of months. It will involve combining hardware and software. I will build an enclosure with multiple cameras to take the images. I will write a Python program to analyze the images of the arms by using Image pre-processing, enhancement, Image segmentation and Feature extraction methods. I will then compare the images of the arm after the program is functional with images of the same arm before the program was developed.

Slide 4: Build enclosure and take an image

The images of the arm will be captured in an enclosure which will be connected to a Raspberry Pi. The Enclosure will allow me to control the lighting of the image. It will have multiple cameras to get a full representation of the arm. It will contain a handle and armrest which will allow the patient to keep their arm in a constant position.

Slide 5: Pre-processing/Enhancement

Image pre-processing and enhancement will prepare the image for analysis by improving the quality of the image. I will test a lot of different Image pre-processing and enhancement techniques to insure I get the results I desire. Some Image Pre-processing techniques may include noise removal and colour transformation. Some Image Enhancement techniques may include applying a median filter and image smoothing. These methods are used to alter the image to remove artifacts like hair, skin lines and shadows.

Slide 6: Image Segmentation

Image Segmentation involves partitioning of the image into meaningful regions or objects to improve its analysis. It is done by separating the objects within the image by finding its boundary and removing the unwanted regions. Image segmentation will help me to remove the skin and background from the images as I won't need these regions to analyse the arm. I will test various methods of Image segmentation until I am happy with the results such as Otsu's thresholding.

Slide 7: Feature Extraction

Feature Extraction is the final step before the images are compared. It is the transformation of the input image into features of distinct properties. The feature extraction obtains the important information from the image. The feature extraction method I will be using in this project is based on the ABCD criteria which are commonly used by Dermatologists. The ABCD mnemonic stands for:

A – Asymmetry refers symmetry of mole
B – Border irregularity refers to the border of the mole being rough or unclear
C – Colour variation refers to any difference in colour in the mole from one region to another
D – Diameter refers to the size of the mole (over 6mm is concerning)

I will test two main methods for feature extraction:

I will write a program that will manipulate the images of the moles to calculate the features using the Python library OpenCV by comparing each half of the image and fitting shapes to the moles. I will also write a Python program that will extract information from the moles using formulas I will create and I will choose the method which performs the best.

Slide 8: Take second images and compare

I will take the second set of images of the same arm in the enclosure after the program is functional. I will compare information from the feature extraction step and the number of moles on the arm in both images. It will allow me to measure the progress of the melanoma on the arm. Comparing the images will determine if the mole has evolved, changed in colour or if any new moles have appeared.

Slide 9: Summary

In summary, I will build an enclosure to image the arm, and I will write a program to analyze the image. Analysing the images of the arm will involve Image Pre-processing/Enhancement, Image Segmentation, and Feature Extraction methods. I will finally compare the images of the arms will allow me to measure the progress of the Melanoma. I think this project ha potential to become an important tool for GPs and dermatologists in monitoring melanoma.

Slide 10: Questions

Thank you for your time, and I would love to answer your questions if you have any.