Project

Segmentation of Dermoscopy Images on Mobile Platform

Prepared for:

Prepared by:

Introduction

The overall goal of the project is to make an easy to use and efficient system that can be used in the early diagnosis of a particular skin cancer type, malignant melanoma. Outline detection of the skin lesion in dermoscopic images is an important step for automatic diagnosis of malignant melanoma. So it is aimed to implement an image segmentation approach for detection of the skin lesion borders on a mobile platform.

Contents

1. **Research** 3
   a. **Motivation** 3
   b. **Background** 3
   c. **Product Functions** 4
   d. **User Characteristics** 4
   e. **General Constraints** 4
   f. **Requirements** 4
   i. **User Requirements** 4
   ii. **Reporting Requirements** 5
   iii. **User Interface Requirements** 5
2. **Methodology** 5
   a. **Image Segmentation** 5
   b. **Software Development** 6
   c. **Project Schedule & Deliverables** 7
   d. **Error Handling** 7
   e. **Testing** 7
   f. **Optional Features (not included in estimation)** 7
3. **Conclusion** 8

1. Research

a. Motivation

The overall goal of the project is to make an easy to use and efficient system that can be used in the early diagnosis of a particular cancer type, malignant melanoma. It has been agreed that early detection of cancerous skin lesion is very important when you look at from both the economic and successful treatment perspective. Fortunately, if malignant melanoma is detected in early stages, there is a very high percentage of cure rate.

There are 2 general clinical diagnosis approaches for malignant melanoma which are ABCD rule and 7-points checklist. They are both based of characteristics such as color, shape, dimension and texture.

So interpreting dermoscopic images has a great potential when it comes to the diagnosis of malignant melanoma. Because of this interpretation is subjective and very time consuming, developing automatic dermoscopic image analysis system to help clinical determination is currently a great interest.

Since clinical diagnosis approaches also depends on the features like asymmetry, border irregularity, shape and dimension characteristics, detection of skin lesion outline is an important step in this interpretation. What is achieved in this work is to select an accurate and reliable image segmentation method and implement it on a mobile platform.

b. Background

Analysis and making a diagnosis of the skin lesion in computer environment begins with the image segmentation. Others steps like extracting features and lesion classification are usually based on the information gathered from the first step.

However there are some complications in image segmentation because of subject images. Skin lesion can be in variety of shapes, colors, sizes for different skin types and textures. These features of the skin lesion make it harder to imply image segmentation accurately and reliably.

Generally, methods of image segmentation for skin lesion can be grouped as region-based approaches, thresholding based approaches, contour based approaches and edge-based approaches. Of course all these methods have pros and cons, for example if there is

much contrast between lesion and skin, thresholding methods can get good results, but results become worse when the change between regions is smoother; same problem is true for edge-based methods too.

c. Product Functions

Software will be capable of detecting borders of a skin lesion from an image file in the mobile phone. It will use the gallery of the phone for the source of the image file, process the detection with the implemented segmentation method and show the result image into the screen. The result image can be saved into the programs directory.

d. User Characteristics

Generally people from medical field, especially from the branch of dermatology, are expected to use this software. They can offer their patients to install the software to their mobile phones. Patients can take photos of the interested region of the skin at regular time basis and send the result images of the software to their doctor. Also dermatologist can use for the images that they already have to get the result images.

On the other hand the software can be a start point or a part of a more complex system such an automated diagnosis system for malignant melanoma disease.

e. General Constraints

Software will be developed for a mobile platform which is either Android, J2ME enabled or Windows Phone.

f. Requirements

i. User Requirements

- Users can select any image from the gallery of the mobile phone.
- After the border detection process, result will be shown as an image with border is highlighted on it.
- Users can either save the result image or start with a new image.
- Users can exit the program.

- Users will install the software by using the setup file that will be provided.

ii. Reporting Requirements

Any error that is caught will be shown or reported.

iii. User Interface Requirements

- Skin lesion image will be selected using a user interface.
- Result image will be shown on a user interface.

2. Methodology

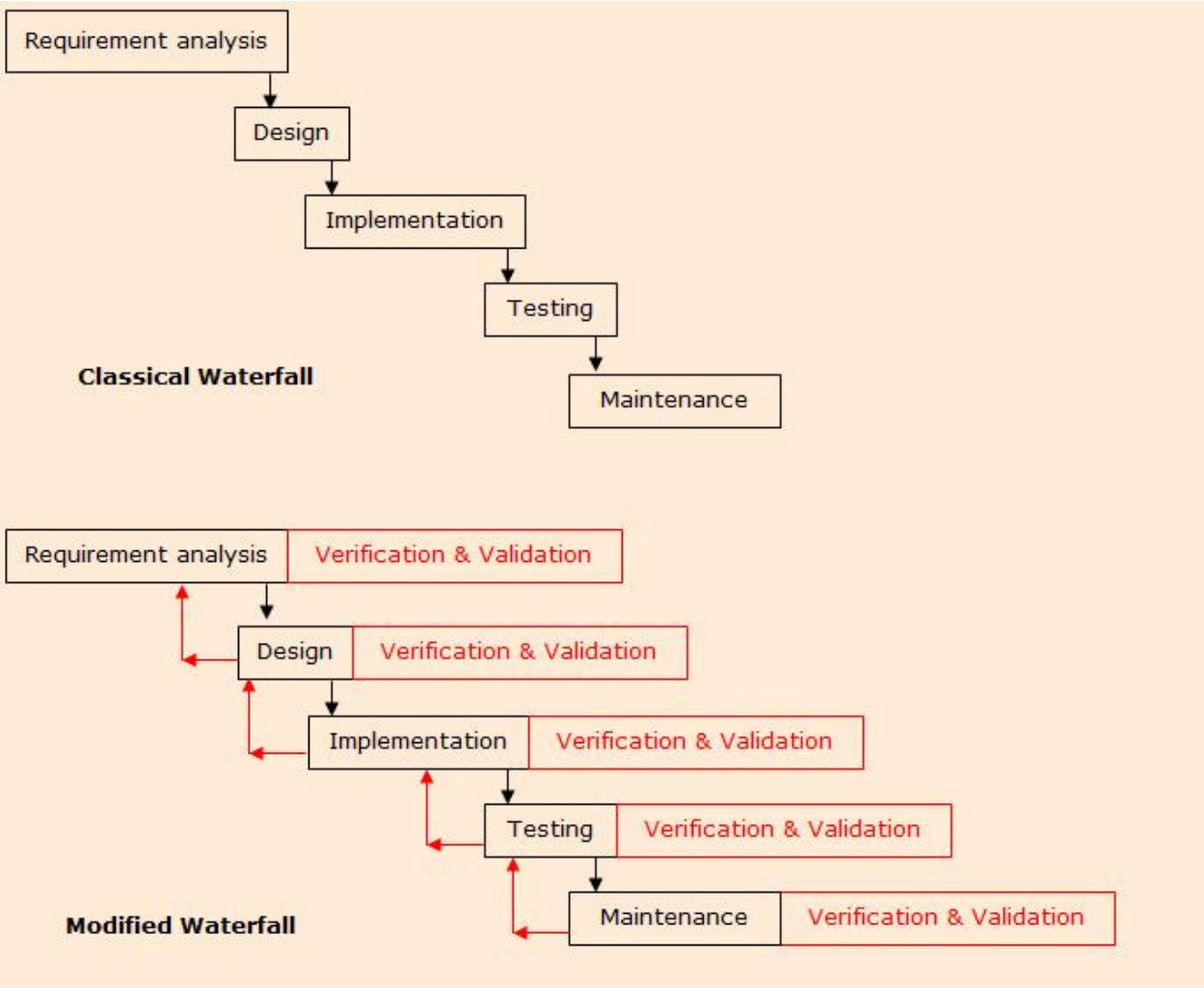
a. Image Segmentation

For image segmentation Fuzzy C-Means Thresholding algorithm will be implemented, these are the reasons to consider it as a choice:

- Structure of the method that can be parameterized and see how different values affect the result (Ex: cluster number, iteration count, fuzzy factor).
- More or less easier understanding of the algorithm.
- There are plenty of documents and algorithm that can be used as a start point.

b. Software Development

The whole software development approach will be as a modified waterfall model:



Modified waterfall will give us these flexibilities:

- overlapping phases
- concurrent tasks
- easy to handle & fix errors
- reduced formality and document procedures

Development Environment

Software will be developed on desktop computer in Microsoft Windows 7 Ultimate 64-bit OS using Eclipse Indigo (v3.7.1) with Android SDK 3.2.

c. Project Schedule & Deliverables

	Task	Assigned To	Start	End	Dur	%	2011 Oct	Nov	Dec
	PROJECT	Caner Yogurtcular	19/10/11	16/12/11	43	100			
1	Requirement Analysis	Caner Yogurtcular	19/10/11	16/11/11	21	100			
2	Design	Caner Yogurtcular	17/11/11	24/11/11	6	100			
3	Implementation	Caner Yogurtcular	21/11/11	7/12/11	13	100			
4	Testing & Maintenance	Caner Yogurtcular	8/12/11	16/12/11	7	100			

Deliverables

1. Project Proposal
2. Architecture & Technical Design
3. Software Source Code and Android Application Package File (APK)

d. Error Handling

Any errors that have been caught will be shown to the user on screen.

e. Testing

Software will be tested with publicly available dermoscopic images whose borders are already detected. Test will initially be on Eclipse environment, after pc tests are completed, android program package file will be produces and software will be installed to Samsung Galaxy S2 with Android Gingerbread v2.3.3.

f. Optional Features (not included in estimation)

- User can send the result image within the software with email.
- Static constants of the thresholding algorithm can be made as parameterized and set by the user via text input or sliding bars.

3. Conclusion

The project aims to make border detection in dermoscopic images easy and mobile to perform. It is expected to cost and effort savings over time, especially for patients whom will reduce their travel costs to visit doctors just to take skin pictures and also they will save time.

On the other the project can be a starting step for an automated diagnosis system for malignant melanoma on mobile platform.