ROBUST IMAGE DETECTION BY USING NEURAL NETWORK

LINGESWARAN S/O SUBRAMANIAM

18TH NOVEMBER 2005

Verification of Supervisor

"I/We have confirm that I have read this thesis and in my opinion this thesis fulfill the scope and quality for the fulfillment of requirements for the **Degree of Bachelor in Electrical Engineering (*Industry Power*)**"

Signature : ……………………………

Name of Supervisor : Mr. Saifulza.

Date : 20 – 11 – 2005.

ROBUST IMAGE DETECTION BY USING NEURAL NETWORK

LINGESWARAN S/O SUBRAMANIAM

This Report Is Submitted In Partial Fulfillment of Requirements for
The Degree of Bachelor in Electrical Engineering (Industry Power)

DEPARTMENT OF ELECTRICAL

KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA

November, 2005

Personal Verification

I verify this thesis is my own work except summary and articles whereby I have included its reference.

Signature : ....

Name : **LINGESWARAN S/O SUBRAMANIAM**.

Date : **21st NOVEMBER 2005.**

Dedication for my beloved parents.

Herewith I would like to thankful for my parents in giving me full support during my thesis verification. They encourage me to find out the articles from internet and also from the reference books. So I should thank them right here.

Acknowledgements

The last six months have been over helming and I could not have gone through it without the help of the people I want to thank right here.

To my supervisor **Mr. Saifulza** for giving me ample guidance and for always making time for me each time I needed help.

To my batch mates for making life in the thesis room a wonderful experience and also letting I make full use of their facilities such as pc, laptop and notes.

To my mom and dad who have given me enough love to survive tough moments. To my brother for taking me seriously all the time.

Last, but never least, to god, who has always shown me that being patient is the best way to handle any situation.

Abstrak

Projek ini akan menggunakan kaedah rangkaian neural cepat yang bergabung dengan algoritma terkini untuk mengesan imej. Gabungan rangkaian neural akan menimbang dan mengurus semula aktiviti neural dalam lapisan tersembunyi untuk membolehkan trasformasi fourier mempercepatkan masa pengesanan dan parameter yang berkaitan. Untuk memenuhi syarat dalam pengesanan yang cepat dan tepat pada arah objek dalam mengawal system, rangkaian neural diambil untuk system proses imagning. Adalah penting untuk resolusi gandaan untuk arah objek untuk melaras kebolehan asli rangkaian neural untuk pengesanan arah. Dalam memperbaiki keupayaan atau kebolehan pengesanan arah untuk sesuatu objek yang diletak di antara satu sama lain, pemotongan dengan corak yang ditampal pada bunyi latar belakang adalah penting. Pengesanan system operasi imej boleh dijalankan dengan cepat dan tepat jika module rangkaian neural yang dicadangkan dilakukan oleh perisian computer.

Abstract

This project will present an approach to image detection based on fast neural network methodology combined with a new algorithm. Cross- co-relation of neural network weights and reformulating the neural activities in hidden layer to enable the use of Fourier Transformation to speed up the time detection and other related parameters. In order to satisfy the requirements, for fast and robust detection of direction of an object on controlling the system, the neural network was adopted to the imaging processing system. The neural network modules got robust performance in detecting edges and directions of objects. It was important for doubling resolution of object direction to adjust original performance of the neural network for direction detection. In order to improve performance of direction detection of an object piled on the other one, trimming with edge patterns embedded in random background noise was found to be essential. The image processing system can be operating very fast and robustly if the proposed neural network modules are composed by software programmers.

TABLE OF CONTENTS

LIST OF TABLES FIGURES

APPENDICES

CHAPTER 1

INTRODUCTION

An important application in robust image detection is image processing. The image can be process by image registration, image analysis and image enhancement. Image registration is a fundamental technique embedded within a wide-range of image processing applications such as motion estimation, pattern target recognition, Super-resolution and medical image analysis as motion estimation, pattern target recognition, Super-resolution and medical image analysis. The registration task, which is typically applied as a pre-processing stage for further analysis, consists of aligning two images with one another so that differences can be detected and analyzed. Hence, the efficiency of further processing greatly depends on the accuracy of the registration phase. Registration is often found complex, particularly when the images are deformed or noisy.

1.1 Objective of this study

- To gather and study image processing, image analysis and image enhancement.
- To determine the criteria and rules needed for image processing, image analysis and image enhancement.
- To fully apply image detection skill and knowledge in developing the rule based on neural network system.
- To identify and apply Matlab toolbox to determine solutions for the problems.

1.2 Scope of this study

Reformulating the neural activities in hidden layer to enable the use of Fourier transformation and Fourier inference to speed up the time detection and other related parameters.

1.3 Problem Statements

- By introducing the neural network system the image produced will be more clear and precise without the noisiness on that object.

- Currently the image processing system is poor when the haze situation. So to recover that problem neural network application is produced fast feed forward neural application to the image produced more clear and precise.

CHAPTER 2

LITERATURE REVIEW

(a) Image Registration

Image registration is a fundamental technique embedded within a wide-range of image processing applications such as motion estimation, pattern target recognition, Super-resolution and medical image analysis. The registration task, which is typically applied as a pre-processing stage for further analysis, consists of aligning two images with one another so that differences can be detected and analyzed. Hence, the efficiency of further processing greatly depends on the accuracy of the registration phase. Registration is often found complex, particularly when the images are deformed or noisy.

Point Mapping

The Image Processing Toolbox provides tools to support point mapping to determine the parameters of the transformation required to bring an image into alignment with another image. In point mapping, you pick points in a pair of images that identify the same feature or landmark in the images. Then, a spatial mapping is inferred from the positions of these control points. The following figure provides a graphic illustration of this process.

** Please refer to the figure 2.0.*

** Please refer to the functions column for more information's about the Commands. (Functions for Image Registration)*

Image registration is the process of aligning two or more images of the same scene. Typically, one image, called the base image, is considered the reference to which the other images, called input images, are compared. The object of image registration is to bring the input image into alignment with the base image by applying a spatial transformation to the input image. A spatial transformation maps locations in one image to new locations in another image. Determining the parameters of the spatial transformation needed to bring the images into alignment is key to the image registration process. Image registration is often used as a preliminary step in other image processing applications. For example, you can use image registration to align satellite images of the earth's surface or images created by different medical diagnostic modalities (MRI and SPECT). After registration, you can compare features in the images to see how a river has migrated, how an area is flooded, or to see if a tumor is visible in an MRI or SPECT image.

<u>Explaining about the demonstration of *Image Registration.*</u>

1. Finding the Rotation and Scale of a Distorted Image

If we know that one image is distorted relative to another only by a rotation and scale change, you can use cp2tform to find the rotation angle and scale factor. You can then transform the distorted image to recover the original image. Contents:-

Step 1: Read image
Step 2: Resize the image
Step 3: Rotate the image
Step 4: Select control points
Step 5: Infer transform
Step 6: Solve for scale and angle
Step 7: Recover original image

Step 1: Read image Bring the image into the workspace.

```
I = imread('cameraman.tif');
imshow(I)
```

*(*please refer to the figure 2..1.0)*

Step 2: Resize the image

```
scale = 0.6;
J = imresize(I,scale); % Try varying the scale factor.
```

Step 6: Solve for scale and angle

The TFORM structure, t, contains a transformation matrix in t.tdata.Tinv. Since we know that the transformation includes only rotation and scaling, the math is relatively simple to recover the scale and angle. Let

```
sc = s*cos(theta)
Let ss = s*sin(theta)Then, Tinv = t.tdata.Tinv = [sc -ss  0;
                                                  ss  sc  0;
                                                  tx  ty  1]
```

where tx and ty are x and y translations, respectively.

```
ss = t.tdata.Tinv(2,1);
sc = t.tdata.Tinv(1,1);
scale_recovered = sqrt(ss*ss + sc*sc)
theta_recovered = atan2(ss,sc)*180/piscale_recovered =
0.6000
        theta_recovered =
29.3699
```

The value of scale_recovered should be 0.6 or whatever scale you used in Step 2: Resize the Image. The value of theta_recovered should be 30 or whatever theta you used in Step 3: Rotate the Image.

Step 7: Recover original image

Recover the original image by transforming K, the rotated-and-scaled image, using TFORM structure t and what you know about the size of I.

In the recovered image, notice that the resolution is not as good as in the original image I. This is due to the sequence which included shrinking-and-rotating then growing-and-rotating. Shrinking reduces the number of pixels in the image K so it effectively has less information than the original image I.

The artifacts around the edges are due to the limited accuracy of the transformation. If you were to pick more points in Step 4: Select control points, the transformation would be more accurate.

```
D = size(I);
recovered = imtransform(K,t,'XData',[1 D(2)],'YData',[1 D(1)]);
% Compare recovered to I.
figure, imshow(I)
title('I')
figure, imshow(recovered)
title('recovered')
```

*(*please refer to the figure 2.1.2 &2.1.3)*

2. Explaination about the:-

Registering an Image Using Normalized Cross-Correlation

Sometimes one image is a subset of another. Normalized cross-correlation can be used to determine how to register or align the images by translating one of them.

Step 1: Read Images

```
onion = imread('onion.png');
peppers = imread('peppers.png');

imshow(onion)
figure, imshow(peppers)
```

*(*please refer to the figure 2.2.0 & 2.2.1)*

Step 2: Choose Sub regions of Each Image

It is important to choose regions that are similar. The image sub onion will be the template, and must be smaller than the image sub peppers. We can get these sub regions using either the non-interactive script below or the interactive script.

```
% non-interactively
rect_onion = [111 33 65 58];
rect_peppers = [163 47 143 151];
sub_onion = imcrop(onion,rect_onion);
sub_peppers = imcrop(peppers,rect_peppers);
```