PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester 1 **Academic Year**: 2008-2009

Date:30 July 2008 **Time**: 09.00-10.30 (1hour and half)

Subject Number: 241-574 **Room**: R200

Subject Title: Advanced Image Processing

Exam Duration: 1 hour and half

This paper has 3 pages, 7 questions and 30 marks (30%).

Authorised Materials:

- Writing instruments (e.g. pens, pencils).
- Textbooks, a notebook, handouts, and dictionaries are permitted.

Instructions to Students:

- Scan all the questions before answering so that you can manage your time better.
- Attempt all questions in English.
- Write your name and ID on every page.
- Any unreadable parts will be considered wrong.

When drawing diagrams or coding, use good layout, and short comments; marks will not be deducted for minor syntax errors.

Cheating in this examination

Lowest punishment: Failed in this subject and courses dropped for next semester.

Highest punishment: Expelled.

Name_____ ID_____

ชื่อ_____รหัส_____

241-574 Advance Image processing (30 คะแนน 1 ชั่วโมง 30 นาที)

1. Describe operations on images which achieve the following effects:
   (i) lighten an image which is too dark; [2 marks]

   (ii) Rotate 45° degree an image; [2 marks]

   (iii) convert a colour image (in RGB format) to a greyscale image while preserving the perceived luminance. [2 marks]

2. Compute the histogram of X. Suppose that X is the array X=[1 0 1 2 0 4 2 0 4 1 4 1] [2 marks]

3. Explain the advantages and disadvantages of using Subsampling compared with interpolation. [3 marks]

ชื่อ_____ รหัส_____

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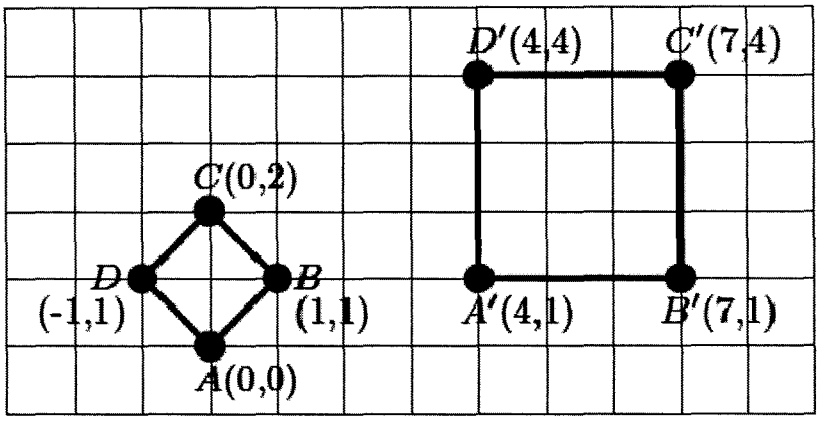
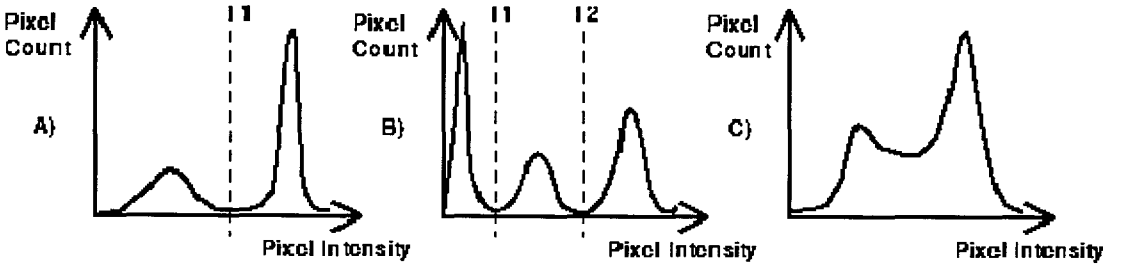
4. Give a matrix, or a product of matrices, which will transform the square ABCD to the square A'B'C'D'. [3 marks]



5. Show what happens if the same transformation is applied to the square A'B'C'D'. [3 marks]

6. Give a image of object that can build this histrogram [3 marks]



a)

b)

c)

7. Let u = [u_1, u_2, 1]T and v = [v_1, v_2, 1]T denote the homogeneous coordinates of points in planes ***P*** and ***Q***, respectively. Matching point pairs are related by a projection matrix H as

$$v_i = \boldsymbol{H}u_i,\ i = 1, 2, \ldots, n$$

A transform from ***P*** to ***Q*** in the form of a translation by (x_0, x_1) then a rotation by then a scaling by (s0, s1) is described by the matrix

$$H = \begin{bmatrix} 0.951623 & 0.443749 & -6.97686 \\ -0.401487 & 0.860992 & -2.29753 \\ 0 & 0 & 1 \end{bmatrix}$$

Determine the values of (x0, x1, s0, s1,) for this order transformations. [10 marks]