

Detection of selected cells in Multi Choice Sheets

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Abstract

In this paper we introduce a method based on vertical and horizontal histogram threshold to overcome the problem of detection the huge number of multichoice questioner sheets, where the manipulating, checking, find duplicate answer, and produce the result manually take a lot of time from human and also errors may be occur.

The proposed algorithm work into two main steps first detect the grid found in each sheet by applying vertical and horizontal histogram, then detect the selected cell by also applying vertical and horizontal histogram depend on threshold value.

The values of sheets stored in a data base to process it and the results printed either in word or excel form.

We test this work on the evaluation supervisor questioners sheet for 50 students.

Introduction

Edge detection has been a field of fundamental importance in digital imaging research. Edges can be defined as pixels located at points where abrupt changes in gray level take place. By marking the edges of individual objects, an image can be segmented; the individual segmented objects can be indexed and classified; and semantic characteristics of the image can be identified.

Line detection is a fundamental task in computer vision. Hough transform is the most well-known method to detect lines. Normally, Hough transform starts from edge detection based on the local differential property of image. Then, the edge map is transformed from image space into parameter space [1].

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Present paper can detect any selected cell not only lines, either selected by circle or line or any thing other, applying vertical and horizontal histogram can be considered as one method to search about the edge of grid in image.

Histogram

Histograms have been widely used to represent, analyze, and characterize images. One of the initial applications of histograms was the work of Swain and Ballard for the identification of 3D objects [2]. Following that work, various recognition systems [3], [4] based on histograms were developed. Currently, histograms are an important tool for the retrieval of images and video from visual databases [5], [6], and [7]. Some of the reasons for their importance are that they can be computed easily and efficiently, they achieve significant data reduction, and they are robust to noise and local image transformations. For many applications, however, the histogram is not adequate, since it does not capture spatial image information.

The term histogram has several meanings. Originally a graphical tool developed by statisticians to visualize frequency distributions, it has come to have a very specific meaning when used in the context of digital images.

To keep things simple, we'll start with black and white images. In black and white images, each pixel has a specific brightness level which is stored in the computer as a number between 0 and 255. Zero corresponds to black and 255 to white. Since the eye, even under ideal conditions, cannot barely distinguish 200 different gray levels, the 256 available gray levels in a digital image, if properly used, are more than adequate to represent even the most subtle tonal variations in a black and white image.

Multi choice detection in sheets

To perform the detection there are main steps in this work must do, before any one of these steps the sheet treats as image and scanner for it.

- 1- Convert image to black and white.
- 2- Rotate image if needed.
- 3- Divide image into sub-image.
- 4- Find the selected cell.
- 5- Print the result into appropriate format.

The Supervisors Evaluation

		0.5	1	1.5	2
The Theoretical					
1	The general appearance			✓	
2	Commitment to implementation of the lesson's plan				✓
3	Enrichment of lesson's content		✓		
4	The use of illustration aids			✓	
5	Keeping order in class	✓			
The application part					
6	Appropriate pre-lesson preparations				✓
7	Ability to stimulate the student				✓
8	Precision of instructional material				
9	Linking the instructional material to the environment.			✓	
10	Clarifying and simplifying of scientific terms and concepts.	✓			
11	Presenting of ideas in a systematic way.		✓		
12	Good investment of time.				✓
13	Emphasis on the application part of the instructional material			✓	
14	Raising various cognitive questions to develop critical thinking.				✓
15	Equitable distributing of questions among students.		✓		
16	Good follow up of the students class and home work.				✓
17	Using various techniques in lesson's evaluation	✓			
18	Using different ways to encourage students	✓			
19	Giving attention of class environment				
20	The use of labs to put over knowledge to students		✓		
21	Attention to handicrafts of the students		✓		
22	Attracting the attention of the students to their mistakes.				✓

Figure (1): Color supervisor evaluation questioner sheet after scanner.

1- Convert image to black and white

this step convert the color image to black and white for many reasons, first to reduce the noise, second to reduce the process when treat with color image. Converting process is done by find histogram for all images and depends on threshold value a median average produced from the intensity of image so that gives as the value used for converting to black and white.

$$x_{ij} = \begin{cases} 0 & x_{ij} < \text{Threshold} \\ 1 & x_{ij} > \text{Threshold} \end{cases} \dots(1)$$

		The Supervisors Evaluation			
The Theoretical		0.5	1	1.5	2
1	The general appearance			✓	
2	Commitment to implementation of the lesson's plan				✓
3	Enrichment of lesson's content		✓		
4	The use of illustration aids			✓	
5	Keeping order in class	✓			
The application part					
6	Appropriate pre-lesson preparations				✓
7	Ability to stimulate the student				✓
8	Precision of instructional material				
9	Linking the instructional material to the environment.			✓	
10	Clarifying and simplifying of scientific terms and concepts.	✓			
11	Presenting of ideas in a systematic way.		✓		
12	Good investment of time.				✓
13	Emphasis on the application part of the instructional material			✓	
14	Raising various cognitive questions to develop critical thinking.				✓
15	Equitable distributing of questions among students.		✓		
16	Good follow up of the students class and home work.				✓
17	Using various techniques in lesson's evaluation	✓			
18	Using different ways to encourage students	✓			
19	Giving attention of class environment				
20	The use of labs to put over knowledge to students		✓		
21	Attention to handicrafts of the students		✓		
22	Attracting the attention of the students to their mistakes.				✓

Figure (2): Supervisor evaluation questioner sheet after converting to black and white.

2- Rotate image.

After converting the image to black and white, the image may be loaded not in the correct form, so, it needs to rotate.

In rotation steps, first find index box in the upper side of image that far one cm from left and right sides of image, compute the height from the start of image by the number of pixels(β), calculate the difference between index box and the upper margin

of the image. For the horizontal width we calculate the distance between two index box(α), θ angle of rotate found by equation [8]

$$\sin^{-1}(\beta / \alpha) = \theta \quad \dots(2)$$

Divide θ by 2 because it represents the rotation of the total image, rotation is done from rotation equation

$$x_n = x_o \cos(\theta / 2) - y_o \sin(\theta / 2) \quad \dots(3)$$

$$y_n = x_o \sin(\theta / 2) + y_o \cos(\theta / 2) \quad \dots(4)$$

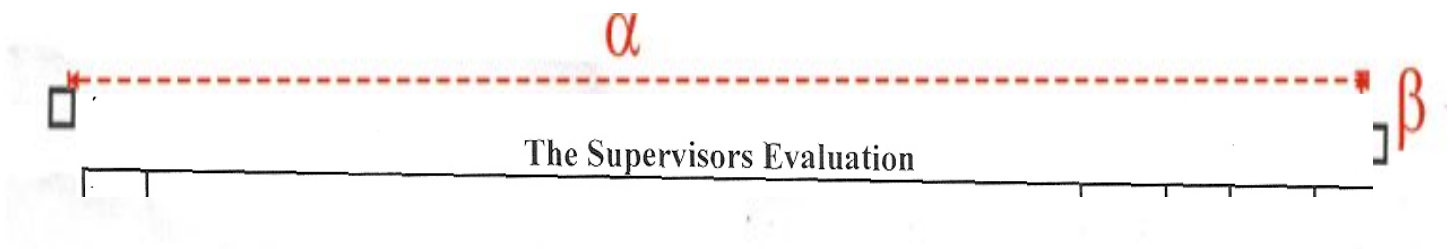


Figure (3): Calculate index box of upper image

3-Divide image into sub-image

The main purpose for present paper is to detect the multichoice of answers in questioner or examiner sheets.

The output of this stage find grid net, so, this help to specify the grids that will be treat with them later for determining the selected cells, the occurrences for the horizontal and vertical pixels for image will generate the grid net from equation

$$x_i = \begin{cases} r_i + 1 & x_{ij} > threshold \\ r_i & otherwise \end{cases}$$

Where r represent occurrences of active pixels in row i

$$y_j = \begin{cases} c_j + 1 & x_{ij} > threshold \\ c_{ji} & otherwise \end{cases}$$

Where c represent occurrences of active pixels in column

The Supervisors Evaluation

The Theoretical		0.5	1	1.5	2
1	The general appearance				✓
2	Commitment to implementation of the lesson's plan				✓
3	Enrichment of lesson's content		✓		
4	The use of illustration aids				✓
5	Keeping order in class	✓			
The application part					
6	Appropriate pre-lesson preparations				✓
7	Ability to stimulate the student				✓
8	Precision of instructional material				✓
9	Linking the instructional material to the environment.				✓
10	Clarifying and simplifying of scientific terms and concepts.	✓			
11	Presenting of ideas in a systematic way.		✓		
12	Good investment of time.				✓
13	Emphasis on the application part of the instructional material				✓
14	Raising various cognitive questions to develop critical thinking.				✓
15	Equitable distributing of questions among students.		✓		
16	Good follow up of the students class and home work.				✓
17	Using various techniques in lesson's evaluation	✓			
18	Using different ways to encourage students	✓			
19	Giving attention of class environment				✓
20	The use of labs to put over knowledge to students		✓		
21	Attention to handicrafts of the students		✓		
22	Attracting the attention of the students to their mistakes.				✓

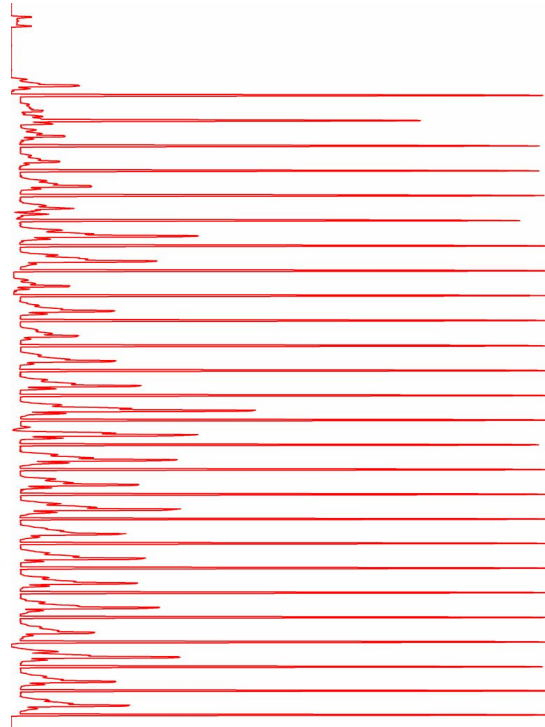


Figure (4): Horizontal histogram for image

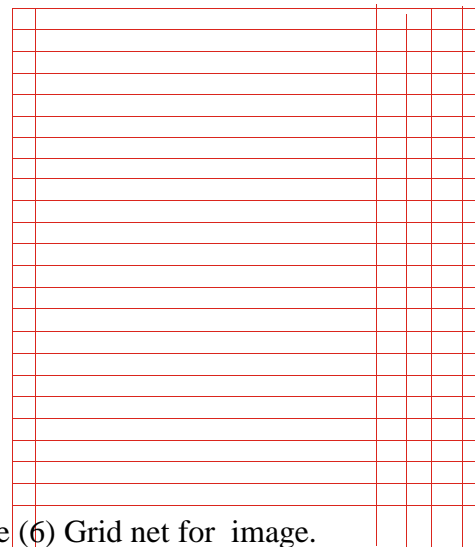
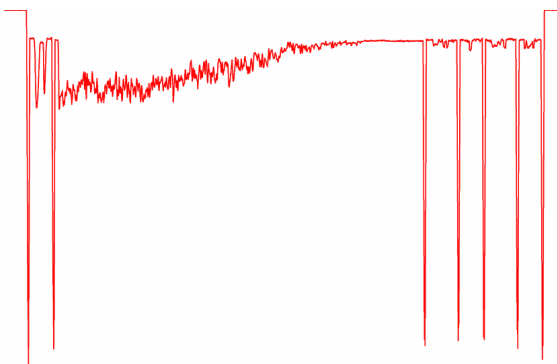
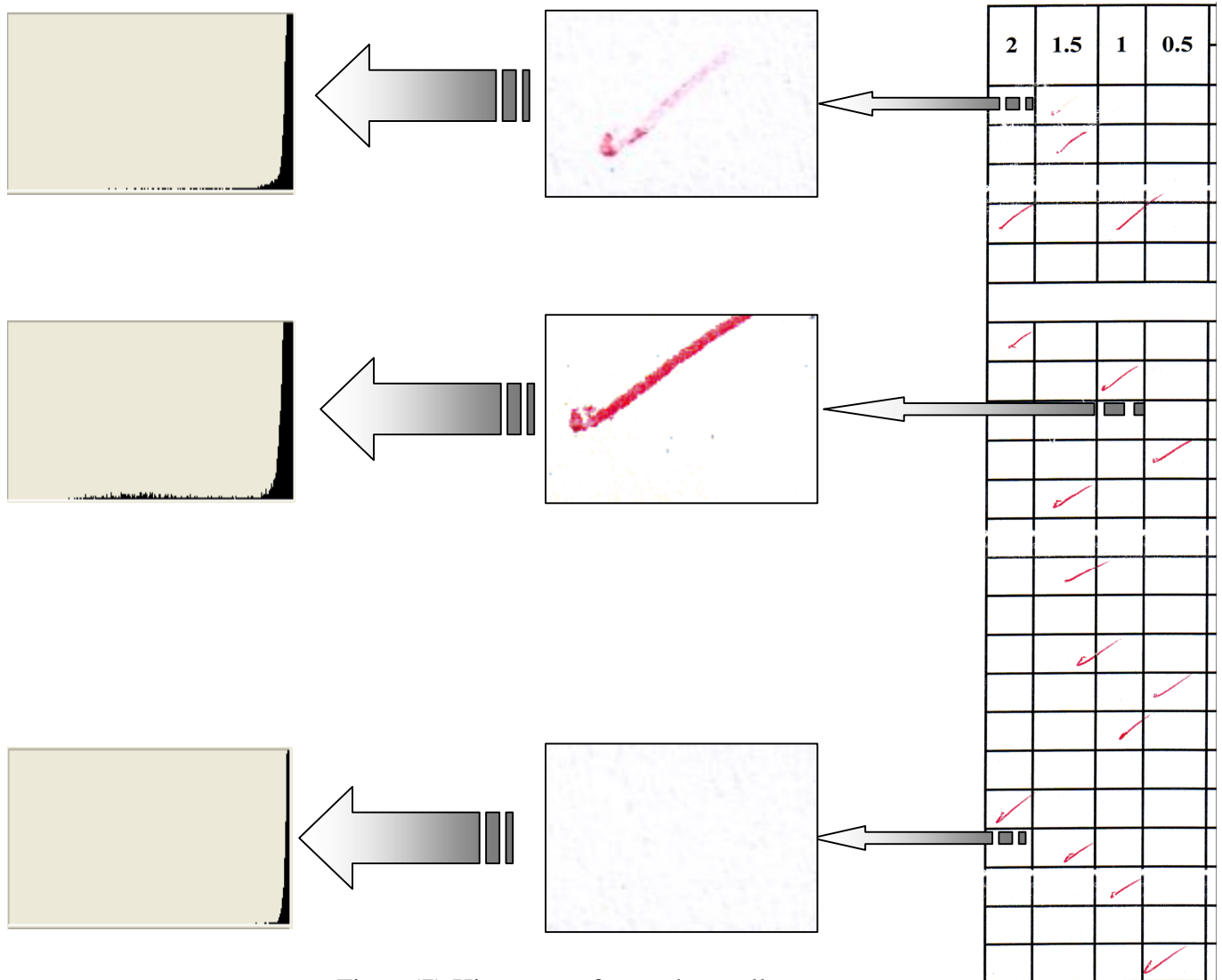


Figure (5): Vertical histogram for image Figure (6) Grid net for image.

4. Find the selected cell.

From the grid net generated above, the image will be divided into sub-images, each of them addressed by row and column. Finding another histogram for each sub-image, again comparing with threshold, this leads to know if the cell selected or not, from the values related with each selected cell

, that store in a database, perform the processing needed, check if there is a duplicate answer...etc.



Figure(7):Histograms for random cells

5. The result printed in table 1

	Result	Sheet No.	Result	Sheet No.	Result
1	28.5	18	20	35	33.5
2	27	19	21	36	26.5
3	32	20	24	37	30.5
4	32.5	21	26.5	38	32.5
5	30	22	30.5	39	30
6	26	23	24	40	26
7	25	24	28.5	41	33.5
8	16	25	23.5	42	34
9	32	26	24.5	43	34
10	27.5	27	32.5	44	31
11	26.5	28	32.5	45	32
12	30.5	29	30	46	26.5
13	30	30	26	47	30.5
14	30	31	0	48	27.5
15	32	32	26.5	49	28
16	34	33	30.5	50	28
17	32.5	34	16.5		

Table 1: The result printed in table after perform calculation

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تحديد الخلايا المختارة في الاستثمارات المتعددة الاختيارات

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الخلاصة:

قدم هذا البحث طريقة تعتمد على الرسم البياني الافقي والعمودي لتجاوز مشكلة العدد الكبير من الاختيارات في اوراق الاستبانة او الاسئلة الامتحانية او اي تطبيق آخر يعتمد على مبدأ الاختيارات المتعددة ، حيث ان عملية التعامل والفحص واستخلاص النتائج من هذه الاستثمارات تحتاج الى وقت بالاضافة الى احتمال ورود اخطاء.

الخوارزمية المقترحة تعمل على عدة خطوات رئيسة الاولى تحويل الاستثمارة الى صورة بالابيض والاسود، تدوير الاستثمارة اذا كانت موضوعة بشكل غير صحيح عند تحميلها، معرفة الشبكة لكل الورقة من خلال تطبيق الرسم البياني العمودي والافقي و ثم تحديد الخلايا المختارة (المؤشر عليها بأي علامة) من خلال اعادة عملية الرسم البياني اعتمادا على قيمة معينة.

القيم المرتبطة بكل حقل تخزن بقاعدة بيانات ومن ثم تتم معالجتها وطباعة النتائج. تم اختبار العمل من خلال استعمال الاستثمارات الخاصة بتقييم الأساتذة للطالبات خلال فترة التطبيق في المدارس في المرحلة النهائية للكلية لخمسين اسم.