A Using Face Detection to Study Students' Emotion in Classroom Teaching

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Abstract

The aim of this study was to investigate the students' emotion and learning in their classroom by using Face Detection technique and to enhance teachers' teaching and improve students' emotion. One school was used as the target school which came from the selection by all staffs and Grade 7 to 9 students in this school agree to participate in this research. There were 3 teachers and 58 students (Grade 7 = 23 students, Grade 8 = 19 students, and Grade 9 = 16 students) participated as the experiment group. The camera were used for data collection. The frequency and Normalized confusion matrix were used to interpret the data. The results show that after 12 weeks of classroom teaching, students feel more "Happy" and the results of this will promote how to use students' emotion in improve classroom teaching.

Keywords: Face Detection, Improving Students' Emotion

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Introduction and Literature

Using information about student learning and progress to inform school and classroom practices is widely recognized as an important component of strategies to support teaching improvement of teachers (Earl and Katz, 2006; Fullan, Hill, and Crevola, 2006). According to Earl and Katz (2006), there can be discuss that educators were mistrust or fear of data and evaluation, and lack of training on how to use data. Individual schools may lack capacity to understand and use data effectively to inform instructional improvement and student learning (Diamond and Spillane, 2004; Earl 2003; Ingram, Louis, and Schroeder, 2004; Mason 2001).

In the past two decades, face detection has been proven as the most interesting research field from the domain of image processing. In this paper, we are going to describe some important aspects of face detection, which are very much useful in many applications like face recognition, facial expression recognition, face tracking, facial feature extraction, gender classification, identification system, document control and access control, clustering, biometric science, human computer interaction (HCI) system, digital cosmetics and many more (Yang, Kriegman, and Ahuja, 2002; Roy and Podder, 2013).

Face detection is a procedure by which we can able to extract face region from a human body Roy and Podder (2013) face recognition has attracted much attention and its research has rapidly expanded by not only engineers but also neuroscientists, since it has many potential applications in computer vision communication and automatic access control system. Especially, face detection is an important part of face recognition as the first step of automatic face recognition. However, face detection is not straightforward because it has lots of variations of image appearance, such as pose variation (front, non-front), occlusion, image orientation, illuminating condition and facial expression.

Face recognition techniques can be classified as two main approaches: Geometric approach or Feature-based approach where we analyze various features by means of their relationships (Yongsheng and Leung, 2002) and holistic approach (Turk and Pentland, 1991) such as Eigenfaces, neural networks (Rowley, 1999).

First, the Geometric approaches or Feature-based approach to recognize a face. In Feature-based approaches (Manjunath, Chellappa, and von der Malsburg, 1992) we first preprocess the input image to remove the noise, and then we extract distinctive facial features such as the eyes, mouth, nose, etc., and then compute the geometric relationships among those facial points, thus reducing the input facial image to a vector of geometric features. Standard statistical pattern recognition techniques are then employed to match faces using these measurements. Most of the previous works was based on this technique.

Second, Holistic based face recognition, unlike Feature based method, holistic based approaches use the global information rather that local feature information of the face. Here we represent the entire image with some small key values, which are directly derived from the pixel information of face images. This small key information is sufficient to uniquely differentiate individual faces. Here we describe two holistic approaches to face recognition called statistical and AI approaches. An overview of some of the methods in these categories such as Statistical Approach (Jain, Duin, and Mao, 2000), Principal Component Analysis (Subba Rao and Asadi, 2010), and Linear Discriminant Analysis (Yang, 2002). In this research, researchers would like to use Face Detection technique to detect students' emotion and use this the information to improve teachers' teaching.

Methodology

The methodology of this research was quantitative method: survey and experiment were used. The participants includes 3 teachers and 58 students in one School located in Ladyao District, Nakhon Sawan Province.

The four steps as follows,

Step 1: Meeting with school administrators, teachers and staffs in school to discuss about the research project after they volunteer as experimental group. And collecting students' face by using Webcam and proceed to Face Detection technique and study of the open source such as OpenCV.

Step 2: Studying images' feature by using the statistics to decrease the image dimension for example, the image size 100x100 pixel have 10,000 picture dots which will reduce by using statistics.

Step 3: Classified the data, after collecting the images' feature will continue with using OpenCV in face detection by coding via Python.

Step 4: Storage the data

Results

The results show that, there were three teachers and 55 Grade 7-9 students from Wat Nongyao School under Nakhon Sawan Provincial Education Service. The details about the effectiveness of using Face Detection in each Grade as follows.

Table 1 The results of using Big Data and Face Detection in improve teaching activities in Grade 7

Month	Week	Students' Emotional Behavior					Total
		Surprised	Happy	Nature	Sad	Angry	
May	1	1,223	1,283	1,562	1,200	384	5,652
	2	1,646	672	2,713	676	356	6,063
	3	1,491	2,892	1,273	248	64	5,968
	4	1,146	1,849	3,503	99	88	6,685
June	1	1,713	1,983	1,765	68	57	5,586
	2	1,595	1,132	1,439	66	7	4,239
	3	1,739	2,748	3,389	81	5	7,962
	4	781	2,838	3,831	983	2	8,435
July	1	1,749	2,645	3,980	890	55	9,319
	2	1,505	2,541	3,790	572	76	8,484
	3	1,086	2,008	4,198	604	30	7,926
	4	1,618	2,893	4,909	365	6	9,791

From Table 1, the results after using Big Data by Face Detection technique of Grade 7 students show that from week one to week twelve students expressed their feeling through their faces with high level in "Sad" and "Angry" in May. However, in June and July, students expressed their feeling with "Surprise", "Happy", and "Nature" in higher rate than May.

Table 2 The results of using Big Data and Face Detection in improve teaching activities in Grade 8

Month	Week	Students' Emotional Behavior					Total
		Surprised	Happy	Nature	Sad	Angry	
May	1	688	560	2,724	849	29	4,850
	2	608	828	2,991	508	34	4,969
	3	1,927	1,156	1,855	892	37	5,867
	4	1,121	1,382	1,365	873	86	4,827
June	1	1,667	1,621	1,744	441	20	5,493
	2	1,960	2,960	1,292	843	37	7,092
	3	1,192	2,568	2,177	217	64	6,218
	4	1,384	2,810	2,332	515	97	7,138

Table 2 (Cont.)

Month	Week	Students' Emotional Behavior					Total
		Surprised	Happy	Nature	Sad	Angry	
July	1	1,121	2,761	2,936	232	57	7,107
	2	1,021	1,998	3,165	867	16	7,067
	3	1,637	2,881	3,877	629	85	9,109
	4	1,783	3,892	3,434	654	11	9,774

According to Table 2, it shows that from week one to week twelve, Grade 8 students expressed their feeling through their faces with high level in "Sad" and "Angry" in May. However, in June and July, students expressed their feeling with "Surprise", "Happy", and "Nature" in higher rate than May.

Table 3 The results of using Big Data and Face Detection in improve teaching activities in Grade 9

Month	Week	Students' Emotional Behavior					Total
		Surprised	Happy	Nature	Sad	Angry	
May	1	230	523	1,829	396	33	3,011
	2	318	1,220	1,700	495	95	3,828
	3	808	1,635	1,969	838	55	5,305
	4	584	1,525	1,019	795	87	4,010
June	1	912	861	1,799	28	59	3,659
	2	945	648	1,875	993	47	4,508
	3	441	776	2,458	918	60	4,653
	4	736	840	2,879	455	53	4,963
July	1	1,049	1,950	2,994	581	13	6,587
	2	1,668	2,611	2,297	494	1	7,071
	3	1,235	3,575	3,629	680	5	9,124
	4	1,371	3,714	3,719	52	8	8,864

According to Table 3, from week one to week twelve students expressed their feeling through their faces with high level in "Sad" and "Angry" in May. However, in June and July, students expressed their feeling with "Surprise", "Happy", and "Nature" in higher rate than May.

Figure 1 The Normalized confusion matrix of Grade 7 during last five week

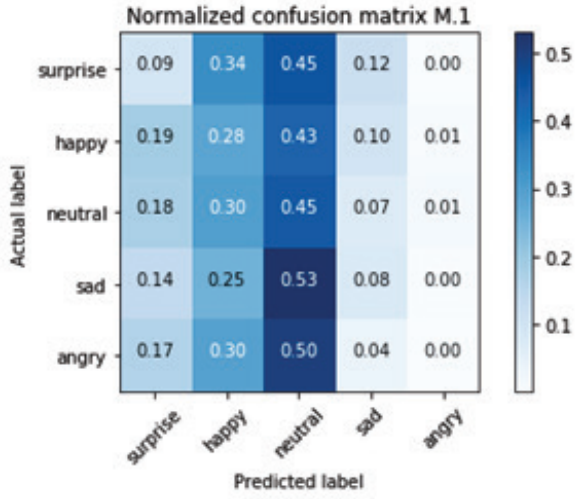

Figure 1 The Normalized confusion matrix of Grade 7 during last five week

From Figure 1, it shows that the Normalized confusion matrix of Grade 7 during last five weeks found that the "Sadness" emotion tended to decrease with 12%, 10%, 7%, 8%, and 4% respectively. Focused on the "Happiness" in learning, students tend to have high "happy" feeling increase with 30%.

Figure 2 The Normalized confusion matrix of Grade 8 during last five week

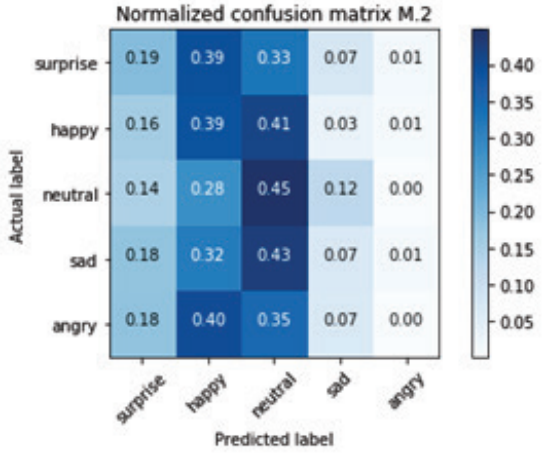

Figure 2 The Normalized confusion matrix of Grade 8 during last five week

From Figure 2, it shows that the Normalized confusion matrix of Grade 8 during last five weeks found that the "Sadness" emotion tended to decrease with 7%, 3%, 12%, 7%, and 7% respectively. Focused on the "Happiness" in learning, students tend to have high "happy" feeling increase with 40%.

Figure 3 The Normalized confusion matrix of Grade 9 during last five week.

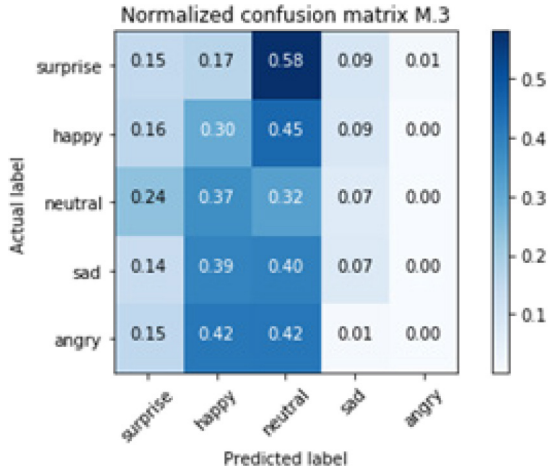

Figure 3 The Normalized confusion matrix of Grade 9 during last five week.

From Figure 1, it shows that the Normalized confusion matrix of Grade 7 during last five weeks found that the "Sadness" emotion tended to decrease with 9%, 9%, 7%, 7%, and 1% respectively. Focused on the "Happiness" in learning, students tend to have high "happy" feeling increase with 42%.

Conclusion

From the results, it shows that from week one to week twelve, Grade 7, 8, 9 students expressed their feeling through their faces with high level in "Sad" and "Angry" in May. However, in June and July, students expressed their feeling with "Surprise", "Happy", and "Nature" in higher rate than May. This may be because teachers after received the information they adapted that information and modified their teaching activities. In the first month, students felt "Sad" and "Angry" in all Grades. It may be because, the semester just began and students felt uncomfortable with the curriculum such as the content to hard and they lack of prior knowledge. After first month passed, in June and July, the classroom was more interaction according to the Normalized confusion matrix during last five week. The classroom tended to be "Happy" which is positively to students. Trust, teachers can use the

information about student emotion to inform school and classroom practices is widely recognized as an important component of strategies to support improvement (Earl and Katz 2006; Fullan et al. 2006).

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