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Classification of Student Faces in Assignment Presentation Video using Bezier Curve and K-Means Clustering Algorithm

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Abstract: ***Grouping facial images can be used for various purposes with various algorithms. The purpose of this study was to determine the classification of students' facial images in the assignment presentation video using the Bezier Curve algorithm and K-Means Clustering. The results showed that the initial classification was still in a varied and uneven position. Then the final classification has a significantly different distribution for each cluster.***

Keywords : Face Image, Video Presentation, Bezier Curve, Face Extraction

I. INTRODUCTION

The development of the world information technology today is increasing along with the development needs. One important part that is being developed today is a face identification system for various specific purposes such as: security systems, attendance, facial recognition, and facial expressions. Grouping of facial images (image clustering) can be used to analyse faces (face recognition) based on the extraction features of a person's face.

Face recognition is currently used to classify a person's emotions by extracting facial features in the form of eyebrow positions, eye curvature, and mouth openings. With this method, a person's emotions can be seen by looking at the movements of changes in the face [1]. The other use of face recognition is in education by the attendance system, using face recognition technology, attendance systems that previously used biometrics in the form of finger prints that are still prone to fraud, replaced by using face recognition, and this can minimize fraud acts [2].

The development of educational media, facilities, infrastructure, and the learning methods used by lecturers have varied greatly with the aim of, among other things, so that students do not feel bored or refreshing from conventional learning.

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In general, the most widely used conventional method is learning in the classical form, where students listen to the lecturers' explanations in class. Current technological developments have also been felt in the field of education, one of which is a learning method that uses project-based performance presentation methods.

The main purpose of this study was to determine the classification of student face images based on the extraction features of faces obtained from recorded learning outcomes through presentations on the task of making web-based applications carried out in the classroom. From this facial extraction feature, it can be analysed the face image of students in accordance with the results of the facial extraction obtained.

II. LITERATURE REVIEW

Image processing technology has many uses. One application of image processing is used in the face and retina detection system of the eye. Even the basis of fingerprint and touch screen recognition technology also uses the philosophy of image processing technology [3].

One approach that can be used for face detection systems is the Bezier Curve algorithm. The Bezier curve is a curve used in computer graphics and image processing. Through this curve we can interpolate and estimate curve accuracy and represent an object in the form of a curve (see figure 1) [4].

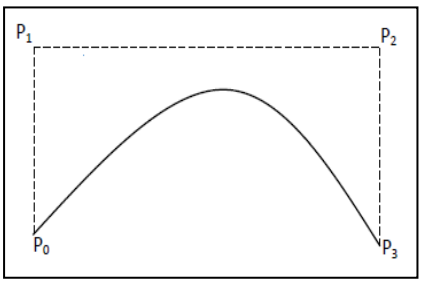

Fig 1 Bezier Curve [4]

The technique in the Bezier curve defines the curvature at four points: the starting position and the final position of the curvature at P0 and P3. Two separate midpoints (handles) in P1 and P2 are useful for determining the direction of the curve.

Retrieval of vector values from faces is done by representing the face as two-dimensional space.

Determining the face as a proportional (symmetrical) space can determine (1) Face height / width; (2) lip location; (3) Face height; (4) Position of the nose; and (5) the distance between the eyes [4]. Illustration of these provisions [5] is shown in the proportion of faces in Figure 2.

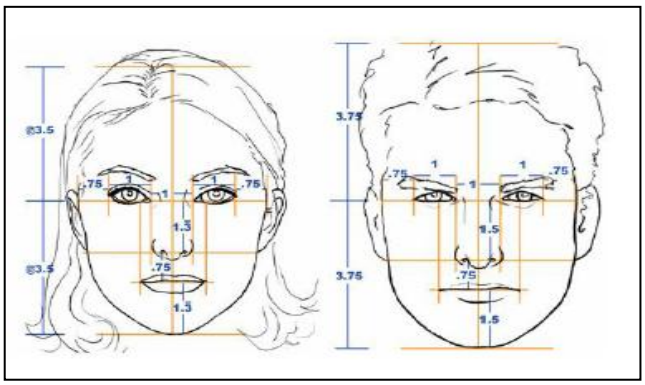

Fig 2 The Proportion of Faces [5]

Then, a classification can use the k-means algorithm as a process of grouping a similar object into different groups. K-means algorithm uses the process repeatedly to get the cluster [6]. It takes the desired number of initial clusters as input and produces the final centroid point as output. The number of iterations to reach the centroid cluster will be influenced by prospective random centroid clusters [7]. After the K-Means iteration stops, each object in the dataset becomes a member of a cluster. Cluster value is determined by searching for all objects to find the cluster with the closest distance to the object.

III. RESEARCH METHOD

Capture Image, in this student face image classification, the data is obtained from video results of student assignments on web programming subjects. There are 50 students given the task to create a website, then they present it in front of the class and recorded through a camera. Figure 3 shows some sample video recordings that are used as data sources.

In the next stage, the recorded video will be separated by using the help software as shown in Figure 4. At this stage a face image will be generated based on the frame extracted from the source video, each frame will be taken feature in the form of pixels of the left eye, right eye and mouth. Figure 5 shows the results of the separation of the frame. The next stage is the process of taking pixel values from the extraction feature on the face.

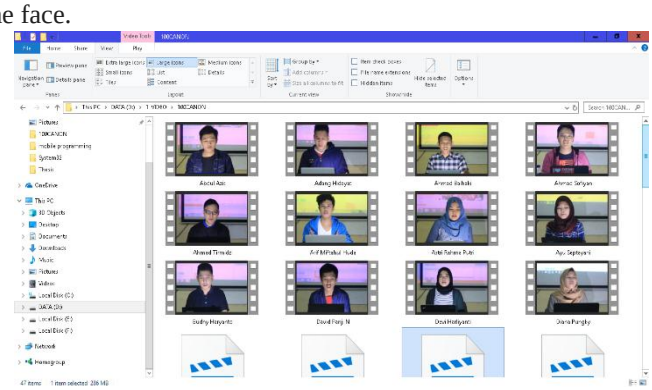

Fig 3 Data Source

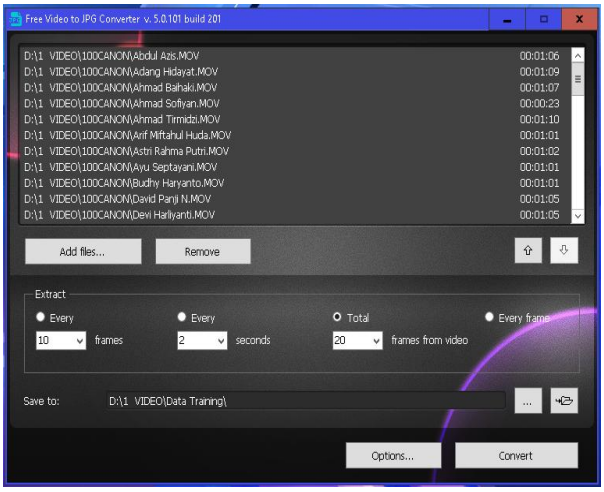

Fig 4 The process of separating face frames

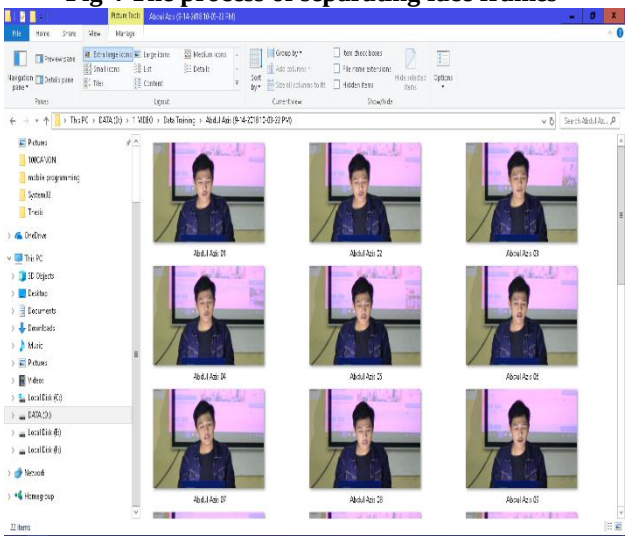

Fig 5 The results of the separation of the frame

IV. RESULT

The results of facial recognition of the student's facial extraction feature are based on extraction features obtained from pixel values of distances for the left eye, right eye and lips. Figure 6 shows an example of facial recognition results. The complete results can be seen in table 1.

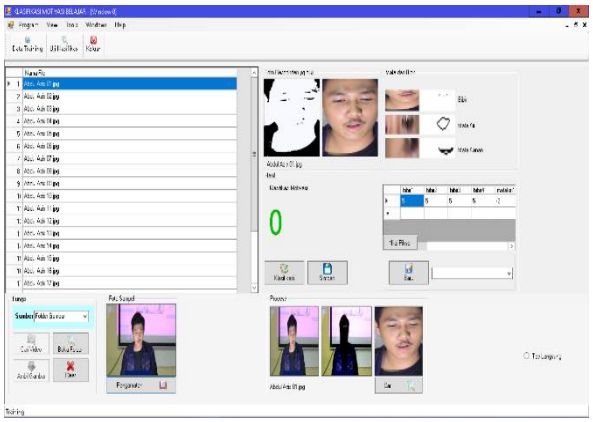

Fig. 6 An Example of Facial Recognition Results

Table- I: The complete of Facial Recognition

Lips	Left Eye	Right Eye	Total Distance	Students
1	0	0	1	S1
10	2	0	12	S2
4	3	0	7	S3
2	0	3	5	S4
0	12	6	18	S5
3	0	5	8	S6
6	0	9	15	S7
3	18	18	39	S8
0	0	4	4	S9
4	16	5	25	S10
3	0	11	14	S11
3	0	0	3	S12
4	8	6	18	S13
1	1	4	6	S14
3	5	2	10	S15
2	0	9	11	S16
3	2	2	7	S17
4	0	8	12	S18
3	4	6	13	S19
5	0	0	5	S20
0	0	0	0	S21
4	10	13	27	S22
8	9	25	42	S23
4	0	5	9	S24
1	5	3	9	S25
0	6	4	10	S26
10	0	0	10	S27
0	0	66	66	S28
0	0	7	7	S29
6	0	9	15	S30
15	0	0	15	S31
0	3	5	8	S32
0	10	15	25	S33
4	11	0	15	S34
7	10	0	17	S35
0	0	10	10	S36
0	0	11	11	S37
0	0	10	10	S38
6	6	0	12	S39
8	0	9	17	S40
0	8	20	28	S41
0	0	0	0	S42
18	6	0	24	S43
0	0	0	0	S44
18	4	1	23	S45
33	12	3	48	S46
23	5	0	28	S47
0	2	0	2	S48
0	10	8	18	S49
99	4	0	103	S50

Based on table 1, the classification results are obtained to determine the initial cluster that will be used as the center of the first Cluster. This cluster is determined randomly. There are three initial clusters, namely C1, C2, and C3. The results of each cluster obtained S14 as C1, S7 as C2, and S10 as C3.

The results of clustering classification using the k-means algorithm for the first iteration obtained the following data: cluster 1 (c1) consists of 23 face images, cluster 2 (C2) consists of 12 face images and cluster 3 (C3) consists of 15 face images. Figure 7 shows the distribution of each cluster.

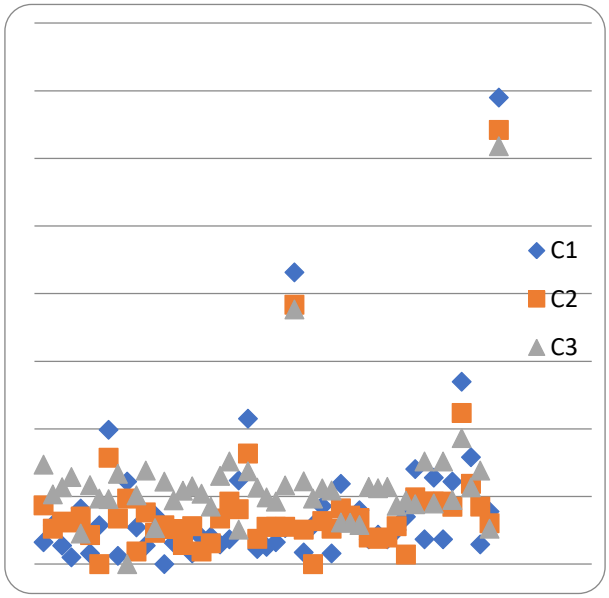

Fig.7. First Iteration clustering results

In the first iteration graph, some students in each cluster are still in a varied and unevenly distributed position. In this study iteration achieved the same cluster value at the 8th (eight) iteration. Figure 8 shows the final classification results.

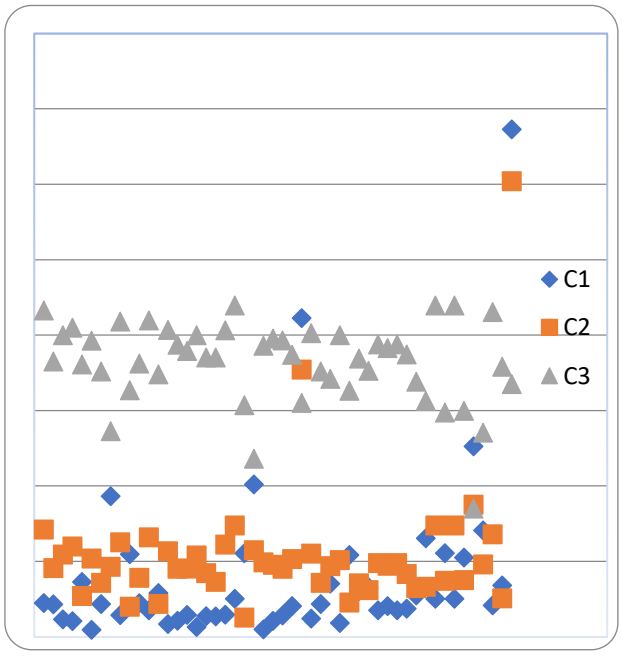

Fig. 8. Final Iteration clustering results

Based on Figure 8, it can be seen that the distribution of face images from student face samples has a significantly different distribution for each cluster, with the results that 34 face images entered into cluster 1 (C1), and as many as 13 face images entered into cluster 2 (C2), and the remaining 3 face images enter the third cluster (C3).

V. CONCLUSION

Face recognitioin can be used to classify students' facial images obtained from video extraction results and produce two-dimensional images using the Bezier Curve approach. By extracting features from the face in the form of lips,

right eye and left eye, then this face image data will produce pixel values for the distance of each of the three facial components.

Then the final result of classification shows that by using the K-Means Clustering algorithm, the results are 34 face images entered into cluster 1, and 13 face images enter cluster 2 and the remaining 3 face images enter cluster 3.

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