

Title	Global Facial Modelと画像の粗さ測度に基づく表情顔 画像からの表情情報抽出に関する研究
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# Feature extraction for Facial expression from Facial Images based on Global Facial Model and Analyzing for Image Pattern Complexities

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This paper proposes a feature extraction method for facial expression based on Global Facial Model and using coefficient of curved surface. We look on a gray level's surface of facial image as curved surface, and express complexities of curved surface using coefficient of Hausdorff dimension. By coefficient of computed Hausdorff dimensions, conduct the region segmentation consist of split and merge. The result of segmentation, regions of facial parts and other regions such as hair and wear are left on the image. At this time, region estimation for facial parts can be by using the proposed method which based on Global Facial Model.

People get information from the other peoples via five senses (sight, hearing, smell, touch and taste) on communication. These informations can be classified into verbal information and nonverbal information. Facial expression are of nonverbal information is important on a human communication. Mehrabian (1968, psychologist) reported that people get facial expressions as parts of message on entire 55%. And more, facial expression has the other function. For example, which transmit condition of the other people and transmit the information for specify who the people is. And the other characteristic point, people can get information from partners without any action by them. It is different point to voice.

If communication tools can handle these informations on the telecommunication, human communication can become more efficient and the tools can become more functional. For this purpose, it is necessary to develop the basis of facial analysis.

To extract facial expressions from facial image, it needs to find how people get facial expression and where the information of facial expressions are appear. And then, we can develop techniques for facial analysis.

The purpose in this research is to obtain the technique to extract facial expression, which appears as physical factor on facial image. We take five steps to do as follows:

### 【 1 】 Measurement tendency of recognition for facial expression

First, we find regions that have rich information of facial expression. Generally, people know that we attention eye and mouth to recognize facial expression. Some research reports human tendency of recognition on a situation people has limitation to view facial image. We measure tendency of facial expression recognition more natural situation. To do this, we use eye-mark recorder that points viewpoint of people. The result of measurement, people tend to attention eye and mouth on facial expression recognition.

### 【 2 】 Region segmentation from image pattern complexities

From the result of measurement, we construct methods to extract facial expression from partial image (eye and mouth). We use region segmentation method to get partial image. The method uses image pattern complexities as hausdroff dimension. Hausdroff dimension have distinctive characteristics the dimension don't have much effect of linear transform (such as rotation, dilatation and diminution). So, we can well done region segmentation without normalization for input image.

For region segmentation method, we confirm such characteristics by analyzing model image.

### 【 3 】 Position estimation of facial parts using Global Facial Model

Result of region segmentation using hausdroff dimension, there are regions of facial parts and the other regions. So, we need to choose regions of facial parts from their regions. To choose them we propose the method based on Global Facial Model. Global Facial Model is a model that constructed with size of regions and position information. On this research, we measured size of eye and mouth and its position on 25 facial images. Then, we design Global Facial Model and try to estimate regions of facial parts from regions which separated by region segmentation method.

### 【 4 】 Extraction information of facial expression as outline image of facial parts

To extract information of facial expression, it needs to analyze images of facial parts. In this paper, we extract information by outline images of facial parts. Processing using filters makes outline images. This method doesn't need any models of facial parts, and then it doesn't need normalization for input image.

### 【 5 】 Application which classify facial expressions

We try to classify facial expressions with outline image of facial parts. In this paper, it takes up 4 categories such as "absence of expression", "laugh", "anger", "yawn". The result of classification, it is possible this system can classify facial expressions into each category.

Finally, as the next step of this research, we must conduct to design Global Facial Model with consideration of structure of face, and to process outline image more exactly.