Pareidolia analysis of architecture: Reading the emotional expression of a building façade.

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Abstract

The psychological phenomenon wherein the human mind recognises particular images in otherwise unrelated visual stimuli is called pareidolia. It is the most common examples of pareidolia is the identification of illusion face-like forms that, through their perception, appear to be facial expressions. In contrast, the conventional pitched roof house, with its central chimney and large set of data. The end result of this process is not a single answer, but rather a complex set of logical ideas or responses, arguing that certain buildings fail to stimulate the full range of the human mind is demonstrated in an analysis of the emotions expressed by facades detected in the facades of two famous houses; the Villa Savoye and the Robie House. Research in cognitive science has suggested that certain areas of the human brain are concerned with recognizing faces and with interpreting the emotional content of facial expressions (Chalup et al. 2012). Both of these systems were trained using sets of images of facial pareidolia and were able to suggest emotions. While there are many reasons that might explain why some architectural façades trigger face-like shapes and forms in a range of natural and synthetic systems (Figure 1). The present paper describes an analysis of the capacity of two famous house facades to be read, through the presence of pareidolia, as suggesting an emotional state. The houses are the Villa Savoye (1929) by Le Corbusier and the Robie House (1908) by Frank Lloyd Wright. The analysis is undertaken using software and methods developed by the authors. The software which has been trained using a database of images of facial pareidolia, relies on two interconnected systems; face detection and expression classification. The detection system uses a type of machine learning called a one-class classifier. The expression classification system uses a method known as Adaptive Support Vector Machine (pa-SVM), a special modified multiclass SVM (Hong et al. 2012). Both of these systems were trained using sets of images of faces and of facial pareidolia (Chalup et al. 2016; 2010). The key data used for training was a set of 380 images of human faces, which were taken from the research image data set of Japanese and Caucasian Facial Expressions of Emotion (JACFEET) and Japanese and Caucasian Neutral Faces (JACNEUT) (Sekii and Matsumoto, 1993). All of the images from this data-classes were cropped and resized prior to training so that each had a full individual frontal face in such a way that the inner eye corners of all faces appeared in exactly the same position (Figure 2).

The first stage of the process commences with the starting image being processed through one of three different filters; binary, grey-scale and equalisation. These filters are used because the results of each different approach to image pre-processing can be compared for statistical validity. The software is then set to scan across the filtered image, at multiple scales, examining every configuration of geometry or form in an image to see if it conforms to the facial patterns in the training data. The software is capable of identifying multiple faces in an image with a high degree of accuracy, although as images become more abstract the faces being detected have a lower mathematical level of confidence. Once a face is detected, it is boxed around its extent. Once the complete set of faces have been detected, then Ekman’s, Friesen’s and Hager’s expressions are used to train the face detection system. Nature Neuroscience, 6(6), 624-631.


The most stable sets of results were produced using the binary detection system with binary expression classification. The results show that the Villa Savoye produces substantially fewer expressions than the Robie House – the results are inconclusive (Figures 8 and 9). The results show that the Villa Savoye produces fewer expressions than the Robie House – the results are inconclusive (Figures 8 and 9). The results show that the Villa Savoye produces fewer expressions than the Robie House – the results are inconclusive (Figures 8 and 9). The results show that the Villa Savoye produces fewer expressions than the Robie House – the results are inconclusive (Figures 8 and 9).

References


Figure 2: Image prior to face detection and expression classification

Figure 3: Image after face detection and expression classification.

Figure 6: Robie House, South Elevation, December AM

Figure 7: Robie House, South Elevation, June AM

Figure 8: Villa Savoye – average results for expression classification

Figure 9: Robie House – average results for expression classification

Figure 10: Comparative analysis of a human face and a building façade (Sekii and Matsumoto, 1993).

Figure 11: Pareidolia analysis of architecture: Reading the emotional expression of a building façade.

Figure 12: Pareidolia analysis of architecture: Reading the emotional expression of a building façade.

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Figure 25: Pareidolia analysis of architecture: Reading the emotional expression of a building façade.

Figure 26: Pareidolia analysis of architecture: Reading the emotional expression of a building façade.

Figure 27: Pareidolia analysis of architecture: Reading the emotional expression of a building façade.