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A Deep Learning Facial Expression Recognition Based Scoring System For Restaurants

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ABSTRACT:

Recently, the popularity of automated and unmanned restaurants has increased. Due to the absence of staff, there is no direct perception of the customers' impressions in order to find out what their experiences with the restaurant concept are like. For this purpose, this paper presents a rating system based on facial expression recognition with pre-trained convolutional neural network (CNN) models. It is composed of an Android mobile application, a web server, and a pre-trained AIserver. Both the food and the environment are supposed to be rated. Currently, three expressions (satisfied, neutral and disappointed) are provided by the scoring system.

INTRODUCTION:

In recent years, the rapid development of information and communication technology (ICT), the Internet of Things (IoT) and artificial intelligence (AI) has resulted in an increasing number of applications based on these technologies. Followingt

his trend, the popularity of automated and unmanned restaurants continues to grow. Particularly in Japan and Taiwan, the number of automated or unmanned restaurants that run successfully is growing. In Fig. 1 examples of two restaurants of this type are shown.Saeed *et al.* [1] proposed a cloud-based smart restaurant management system, which is composed of an Android mobile application for customers and a web application for restaurant staff members. The mobile application provides the customer among other things an interactive menu for ordering dishes andpaying their bill.

As there is no staff available in unmanned restaurants, it is difficult for the restaurant management to estimate how the concept and the food is experienced by the customers. In addition, it is not possible to estimate the age and gender composition of customers to successfully perform targeted marketing. Existing rating systems, such as Google and TripAdvisor, only partially solve this problem, as they only cover a part of the customers' opinions.

Fig:1. An automated restaurant operated in Tokyo, Japan.

Algorithms:

Haar-AdaBoost

Convolutional Neural Network (CNN)

EXISTING SYSTEM:

As there is no staff available in unmanned restaurants, it is difficult for the restaurant management to estimate how the concept and the food is experienced by the customers. Existing rating systems, such as Google and TripAdvisor, only partially solve this problem, as they only cover a part of the customer's opinions. These rating systems are only used by a subset of the customers who rate the restaurant on independent rating platforms on their own initiative. This applies mainly to customers who experience their visit as very positive or negative.

PROPOSED SYSTEM:

In order to solve the above problem, all customers must be motivated to give a rating. This paper introduces an approach for a restaurant rating system that asks every customer for a rating after their visit to increase the number of ratings as much as possible. This system can be used unmanned restaurants; the scoring system is based on facial expression detection using pretrained convolutional neural network (CNN) models. It allows the customer to rate the food by taking or capturing a picture of his face that reflects the corresponding feelings. Compared to text-based rating system, there is much less information and no individual experience reports collected. However, this simple fast and playful rating system should give a wider range of opinions about the experiences of the customers with the restaurant concept.

ARCHITECTURE AND DESIGN:

Fig. 2 shows an application scenario of the proposed scoring system. After the customer has finished eating and paid, he could be asked to rate the food as well as the environment on the same tablet that has already been used for ordering the food and payment.

The proposed restaurant scoring system is composed of an Android mobile application, a web server and a pre-trained AI server. The mobile application forms the interface through which the customer interacts with the scoring system. The facial expression recognition is performed on the AI server. The mobile application and the AI server do not communicate directly with each other. Instead, the entire data transfer between these two runs via a web server on which the data is stored in a database.

System Architecture:

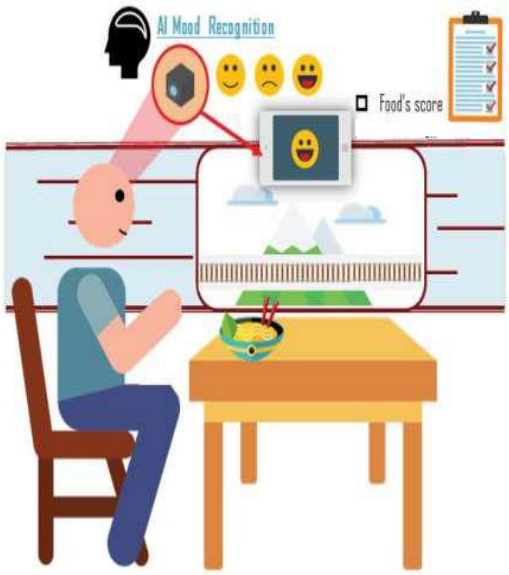

Fig:2.Application of the scenario of the Restaurant scoring system

Modules:

Face Detection:

Face detection or localization is an important step for image classification since only the principal component of face such as nose, eyes, mouth are needed for classification. Face detection algorithms can be broadly classified into feature, knowledge, template and appearance based methods. Our proposed system uses Viola Jones object detection algorithm for face localization which comes under feature based classification. Viola Jones object detection algorithm uses Haar featurebased cascade classifiers. The Haar Cascade classifier is extremely important element of the face detection. The presence of the features in any of the input image is determined by the Haar features.

Facial Expression Recognition classification:

After learning the deep features, the final step of FER (Facial Expression Recognition) is to classify the given face into one of the basic emotion categories. Unlike the traditional methods,
where the feature extraction step and the feature classification step are independent, deep networks can perform FER in an end-to-end way. Specifically, a loss layer is added to the end of
the network to regulate the back-propagation error; then, the prediction probability of each sample can be directly output by the network. In CNN, softmax loss is the most common used function that minimizes the cross-entropy between the estimated class probabilities and the ground truth distribution.

Convolutional neural network (CNN):

CNN has been extensively used in diverse computer vision applications, including FER. At the beginning of the 21st century, several studies in the FER literature found that the CNN is robust to face location changes and scale variations and behaves better than the multilayer perceptron (MLP) in the case of previously unseen face pose variations, employed the CNN to address the problems of subject independence as well as translation, rotation, and scale invariance in the recognition of facial expressions.

SYSTEM CONFIGURATION:

Hardware requirements:

Processer : Any Update Processer
Ram : Min 4 GB
Hard Disk : Min 100 GB

Software requirements:

Operating System : Windows family
Technology : Python 3.6
IDE : PyCharm

CONCLUSION:

In this paper, a restaurant scoring system, which is based on facial expression recognition, is proposed. It is possible to get a wider range of customer opinions compared to independent scoring platforms by making a direct request at the end of the visit to the customer. But there is only a rough insight, since only two ratings are requested. Because facial expression recognition is a modern technology that is used in a playful setting for the scoring system, the interest of the customer to give a rating is aroused.

In a next step, the system could be combined with existing text-based rating platforms like Google rating to bring together the advantages of both systems. A further development could lead to a system where the customer can rate touchless in the restaurant. For this, it must be ensured that the accuracy of the facial expression recognition is high enough. It is also an idea to extend the image-based rating system with a speech recognition feature. The customer could express his opinion and impressions verbally or make suggestions for improvement like it is already done with Google ratings.

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