

# Recognition of Weak Facial Expressions Based on Decision Tree Votes

## 決定木票に基づいた弱い顔表情の認識

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### 英文要旨

Automatic facial expression recognition has been an active research field in the last decades, and much progress has been achieved, to the point of achieving very high accuracy rate, especially for peak expressions, where facial expressions are most distinguishable. However, such expressions are rarely seen in usual day-to-day communication. Therefore, the recognition of weak, hard to distinguish expressions is still necessary. In this paper, a recognition system of different intensity level expressions, including ambiguous, hard to distinguish expressions, was developed. In the proposed method, dense SIFT features are used to extract facial information. Then, classification of facial expression is performed by random forest classifiers. Random forest is a collection of decision trees, where each one of them performs a classification, or vote, independently. By using these tree votes it is possible to perform a probabilistic recognition of facial expressions. For the classification of different intensity level expressions, an automatic level detection method, based on the distribution of probabilistic results, was proposed. Also, the number of features was reduced by using only important features and eliminating not important ones, and this improved the random forest performance, both for recognition rate and time efficiency. As a result, it was possible to develop a system which allows a probabilistic recognition of weak, hard to distinguish expressions, and achieves higher rates than those of the original support vector machine based system.

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### 1. Introduction

Recent advances in facial expressions analysis have allowed the development of good systems, which achieve high levels of robustness and recognition rates [1], [2]. Although much progress has been achieved, there are several remaining challenges yet to be solved. One of the remaining problems corresponds to how to recognize weak or non-peak expression images. Peak expressions images are relatively easy to recognize, because peak expressions exhibit the biggest changes

in facial features [3]. However, such expressions are often exaggerated, and rarely seen in normal situations, whilst more subtle changes are seen in usual day-to-day life.

Therefore, the objective of this paper was to develop a system which can be used to recognize non-peak facial expressions. Also this study provided a suggestion to the interesting question of until what point it is possible both for humans and machines to discriminate between small level facial expressions. It

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