

recognition of three kinds of basic learning expressions is finally accomplished.

In the experiments, nine expression images of three E-learners are randomly chose; they contain all three kinds of expression images: absorbed, neuter and fatigue expressions and the number of each kind is nine. Experimental results are shown as follows Table III and Table IV.

TABLE III. LEARNING EXPRESSION RECOGNITION RESULTS

	Absorbed	Neuter	Fatigue
Absorbed	7	2	0
Neuter	3	5	1
Fatigue	0	1	8

TABLE IV. LEARNING EXPRESSION RECOGNITION RATE

Expression	Image Num	Correct	Recognition Rate
Absorbed	9	7	77.8%
Neuter	9	5	55.6%
Fatigue	9	8	88.9%
Average recognition rate: 74.1%			

As results indicate, the learning expressions of E-learner can be accurately recognized, and the average recognition rate is 74.1%. For the facial expression characteristics of absorbed expression and fatigue expression are more obvious than neuter expression, so it can be found that the recognition rate of absorbed expression and fatigue expression is higher than neuter expression. After E-learner's expression state is estimated and confirmed, some corresponding emotion incentive pleasures to their given emotion state would be taken to decrease the emotional absences in E-learning.

VI. CONCLUSION

The emotional state of E-learner receives less concern but the emotional state is of great relation to learning efficiency of E-learner. Facing the truth that there are serious emotional absences in E-learning, we propose an approach to learning expression modeling of E-learner, using affective computing theory and facial expression recognition technique. We define three basic learning emotions and research the characteristics of three learning emotions. This paper makes a foundation to taking emotion incentive pleasures to decrease the emotional absences in E-learning. Our experimental results demonstrate the effectiveness of our work.

There are several difficulties in facial expression recognition (FER) due to the variation of facial expression even for the same individual. Because the common expressions of E-learner are usually complex and mixed, and dividing expressions into only several basic kinds may decrease the universal of the system. On

the other hand, it is still not very clear what factors contribute to the final expression representation of human. When E-learners' eyes is closed but not be fatigue, it may make a false recognition, so only one image being recognized is not enough. In future work, we plan to extend more universal kinds of learning emotions of E-learner and take emotion incentive pleasures to E-learner. We would also like to research the relation between learning emotions and expressions deeply and try to build an emotion state transformation model.

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