Emotion Expression Recognition based on Facial Image for Mechanical System Operator's Safety

Kyuwon Jeong[1] , Yujin Park[2]
[1,2]Chungbuk National University
Chungdae-ro 1, Cheongju, Korea
jeong@chungbuk.ac.kr

Extended Abstract

Automation has become prevalent in modern factories, but there are still numerous operational and monitoring tasks performed by human operators. However, human operators are prone to environmental influences and interpersonal dynamics, making it challenging for them to consistently make sound decisions and potentially leading to serious accidents. To mitigate such risks, it is crucial for human operators to maintain good physical condition and mental alertness. One approach to enhance safety is the implementation of a monitoring system utilizing camera images and an intelligent algorithm.

Human emotions are often conveyed through facial expressions and gestures, reflecting various emotional states such as happiness, sadness, anger, surprise, disgust, and fear. These emotions can be effectively described using the valence-arousal circumplex model. In this model, a neutral expression corresponds to a valence and arousal value of zero, while happiness is associated with a positive and higher valence value, and sadness or fear exhibit negative and higher valence values. However, real-life facial images may exhibit uncertain or neutral emotional expressions. If an operator demonstrates negative valence emotions, it is advisable to remove them from tasks requiring high concentration.

To assess an operator's emotional state, a convolution neural network (CNN) can be employed to process facial images. Existing CNN models such as VGG19, ResNet18, and GoogLeNet consist of multiple layers and demand substantial computational resources, including powerful graphic processing units (GPUs). In this study, a simplified CNN model capable of discerning whether an image exhibits a positive valence or not is proposed.

References

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