

Detection of Insiders Malicious Behaviors for Nuclear Security by Hand Motion Analysis

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Abstract

After Fukushima Daiichi nuclear power plant accident, the importance of nuclear security is increased. Especially as the threat to nuclear power plants, sabotage is worthy of attention. In addition, when considering the sabotage, due attention should be paid to insiders. Moreover, hand motion is an important part of human activity and it has high contribution to high-accuracy detection of insider malicious behaviors.

In this research, the real-time hand motion detection system was developed by using Kinect v2. Also, the possibility of malicious behavior detection was explored by using Stacked Auto-Encoder.

Keywords: Malicious Behaviors Detection, Hand Motion Tracking, Kinect, Stacked Auto-Encoder

1. Introduction

Recently the importance of nuclear security is increased after Fukushima Daiichi nuclear accident. Especially as the threat to nuclear power plant, sabotage is worthy of attention. For this case, human malicious behavior detection is necessary for nuclear security. Hand motion has high contribution to human activity and a significant portion of maintenance behaviors and malicious behaviors can be detected through hand motion.

In this research, a real-time system to capture hand motion time series data was developed by using Kinect v2. Moreover, Stacked Auto-Encoder was used to extract features of hand motion time series data and recognize malicious behaviors.

2. Hand Motion Capturing

Fingertips position can be used to detect hand motion and recognize hand gesture. Stretched fingers pixels and bend fingers pixels of both left and right hands were classified as different parts by using Kinect v2 [1]. Fingers were identified by using K-means clustering algorithm [2]. Finally, hand motion time series data was captured by the real-time hand motion detection system based on this algorithm.

3. Behavior Recognition

To distinguish malicious behavior and ordinary maintenance behavior, different malicious motion should be classified into different patterns. For this purpose, Stacked Auto-Encoder was implemented [3]. By training Stacked Auto-Encoder using the time series data of assumed motion, malicious motions can be detected.

4. Conclusion

In this research, we proposed a hand motion detection algorithm for insiders' malicious behaviors detection for nuclear security and both stretched fingers and bend fingers can be detected and identified. Moreover, by using Stacked Auto-Encoder, assumed malicious motions can be classified into different patterns and detected.

References

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