ABSTRACT

Gait analysis is a science that studies how to move or walk ability of humans so that can be seen if there is a disturbance in gait. Gait disturbance is one of the causes that contribute greatly to the risk of falling, especially in the elderly. To perform gait analysis, a special device is needed to measure gait parameters as well as laboratory to process the resulting data from parameter measurements that operated by experts. This requires a program to perform gait analysis using common devices such as Personal Computer.

Previously, a fall detection study was conducted on the elderly using PoseNet using Riemannian manifold of positive semidefinite metrics with an accuracy of 87.39%, Difference Absolute Standard Deviation (DASDV) with an accuracy of 80%, and Average Amplitude Change (AAC) with an accuracy of 85%. The research accuracy can be increased by using different classification method. In this study, the Convolutional Neural Network classification method was used which has a higher accuracy rate of 93.5% to 96.23%. In this study, a fall detection system was built for the elderly using PoseNet as Pose estimation and Convolutional Neural Network as classification algorithm. Pose estimation techniques are expression estimation techniques that involve the hands, arms, head, and other body parts that form a pose. Meanwhile, PoseNet is an artificial intelligence of pose estimation techniques that can estimate body keyjoint coordinate values in real time based on tensorflow.js. PoseNet is used with COCO dataset with the MobileNetV1 architecture. The results of these calculations are classified using the Deep Learning method, namely Convolutional Neural Network with 1 direction (1D) data processing type.

The result of this research is PoseNet with 1D Convolutional Neural Network Classification system had been evaluated and the result for classification accuracy, precision, recall, and F1-Score of human pose is 95%, 90%, 100%, and 93.23% for 100 dataset samples. This accuracy is better than the PoseNet with Riemannian manifold of positive semidefinite metrics classificaition method, Difference Absolute Standard Deviation, and Average Amplitude Change. In addition, the value of maximum runtime, minimum runtime, and mean runtime that retrieved is 0.340 second, 0.102 second, and 0.167 seconds.

Keywords: Gait Analysis, Pose Estimation Techniques, PoseNet, Human Fall Detection, Deep Learning, Convolutional Neural Network