CHAPTER 6 CONCLUSION AND FUTURE WORK

In this thesis, we have described a surveillance system used to detect dangerous human actions in an indoor environment for elder's home care. The system operates on color video imagery. It consists of four stages: foreground detection, human extraction, posture analysis, and action recognition.

For foreground detection, foreground pixels of each image are detected using a statistical background model that we build based on the k nearest neighbor (*kNN*) density estimation, and then grouped into foreground regions. Our background modeling method can achieve sensitive foreground detection, and suppress the detection of the shadows of foreground objects.

For human extraction, we determine whether a foreground region contains a single person according to the number of its pixels and the proportion of its skin color pixels to its pixels. The method for human extraction is simple but the performance is acceptable.

For posture analysis, we analyze the shape features of a person silhouette to classify the posture of this person into one of the seven main postures. Although the accuracy rate of our method cannot achieve 100%, the misclassification does not affect the next stage, action recognition.

For action recognition, our approach is based on a posture state transition diagram constructed with the seven main postures. The approach can detect dangerous human actions accurately, while the dangerous actions occur.

For future work, several directions suggested to improve the performance of our system are listed as follows.

1. The method for human extraction can be more accurate, if more features of single

persons are used.

2. Some postures in certain views are easily confused. For example, consider postures of squatting and kneeling with $90°$ viewing angle. This difficulty could be alleviated using multiple cameras.

3. Although our approach to human action recognition is simple and accurate, it could be better if using a Hidden Markov Model (HMM) instead of the posture state transition diagram.