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VE370 Intro to Computer Organization

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Literature Review

Pattern recognition is closely related to artificial intelligence or image processing and computer vision. The field of pattern recognition is concerned with the automatic discovery of regularities in data through the use of computer algorithms and with the use of these regularities to take actions such as classifying the data into different categories [2]. Pattern recognition is mostly studied by approach of machine learning. There has been a lot of work in making computer to understand how human behave and how human interact with each other in human’s society. Researches of human recognition facilitate computers that can assist human in real-world situation, including social/business communication, offering psychological/medical help for human. The goal of this literature review is to explore what has been achieved in recent years in making computers to understand the human ‘s behavior and activities in real-world situation by pattern recognition.

Laurel D. Riek and Peter Robinson (2011) explored approaches in studying social contexts, situational contexts, giving out questions and thoughts on building autonomous system that studying contextual information. [4] Early work ignored the importance of environmental context, which led to a disservice of research. [6] Years after the concept of Content and context was first discussed at the conference, Riek and Robinson’s work provided reference and guidance for later researches on pattern recognition.

Content and Context concept gives theoretical support for researches that detect and recognize human’s actions. Bangpeng and Fei-Fei (2012) introduced a mutual context model to jointly model objects and human poses in human-object interaction activities in detecting objects and human poses, as well as classifying human-object interaction activities.[3] They suggested that context between objects and human poses is important in visual recognition. However, Bangpeng and Fei-Fei’s model could not work without annotating the human body parts and objects in training sets.

Zhe and his team presented a novel human action recognition method with Hidden Markov Model. They took use of the generative feature mapping over 3D human body joint sequences. Their model performed better than state-of-art method [6]. Zhe’s work focused on human actions that didn’t interact with objects much. (i.e. walk, run, etc.) Further research can be done in human action recognition in complicated real-world situation.

There are some studies that developed models to detect people’s location in real-world environment. Catherine, Sebastien and Muhammd (2014) introduced a method to localize people in multi-camera video surveillance systems. [1] They compared the physical reality of the scene with the synthetic data, and then validate the assumptions of people detection with pattern matching methods. Catherine and his team’s model effectively match people in PETS2009 test. [1] Further optimization is needed in the local maxima detections

to reduce missed detections.

Through all of the above work, researchers apply the concept of context and content into their model or methods. Computers are capable of recognizing human’s activities, detecting human as patterns in certain, limited situation, i.e. with annotated images [4], with outcomes that have limited accuracy [1]. As we see in the researches above, since all the above models are proposed in single camera system, there is a huge potential to explore the use of multi-camera system to improve the performance of recognition. There has been sparse research in developing unsupervised learning method of human behaviors and activities detections in real-world situation. In addition, Further researches into interactions between human and object are needed.

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