Chapter 61
The Status of Research into Intention Recognition

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ABSTRACT

In recent years, service robots have been widely used in many fields, especially for assisting the elderly and disabled. For example, the medical care of patients with Alzheimer's disease has become a worldwide problem. Existing service robots with some intelligence quotient can perform actions that are programmed by a human. However, the robot cannot understand human intentions or communicate with people naturally. Understanding the intent of the service object could allow the robot to provide better service. Therefore, the most critical component of human-computer interactions is intention recognition. There are currently many methods by which intention recognition can be achieved, such as EMG, EOG and EEG. In addition, emotion is one of the important factors during intention recognition, and this has been a breakthrough notion. This chapter summarizes the current status of research into intention recognition and gives a brief description of the relationship between emotion and intention. We hope to provide more ideas for optimizing human-computer interactions.

INTRODUCTION

In this chapter, we focus on the status of research into intention recognition.

In the first part, we provide an overview of the current research status of the field of intelligent robots, and we describe the key technologies related to improving robot intelligence in human-computer interactions. Intention recognition is one of the problems to be solved urgently.

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In the second part, recent research using EMG, eye movements and EEG as human physiological electrical signals are introduced in detail. EMG studies focus on surface EMG signals, which can be acquired more directly. They contain information describing the state of muscle functions and a wealth of information about movement intention. We introduce the research results and the methods used to analyze surface EMG signals. Eye movement has a certain regularity and is primarily related to intention. The methods used for eye tracking mainly include Electro-OculoGraphy (EOG) and Video-OculoGraphy (VOG). Based on the above methods, further types of mature eye-trackers have been developed. EEG has good temporal resolution and can extract enough characteristics to perform intention recognition. A brain computer interface can be used to facilitate communication between the brain and the external environment. Its development is helpful for people aiming to understand and study the neural activity of the brain. The status of studies of intention recognition that are based on visual-evoked potentials, cortical slow potential, P300 signals and sensory motor rhythms is introduced in this paper. In recent years, research into emotion has provided new ideas to the field of intention recognition. The overall summary of this manuscript is described in Figure 1.

Finally, we summarize the above three research methods. Furthermore, we propose a multimodal fusion strategy that can be used to simulate the complex information processing functions of the human brain and achieve a deep recognition of intention.

BACKGROUND

With the progress of society, the development of intelligent robots is being paid more and more attention. The list of potential uses for such robots is continuously increasing, and applications have been suggested in many fields, including industrial, space, underwater, disaster relief, service, military, and especially medical fields. Because the number of elderly and disabled people in the world is increasing year by year, how to help them has become a serious social problem. With the development of human-robot interaction technologies, robots have played an increasingly important role in many fields. They are expected to provide multiple services for the elderly and disabled, such as travel, care and medical

Figure 1. An overall summary of this chapter