Chapter 14

Humanoid Robots: Future Avatars for Humans through BCI

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**ABSTRACT**

This paper provides a review of humanoid robots and mind control humanoid robots. Information was obtained mainly from journals and conference proceedings on robotics and mind control technology. We primarily focus on providing an overview of commercially available robots and prototype research-stage humanoid robots in addition to mind control humanoid robot systems. First, a history and overview of the humanoid robot is presented. Then, typical mind control humanoid robot systems are described, including the relevant brain-computer interface and the whole control framework. Finally, the remaining research challenges in the field of humanoid robot safety are summarized.
INTRODUCTION

A humanoid robot is a robot with human appearance and behavior. These qualities provide this kind of robot with a more human-friendly appearance that is more acceptable to individuals. Human robots are used as a research tool to promote the development of scientific areas such as biomechanics, biomechanical controls, sensors, and mechanisms, computer science, and artificial intelligence. A human shape and appearance also make it possible for humanoid robots to adapt to surroundings similar to those of humans (including a normal environment and some dangerous or dirty environments) and to utilize tools designed for humans (Sakamoto 2005; Behnke, 2008). These advantages make humanoid robots the best choice for serve humans in daily life or for improving the lives of the elderly or physically disabled people.

Brain Computer Interfaces (BCIs) are communication systems that allow external devices, including computers and robots, to be controlled by brain activity. Humanoid robot surrogates controlled using BCI can help users, especially the elderly and physically disabled, to regain autonomy. The user can meld his/her own mind and movements with a robot surrogate or avatar. The development of robotics and BCI currently make the idea of avatars a possibility. Compared to other types of robots, humanoid robots, with their human size and appearance, are more suitable for use as special avatars for individuals.

This paper presents a review of the recent literature in the field of humanoid robots. The review is divided into three inter-related sections:

1. An overview of humanoid robots,
2. Mind control humanoid robots, and

More specifically, the first section presents a history and overview of humanoid robots. The second section describes the mind actuated humanoid robot system, which is a new trend in the application of humanoid robots. Finally, the last section addresses key research into the safety of humanoid robots, including a discussion of safety issues for both robots and humans.

BACKGROUND

Researchers have made substantial progress in the field of humanoid robots since the first such robot, WABOT-1 (Kato, 1973), was developed in 1973. The field of
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