Chapter 6
Android Robots as Telepresence Media

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ABSTRACT

In this chapter, the authors describe two human-like android robots, known as Geminoid and Telenoid, which they have developed. Geminoid was developed for two reasons: (1) to explore how humans react or respond the android during face-to-face communication and (2) to investigate the advantages of the android as a communication medium compared to traditional communication media, such as the telephone or the television conference system. The authors conducted two experiments: the first was targeted to an interlocutor of Geminoid, and the second was targeted to an operator of it. The results of these experiments showed that Geminoid could emulate a human's presence in a natural-conversation situation. Additionally, Geminoid could be as persuasive to the interlocutor as a human. The operators of Geminoid were also influenced by the android: during operation, they felt as if their bodies were one and the same with the Geminoid body. The latest challenge has been to develop Telenoid, an android with a more abstract appearance than Geminoid, which looks and behaves as a minimalistic human. At first glance, Telenoid resembles a human; however, its appearance can be interpreted as any sex or any age. Two field experiments were conducted with Telenoid. The results of these experiments showed that Telenoid could be an acceptable communication medium for both young and elderly people. In particular, physical interaction, such as a hug, positively affected the experience of communicating with Telenoid.

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INTRODUCTION

As the development robotics technologies has advanced, robots have moved into our daily lives from the laboratory. As such, robotics is expected to fill a role in the design of media for human communication. In the human-robot interaction (HRI) field, researchers have focused on natural or appropriate interactions between humans and humanoid robots. For example, Robovie, developed by ATR, has been used as a navigator or as a shopping advisor in a real environment, such as a shopping mall (Shiomi, 2009). Robovie also has been used for educational purposes in elementary schools (Kanda, 2007). However, the goal of ATR has been the development of a "useful" robot that can think and move autonomously and that can support its users' daily activities. Indeed, this robot was not designed to evoke emotions in its users.

Inspired by these developments, we have developed a notably human-like android, known as "Geminoid" (Figure 1), which resembles an actual person (Ishiguro, 2007). We developed Geminoid because we believed that to facilitate effective human-robot interaction, both the robot's functions and the robot's appearance must be optimized to take advantage of any cognitive specializations humans may have for recognizing other humans. We believe that an android with a very human-like appearance could evoke a human's sincere emotions and intentions more than other humanoid robots could. For example, we are now using an android in a theater performance, and interviews with the audience suggest that androids might have the potential to affect humans emotionally more than other actual humans can.

The effects of an android's appearance and body movements in human interactions to date have been investigated mainly in empirical studies conducted in laboratory environments. Noma et al. (2006) showed that Geminoid is indistinguishable from a real human if the robot is observed for only three seconds. Minato et al. (2006) used Geminoid to investigate whether the uncanny

Figure 1. Geminoid HI-2 and the model of it

feeling of interacting with the robot diminishes if it performs increasingly complex behaviors.

These studies were mainly focused on a human's cognitive behavior in response to Geminoid. This research, however, did not focus on human-android communication. Therefore, we have developed a teleoperation system to deal with the communicative aspects of Geminoid. In this paper, we describe several experiments in human-android interaction that used this teleoperation system.

Moreover, our latest challenge has been the development of new concept android, known as "Telenoid" (Figure 2), a robot with a more abstract appearance than Geminoid that looks and behaves as a minimalistic human. At first glance, Telenoid resembles a human; however, its appearance can be interpreted as any sex or any age. Due to this minimalistic design, Telenoid allows people to feel as if a faraway acquaintance were close to them. In this paper, we describe in detail the design concept behind Telenoid and field experiments using it.

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