Studying the Influence of Handheld Robotic Media on Social Communications

Takashi Minato¹, Hidenobu Sumioka¹, Shuichi Nishio¹, and Hiroshi Ishiguro¹

Abstract—This paper describes research issues on social robotic telepresence using “Elfoid.” It is a portable tele-operated humanoid that is designed to transfer individuals’ presence to remote places at anytime, anywhere, to provide a new communication style in which individuals talk with persons in remote locations in such a way that they feel each other’s presence. However, it is not known how people adapt to the new communication style and how social communications change by Elfoid. Investigating the influence of Elfoid on social communications is very interesting in the view of social robotic telepresence. This paper introduces Elfoid and shows the position of our studies in social robotic telepresence.

I. INTRODUCTION

Recent studies have tried to realize immersive telepresence in telecommunication by application of tele-operated robots, which can transmit not only visual and vocal information but also physical information of speakers to remote places (ex. [1], [2]). In particular, the study with Geminoid [2], whose appearance and motion resemble those of an existing person, has revealed that a person operating Geminoid feels its body is his/her own body and another person facing the operated Geminoid also feels it is possessed by the operator, that is, the operator’s presence can be transferred. Humanoid robots that resemble humans can be potent media for transferring human’s presence. In order to make presence-transmitting medium pervasive in daily lives, a portable Geminoid is desirable: however, it is hard to implement a realistic human-like shape, numbers of actuators to provide human-like motions, and various sensors in a small body. A minimal design of the shape and motions to convey human’s presence is necessary to develop a portable presence-transmitting medium.

The tele-operated android “Telenoid” has been developed based on the minimal design of humans [3]. It has a simplified human shape, holdable body, several actuators to express some human-like gestural motions. Based on the same concept, we have developed “Elfoid” (Fig. 1) as a portable tele-operated android [4]. It has also simplified human shape and is designed to transfer a speaker’s voice using the cellphone networks and talk to other person in the fashion shown in Fig. 1.

Ogawa et al. [3] have reported that people prefer communication with Telenoid rather than cellphones and aged persons especially like to use Telenoid. From this fact it is expected that Elfoid is also accepted by people and provides a new communication style in which individuals talk with persons in remote places in such a way that they feel each other’s presence. But it is not known how people adapt to this new media. Studying people’s adaptation to Elfoid in social communications will contribute to a design methodology of portable presence-transmitting media.

II. DEVELOPMENTAL CONCEPT OF ELFOID

The design concept of Elfoid is that anyone can transfer her presence to a remote place at anytime, anywhere.

a) Anytime, anywhere: A small 3G cellphone unit is embedded (Fig. 2), and people can talk with others in remote places in the same manner as cellphones. The prototype can register one telephone number in the memory, and users can call the number by pushing a button on the chest (a voice dialing system will be embedded in the future). Elfoid also has its own telephone number and can receive a phone call.

b) Anyone: The shape is designed as easily recognizable at first glance to be nothing but a human, capable of being interpreted equally as male or female, old or young, that is, neutral human shape. The completely symmetrical face provides neutral gender. Mixing the child-like body proportion with the adult-like face proportion results in age-free appearance. These features aim at enabling it to be an avatar of anyone, differing from Geminoid which closely resembles the original person.

c) Transferring individuals’ presence: Ogawa et al. [3] have reported that the holdability of Telenoid contributes conveyance of individuals’ presence (that is, physical (tactile) interaction with the communication media is important)
through the experiments with Telenoid. Elfoid has soft,
pleasant-to-touch exterior (made of urethane gel) and trans-
fers individuals’ presence not only by voice and human-like
appearance but human-like tactile impression.

The prototype shown in Fig. 2 does not have any sensors
and actuators. It can be used as a normal cellular phone. The
future works will improve the hardware of Elfoid. We will
decide necessary hardware capabilities by studying which
sensors and actuators are effective for transmitting human’s
presence. The appearance of the prototype will be verified
whether it can be an avatar of anyone and be accepted by
many people. Even the prototype can be easily used by
people in their lives. This can enable us to conduct social
experiments, not laboratory experiments.

III. STUDYING THE EFFECT OF
CELLPHONE-TYPE TELE-OPERATED ANDROID

We expect that people will use Elfoid to have intimate
conversations with distant people. In order to study peo-
ple’s adaptation to Elfoid, our research group already has
conducted experiments to evaluate people’s impression on
Telenoid and people’s adaptation to Telenoid in shopping
malls [3], facilities for the elderly [5], and elementary
schools [5]. Telenoid provides different interactions compared
with Elfoid in that it can move its extremities and users can
hug its body. But the form is similar to Elfoid, therefore,
it is expected that Telenoid has similar characteristics of
presence-transmitting media to Elfoid. The experiments with
Telenoid have revealed that people quickly adapt conversa-
tion with Telenoid and are impressed by its shape and tactile
feeling, and same results are expected on Elfoid.

The important research issue on Elfoid is to study the
effect of portable presence-transmitting media in social ex-
periments. Kanda et al. [6], [7] placed a humanoid robot in a
classroom of elementary school for two months and observed
how the long-term relationship between children and the
robot and among children changed. Our study also needs
a long-term experiment in the same manner. For example,
we distribute a number of Elfoid to a group of people and
observe how they use Elfoid and how their relationships
change. The focusing points in the social experiments are:

- In which situations and to whom do people use Elfoid
to talk?
The user does not always expect the presence of partner
in the telecommunication. It is inferred that Elfoid can
be easily used among people with close relationships
such as lovers and friends but not with e.g., boss-
subordinate relationship. Beer and Takayama [8] investig-
gated how their tele-presence robot will be used by aged
persons. Their result shows the aged persons want to use
the robot to communicate with mainly their friends or
families. We will investigate whether people use Elfoid
between non-close relationships.

- How does Elfoid establish and change interpersonal
relationships?

Much studies have studied how cellular phones impact
on social relationships of people. A survey [9] describes
that the cellular phones positively and negatively influ-
ence the establishment of young people’s relationship.
From the results of the experiments with Telenoid, it is
expected that Elfoid also increases the users’ (especially
aged persons’) motivation to talk with other persons and
facilitates to establish an interpersonal relationship. We
will find out whether Elfoid has similar effect. We will
also observe how interpersonal relationships among the
users are altered owing to the communication style in
which they feel each other’s presence.

- Which kinds of application do they find?
People recently find/create a new style to form social
communities using the social media such as Facebook
and Twitter. We will observe whether the users create
a new style to form and change a group or community
using the presence-transmitting media.

IV. SUMMARY AND CURRENT PROGRESS

This paper presented a novel communication medium
“Elfoid” which provides new communication style in which
a user can talk with another person while feeling each other’s
presence. The developmental concept and its prototype were
shown and the research issues were discussed.

As a preparatory step toward social experiments, we are
developing Bluetooth version of Elfoid. It works as a Blue-
tooth speaker-phone by connecting to a normal cellphone.

The users can use their cellphones which they already have
to use Elfoid. They do not need to change their cellphones,
and then it is easy to distribute Elfoid to them.

REFERENCES

Telecommunication, Teleimmersion and Telexistence, S. Tachi, Ed. IOS

of an existing person,” in Humanoid Robots, New Developments, A. C.
352.

H. Ishiguro, “Exploring the natural reaction of young and aged person
with telenoid in a real world,” Journal of Advanced Computational
Intelligence and Intelligent Informatics, vol. 15, no. 5, pp. 592–597,
2011.


cellphone-type tele-operated android,” in Proceedings of the 10th Asia

K. Koda, and T. Fujinami, “How does telenoid affect the communication
between children in classroom setting?” in Proceedings of the ACM

trial in an elementary school for long-term human-robot interaction,”

friendship estimation model for communication robots,” Autonomous

older adults: acceptance, benefits, and concerns,” in Proceedings of the
6th ACM/IEEE international conference on Human-robot interaction,

social life,” in Proceedings of the Social Change in the 21st Century
Conference, 2005.