

# Compact Avatar “MARU-TO” For Entertainment Business By Team Last Mile

Masaki Haruna, Munetaka Kashiwa, Kiyotaka Ishii, Toru Sato, Atsuko Uemura, Shunsuke Ichihara,  
Masaki Ogino, and Sigeaki Tagashira

**Abstract**— Team Last Mile is the highest ranked team in Japan in the XPRIZE/AVATAR competition. The team is starting activities to turn their technology into a remote working business from 2023. As the first step of the business, Team Last Mile is exploring the possibility of entertainment with “MARU-TO”, a compact Avatar that can be launched in a short period of time. We will introduce some of the initiatives that have been supported by the Proof of Business for a fee.

## I. INTRODUCTION

Team Last Mile is developing simple and intuitive operation interface technology to realize remote working from anywhere [1]. The team has been developing a humanoid Avatar System and Augmented Avatar System based on visual haptics technology that utilizes human cognitive characteristics [2][3]. However, these robots are still expensive, and it will take several years to launch a remote employment business. As the first step towards the business, Team Last Mile is exploring the possibility of entertainment with a compact Avatar that can be launched in a short period of time. This paper introduces “MARU-TO,” a compact Avatar developed by Team Last Mile, and the business study that utilizes this Avatar. We, Avatar engineers, are aiming to realize a system with higher accuracy and functionality, but it has been confirmed through a price sensitivity analysis that the average user can accept a charge of about \$5USD for 2 minutes, depending on the application, even for a system of this level. We also felt that this experience through “MARU-TO” would provide children with an expectation for the future of robotics.

Masaki Haruna is with the Advanced Technology R&D Center, Mitsubishi Electric Corporation (MELCO), Amagasaki 661-8661, Japan (corresponding author to provide phone: +81-6-6497-3971; e-mail: haruna.masaki@ab.mitsubishielectric.co.jp).

Munetaka Kashiwa is with the Advanced Technology R&D Center, Mitsubishi Electric Corporation (MELCO), Amagasaki 661-8661, Japan (e-mail: kashiwa.munetaka@cj.mitsubishielectric.co.jp).

Kiyotaka Ishii is with the Advanced Technology R&D Center, Mitsubishi Electric Corporation (MELCO), Amagasaki 661-8661, Japan (e-mail: ishii.kiyotaka@aj.mitsubishielectric.co.jp).

Toru Sato is with the Advanced Technology R&D Center, Mitsubishi Electric Corporation (MELCO), Amagasaki 661-8661, Japan (e-mail: sato.toru@ce.mitsubishielectric.co.jp).

Atsuko Uemura is with the Advanced Technology R&D Center, Mitsubishi Electric Corporation (MELCO), Amagasaki 661-8661, Japan (e-mail: uemura.atsuko@dn.mitsubishielectric.co.jp).

Shunsuke Ichihara is with the Pegara Japan G.K., Chiyoda, Tokyo 100-0005, Japan (e-mail: sean@pegara.com)

Masaki Ogino is with the Faculty of Informatics, Kansai University, Takatsuki 569-1095, Japan (e-mail: ogino@res.kutc.kansai-u.ac.jp).

Shigeaki Tagashira is with the Faculty of Informatics, Kansai University, Takatsuki 569-1095, Japan (e-mail: shigea@res.kutc.kansai-u.ac.jp).

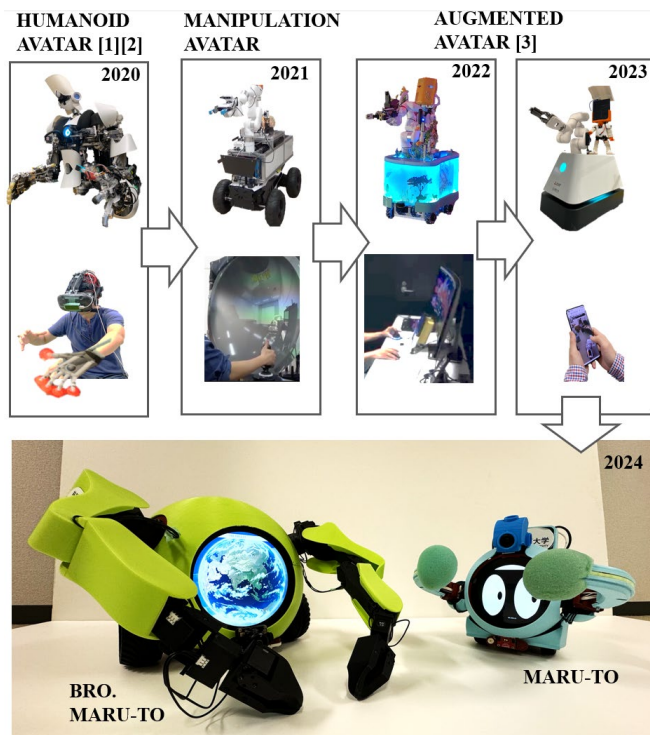


Figure 1. Avatar History of Team Last Mile

## II. COMPACT AVATAR ROBOT “MARU-TO”

### A. Design Concept

Team Last Mile is developing a future in which anyone can work from anywhere. For this purpose, we are building a system that enables remote communication and remote manipulation using only a display with touch functionality, such as that of smartphones, which are becoming increasingly popular as operating interfaces. As the first step in business, the design of the MARU-TO is designed to have a compact and attractive appearance that is easy to transport and poses no risk of harm to people.” The “MARU” in “MARU-TO” is the Japanese word for sphere, and the “TO” is derived from Japanese pronunciation of “ROBOT”.

### B. Function of “MARU-TO” System

- A large circular monitor is used throughout to create impressive remote communication, and the operator's facial expression is communicated to the recipient.
- Voice call

- Body language with a cute arm facilitates non-verbal communication.
- Lightweight manipulation with arm up-and-down motion and pinching motion
- Applying visual haptics technology to improve arm work efficiency • Illumination of arm LEDs according to the size of the tactile sensation
- Provide the operator with images corresponding to the size of the tactile sensation at the fingertip that is being touched (this technique is called mixed haptics)
- Forward, backward, and rotational movement
- Operator operates with a monitor with touch function (e.g., smartphone)
- Movement is operated with one finger
- Manipulation is two-finger operation and gesture operation by hand recognition
- In the case of a smartphone, the operator's face is captured by an inner camera

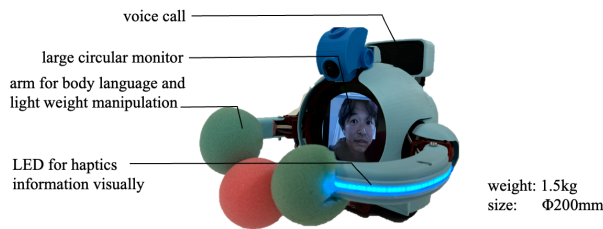


Figure 2. Compact Avatar “MARU-TO”

### III. POTENTIAL FOR ENTERTAINMENT BUSINESS

Team Last Mile aims to achieve remote employment with a simple AVATAR system that anyone can use, based on the experience of developing humanoid Avatar and working in developing countries. Avatar, which can replace human workers, is still expensive and requires more time to become a viable business. Team Last Mile is exploring the possibilities of entertainment as a business with a compact Avatar that can be launched in a short period of time:

#### A. Tokyo-Ginza Exhibition at METoA Ginza

As an opportunity to think about how AVATAR will contribute to the future, a free “MARU-TO” experience will be exhibited in Ginza, Tokyo, for one year from December 2023, provided by Mitsubishi Electric Corporation (Fig. 3). The exhibition attracts 500 visitors on weekdays and about 1,000 visitors on weekends. As a result of a questionnaire survey of visitors, over 50% of parents answered that the AVATAR experience is effective for their children's education.

#### B. Tochigi-Nikko Great Diorama at TOBU World Square

Visitors were invited to experience the “MARU-TO” at the outdoor model exhibition facility. Although visitors were not allowed to enter the precisely constructed model, it was a

valuable experience for both visitors and the creator to enjoy the model from a new perspective. A price sensitivity analysis of around 80 visitors confirmed that charging \$5USD for a 2-minute experience was acceptable.

#### C. Hokkaido-Sapporo Department Store at IKEUCHI GATE

The company has begun to verify the contribution to increased sales by the shower effect and the effect of attracting visitors to the building by installing the Avatar experience exhibit on the rooftop of the building. About half of the visitors with children visit the rooftop for the Avatar experience exhibit.

#### D. Osaka-Osaka Private Education School at PLOW

Recently, programming classes have been spreading in Japan. While hardware and software education using Lego Mindstorms is available, we have begun to study its application in cram schools, where we expect more advanced and unique contents.

#### E. DE&I at Several Facilities

In recent years, the number of students who are not attending school has been increasing in Japan. There are expectations and consultations with students as a tool that allows them to easily participate in places where they can be themselves, such as attending classes from home or the school nurse's office, or participating in a third place via AVATAR.



Figure 3. Proof of Concept Test on Actual Field of Entertainment Business

### IV. CONCLUSION

Team Last Mile aims to realize a remote working business where anyone can work from anywhere at any time, and as the first step of the AVATAR business, the compact “MARU-TO” entertainment business was presented as an overview of its verification in a real field. We plan to start and scale up the business as soon as possible.

#### ACKNOWLEDGMENT

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