

## Structuring Spatiotemporal Environmental Information in the Body Using In-body Cybernetic Avatars.

### Project manager

(selected in 2022)

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### Leader's institution

The University of Tokyo

### R&D institutions

The University of Tokyo, Tokyo  
Denki University, Tohoku  
University, Kyoto University,  
Osaka Metropolitan University,  
Nagoya University, Shibaura  
Institute of Technology, Otsuka  
Pharmaceutical Co., Ltd.,  
FUJIFILM Corporation, JAPAN  
LIFELINE Co., Ltd.

### Summary of the project

We will realize an in-body cybernetic avatar<sup>1</sup> (in-body CA) that operates on the millimeter, micro, and nano scales in vivo, acquires internal information such as body temperature and pH, and can administer drugs locally. This makes it possible, for example, to monitor information about the internal environment that changes over time and in space and to understand it in an easy-to-understand manner. If this is applied to health monitoring, new health monitoring and diagnosis methods that can be performed at home will be realized. By realizing in-body CA, we will realize a safe society where daily life will be changed regarding health maintenance.

### Milestone by 2030

By using in-body CA, reaching microsites in vivo and monitoring health is possible. By dynamically and accurately measuring and monitoring the internal environment of multiple small CAs, it is possible to grasp individuals' daily health status and recovery from poor physical condition and illness. Even if the patient becomes ill, the field of view will be expanded by using the small CA group that is remotely controlled, and there will be no oversights in the examination. As a result, it is possible to diagnose, administer, and sample the inside of the body, which is usually difficult, accurately and quickly, and to diagnose tissues and cells in a living body, shortening examination time and reducing pain. A plurality of specialists distributed in remote locations can share their specialized knowledge and perform collaborative diagnosis while staying at home. As a result, we can make good use of our time, enjoy our leisure time, and do what we like. In addition, we can live a secure, safe, and comfortable life.

### Milestone by 2025

In-body CA makes it possible to measure the internal environment and position necessary for health monitoring. A group of small CAs will dynamically and accurately measure and monitor

the internal environment, and a technology for pinpoint administration within the body will be realized. In addition, the operability of teleoperation devices will be improved, and the technology necessary for biological diagnosis of tissues and cells will be developed, reducing the burden.

### Project structure

