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Motion Lib, Inc.
Keio University Global Research Institute Haptics Research Center
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Remote PCR Sample Collection System that Transmits Tactile Sensations

A remote-controlled system that transmits tactile sensations using RealHaptics*1 has been developed by Motion Lib, Inc. (Kawasaki City, Kanagawa Prefecture; CEO: Takahiro Mizoguchi), Keio University Global Research Institute Haptics Research Center (Kawasaki City, Kanagawa Prefecture; Director: Toshiyuki Murakami), and Yokohama National University (Yokohama, Kanagawa Prefecture; President: Yuichi Hasebe). Using this system, PCR samples can be collected by medical workers without coming into close contact with subjects, and basic tests have already been conducted with doctors to verify the viability of the technology. Additionally, the development team confirmed that the system could replicate the motions of medical workers using the movement data collected.

1. Background

The recent spread of COVID-19 highlights the social problem of testing for infectious diseases. Samples need to be taken to test for infection, but because medical workers come into close contact with subjects when collecting samples, they too are at risk of getting infected. Personal protective equipment (PPE) must also be worn to prevent the transmission of diseases, which can lead both to supply issues and an additional burden on doctors and nurses.

By adopting RealHaptics technology, samples could be collected remotely instead, which would greatly improve the safety of frontline medical workers in the fight against COVID-19. Moreover, through the use of Motion Lib's "AbcCore"*2 IC chip, production costs can be reduced as it enables the transmission of tactile sensations remotely without expensive sensors. The relatively low cost of the technology should also assist with its uptake in developing regions around the world.

In the 19th century, Alexander Bell successfully transmitted sound with the invention of the telephone, while in the 20th century, the transmission of images was realized through television. In the 21st century, it is now possible to transmit tactile sensations, while the technology is still in its infancy. RealHaptics technology, which allows people to touch each other in quarantine, will be increasingly important in the face of threat of infectious diseases.

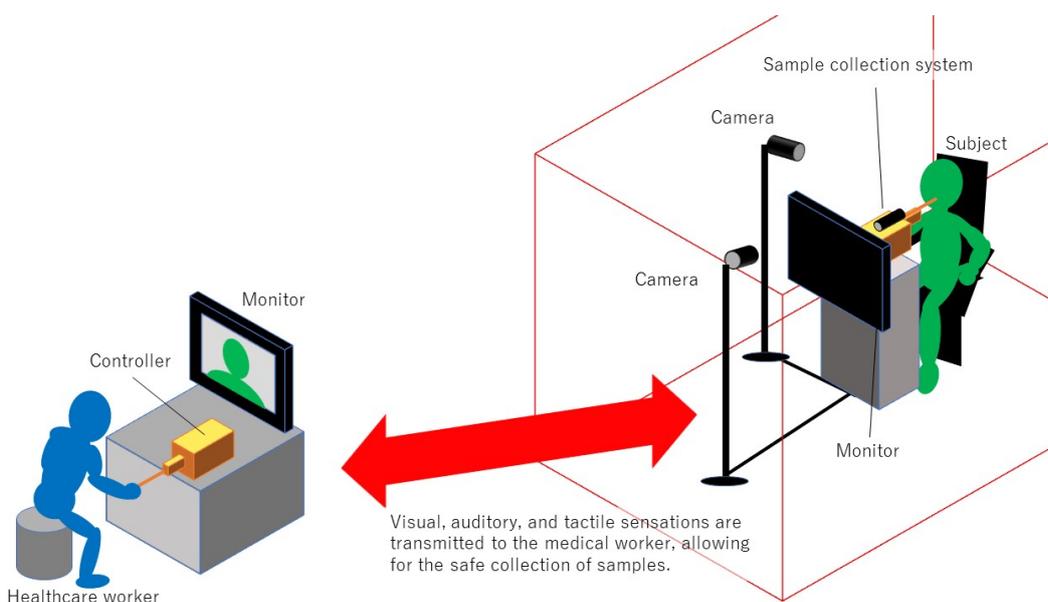
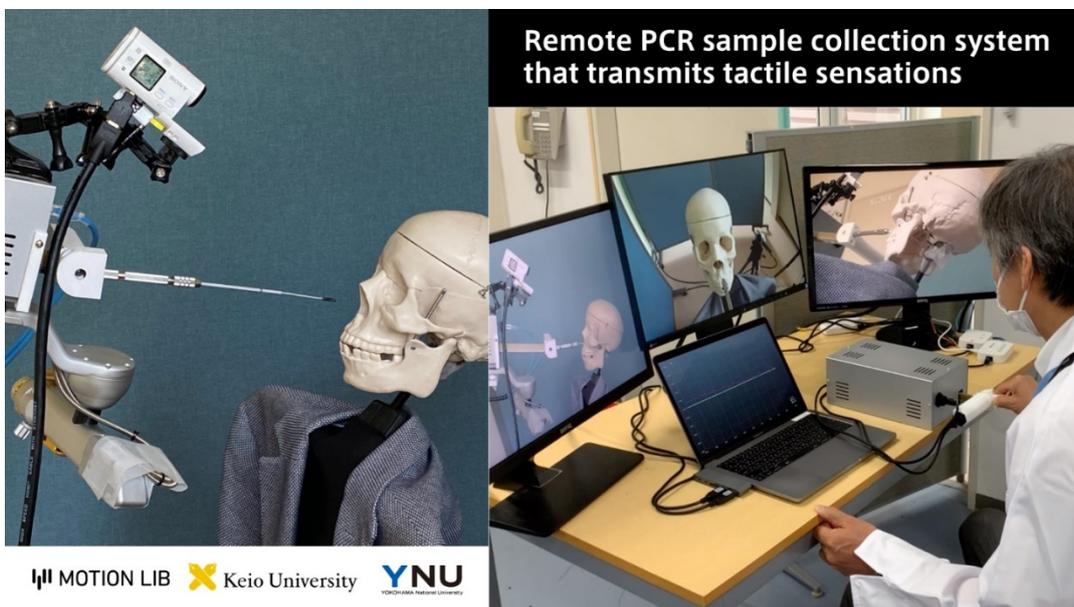
2. Outline of the remote PCR sample collection system

With this newly developed system, medical workers can collect test samples from a subject who is in a physically separated location using a remotely controlled slave robot. It significantly reduces the risk of infection to doctors and nurses.

This remote PCR sample collection system transmits tactile sensations using the functions of "RealHaptics" enabled thanks to the introduction of AbcCore, a general-purpose tactile sensation IC chip developed by Motion Lib, Inc. This chip permits a slave robot to replicate the movements

of the medical worker operating the master device; the tactile sensations felt by the slave robot are fed back to the operator, allowing for more gentle, responsive movements that lessen the risk of harming the subject. A basic verification experiment using a human skeleton model also confirmed that medical workers operating the remote-controlled system could still intuitively perform the procedures necessary to collect samples.

Additionally, the system is able to track the movements of the medical workers operating the master device, and by using this data, the system can itself perform the same tasks automatically. The development team verified expectations for the automation of sample collection by combining the automatic operations of the system with the guidance provided by medical workers in a separate room based on audiovisual information from cameras, speakers, etc.



View a demonstration video: <https://youtu.be/fmu9wXGMW4g>

3. Advantages of the remote PCR sample collection system

- RealHaptics allows doctors and nurses to collect samples remotely with the physical sensations of performing the necessary procedures, making it safer for not only medical workers but also test subjects. Furthermore, this greatly reduces the demand for PPE, which can be scarce in times of high demand.
- The system can record and store the movement data of the medical workers operating it, opening up the potential for automating the sample collection process in the future.
- Since there are no force sensors, the system can be produced cheaply and has the potential to be deployed in developing countries and regions.

Glossary

*1 RealHaptics

RealHaptics is a tactile sensation technology invented by Professor Kouhei Ohnishi of Keio University (Vice Director of the Haptics Research Center), which allows a machine or robot to freely control the amount of force it applies. This technology realizes the visualization and analysis of tactile sensations, remote operations, automation, and sensory reproductions, across a diverse range of fields in the future.

*2 AbcCore

AbcCore is a general-purpose tactile sensation IC chip developed by Motion Lib, Inc., which simplifies the implementation of RealHaptics. It has the following advantages:

- Allows for fine control of the amount of force to be applied: realization of real-time measurement and control of force amounts by modularizing RealHaptics.
- Transmits tactile sensations: force amounts are easily digitized and transmitted to the remote location in both directions.
- No force sensors: due to an original force estimation algorithm, there is no need to install force sensors (although it is possible to integrate force sensors as required).
- Highly versatile: force control is possible using commercially available actuators and devices. Additionally, it is easily integrated into existing systems.

Motion Lib, Inc.

Motion Lib, Inc. is a Keio University startup whose business spans from conducting research and development for the implementation of RealHaptics in machinery, to the manufacture and sale of AbcCore, their flagship product. AbcCore can control force amounts and transmit tactile sensations using motors that are commercially available without specialized sensors or motors. AbcCore has already been delivered in advance to over 60 companies, with which multiple research projects are now underway. Some companies have even started putting AbcCore into use for practical applications.

In addition, Motion Lib Inc. has supported customers, based on the 3 pillars of its "solution business" for carrying out joint research, its "device business" focused on "AbcCore," and its

"licensing business" for the provision of technology. To further accelerate the practical application of RealHaptics, Motion Lib, Inc. is actively seeking companies with which to conduct studies.

Website: <https://www.motionlib.com/> (Japanese language only)

Keio University Global Research Institute Haptics Research Center

The Haptics Research Center is aiming to make RealHaptics technology widely and universally available to consumers and companies worldwide and operates a council for RealHaptics technology in which private companies also participate. As a research institution for RealHaptics technology, Keio University holds a core set of related patents. Furthermore, the Haptics Research Center works closely with companies to carry out joint research to explore new applications for the technology.

Website: <http://haptics-c.keio.ac.jp/> (Japanese language only)

Yokohama National University (Faculty of Engineering, Shimono Lab)

Under the vision of "the university of global excellence," Yokohama National University is aiming to become an international center for practical academic pursuits. Practice emphasizes social contribution through the real-life application of theory. As part of this, the Shimono Laboratory at the Faculty of Engineering is promoting research aimed at utilizing RealHaptics technology in healthcare fields such as medical care, social welfare, and nursing care. In particular, while researching basic technologies such as original actuation technology to improve control performance for tactile sensation and advanced network control technology, they are also developing prototypes of various human support systems including medical devices, rehabilitation robots, and surgical robots.

※ Please direct any requests or inquiries to the contact information provided below.

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