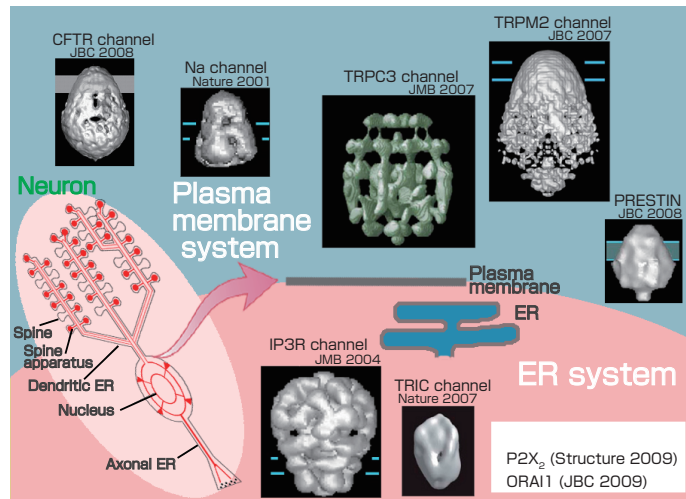


Structure analysis of ion channel proteins in membrane

3D structure of ion channels revealed by single particle electron microscopy

Ion channels, including six-transmembrane (6-TM) type channels, are membrane integral components of cellular signaling pathways conserved in almost all species including animals, plants, and some kinds of prokaryotes. We have recently determined the structure of four different 6-TM type cation channels: the voltage-sensitive sodium channel, the IP3 receptor, the TRPC3 and TRPM2 channels, using single particle analysis from cryo-electron microscope images. The basic structure of the molecules was found to be similar: a bell-like shape composed of a relatively small extracellular (or luminal) domain, a protein-dense transmembrane domain, and an expanded cytoplasmic domain. These structures were compared with the newly determined structure of CFTR, P2X2 and Orail.



Ion channel structures determined by our group: Single particle analysis has a high potential to determine the structures of various kinds of proteins whose crystals are difficult to obtain.

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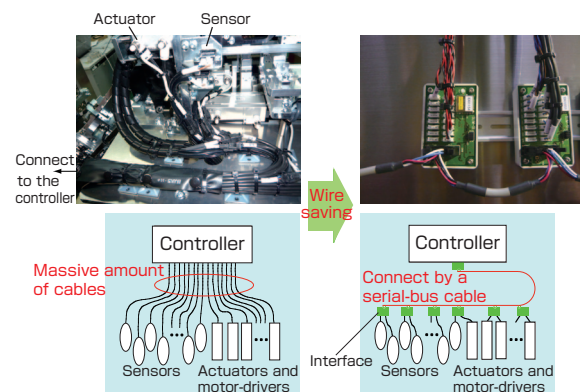
Information Technology and Electronics

Development of low-cost, noise-proof, wire-saving technology

Serial bus communication system reduces wiring and improve productivity

We have developed a serial bus communication system that lays only a single cable in the industrial machine to interconnect the control unit with a number of sensors and actuators in it. The developed system employs a simple communication protocol with enhanced real-time capability and robustness. The prototype interface is built with electronic devices that are commercially available and inexpensive. The system is robust to external noise and achieves high speed in communications. The prototype system has recorded no longer than 0.2 ms in communication delay and as fast as 2 Mbps in transmission speed. These data from the test including the ones mentioned above have demonstrated the excellence of the system.

This system is expected to improve productivity in manufacturing industrial machines by reducing time and cost for wiring drastically and to make the machines lighter and smaller with far less maintenance cost. The technology developed can be applied in a broad range of industries such as: industrial robots, humanoid robots, and car electronics, in which massive amount of cabling is required.



(left) Conventional wiring
Hundreds of cable connecting components occupy a large space in the machine.

(right) The serial bus communication developed blows away massive amount of cables.

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