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The Beginning of "Control"

Associate Professor Takahashi's key research theme is "Model Base Control." "Control" means "to regulate machines, equipment or facilities so that they can move in a way as required by the purpose." While the history of control itself is very old, it was not until 1788 that what can be properly explained with today's concept of "control" was created.

James Watt is referred to as "Father of industrial revolution" because in 1776 he invented the "steam engine" – the first driving motor created by humankind. The motor is a device to supply energy to the machine. But unless it is designed to supply energy "when needed and in an amount required," the machine will fail to move as desired. In order to keep the steam engine output constant, Watt devised a regulator known as a "governor" and attached it to the valve on a steam-feeding pipe for the steam engine. The development of this "governor" contributed to the rapid spread of steam engines. Though not widely known, Watt is called the "Father of control engineering" because of this governor development.

In the mid-19th century, G. B. Airy of Cambridge University employed a "centrifugal governor" which represents the governor's operating principle, to maintain rotational accuracy of an astronomical telescope. In this process, he found an unstable motion of the centrifugal governor and analyzed it theoretically. This analysis is said to mark the beginning of feedback control.

J. C. Maxwell, famous for electromagnetism-related studies, wrote a paper entitled "On Governors" in 1868, discussing the stability of governors. He examined characteristics common with many governors and gave a quantitative account of these universal characteristics. In other words, he conducted analysis by making a "model" of governors. He also expressed the concept of stability in mathematical formulas. As such, Maxwell is credited for having achieved the first systematic study on stability of control.

If Watt's development of the "governor" gave birth to control engineering, then you could say that Maxwell's research results formed the very basis on which the control theory was built.

The concept of control thus came into being and subsequently went through the hands of many researchers for refinement. The results are robust control based on advanced mathematics, adaptive control, nonlinear control and so on, contributing to the development of technological forefronts such as robotics, space engineering and signal/image processing, among others.

Science and Technology **Information**

Keio Leading-edge Laboratory of Science and Technology (KLL) Participates in Technical Show Yokohama 2011 (32nd Industrial Technology Fair)

February 2 (Wed.) ~ 4 (Fri.), 2011 (10:00 ~ 17:00)
Pacifico Yokohama (Halls C & D)
http://www.tech-yokohama. jp/tech2011/

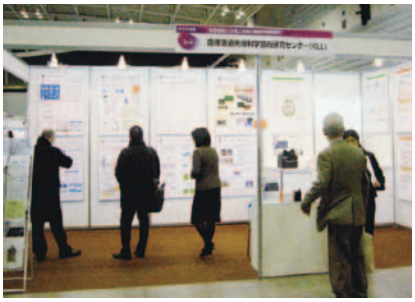
Keio Leading-edge Laboratory of Science and Technology (KLL) participates in the Technical Show Yokohama again this year. KLL's theme for this year is: "Pioneering the Next Technological Forefronts . . . From the Perspective of Fundamental Science and Technology." We introduce our fundamental science research activities that support today's society and industry. We welcome your visit.

The 10th KLL Seminar on Industry-Academia Collaboration "Fundamental Science & Technology Research Endeavors That Support Our Society and Industry"

February 25 (Fri.), 2011 15:00 ~ 18:00
2nd Floor, Kyosei-kan Hall (Multi-purpose Classroom 1) on the Keio University Hiyoshi Campus
Admission free; Prior applications required
http://www.kll.keio.ac.jp/

This seminar is organized and sponsored by KLL. In this seminar, we introduce four studies from mathematical science and physics under the theme "Fundamental Science and Technology That Support Next-generation Society and Industry." After the seminar is over, there will be a meeting for friendly interaction and opinion exchange.

Please apply for participation at the above URL.



A scene from Technical Show Yokohama 2010

A scene from 9th Industry-Academia Collaboration Seminar

Editor's postscript

About the robot appearing in the interview article (pages 4 ~ 5): It is an autonomous mobile guidance/transport robot named "MKR-003." "M" stands for Murata Machinery, Ltd., the manufacturer, "K" for Keio University, and "R" for a robot. The number "003" signifies that the robot is the third model. It's cute but has a "square" name. Asked "Why didn't you give it a more attractive name?", Dr. Takahashi replied, "This is better because it allows the hospital, the robot user, to give it whatever name they like. We were impressed by the fact that attentive ingenuities are incorporated so that the robot can adapt itself to the given environment, interacting with humans and being loved by users.

For the next academic year, we will also have a line-up of attractive researchers waiting to be introduced. Please look forward to the next issue. (Saori Taira)

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