Development Stage

(Fiscal Year 2005-2007)

Toyohashi Area

Development and Application of Smart Sensing System

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Life Sciences

IT

Environment

Nanotech Materials

Others

Project Promotion

Project Director… ………… Takuji Kajiwara
Chief Scientist… ………… Akira Yoshida
Science and Technology Coordinators… Yasunori Hamaguchi
Kenichi Hashiudo
Satoshi Imura

Core Research Organization

Toyohashi University of Technology

Major Participating Research Organizations

Industry… ADVANCE FOOD TECHNOLOGY CO., LTD., AlphaProject Co., Ltd.,
S I SEIKO CO., LTD., OriMacky Inc., ChemInfoNavi, KONDOH SEISAKUSHO Co., Ltd.,
SHIBUYA MACHINERY CO.,LTD., CHIYODA ELECTRONICS Co., LTD,
TS Photon corporation, Teruya Corporation, JAPAN OPERATOR CO., LTD., Fit Corporation,
Fujitsu Limited., Pegasusnet Corporation, HORIBA, Ltd., HONDA ELECTRONICS CO., LTD,
MORITA OPTICAL INDUSTRIAL CO., LTD., YASHIMA NETSUGAKU CO., LTD.,
Yamamoto Electric Machine Instrument Co.,Ltd., and others

Academia… Toyohashi University of Technology, Tokyo University of Agriculture and Technology
Government… National Food Research Institute, National Institute of Livestock and Grassland Science

Aim of research and development

In the cityarea program of basic stage started in 2002, the establishment of versatile sensing systems has been aimed at by developing high performance information-discriminating sensor devices and combining a large-scale information processing capabilities under the joint projects between universities and local industries. By revitalizing actively exploitable local industrial resources (Precision agriculture by IT, medical services, welfare, environmental preservation, car-industry etc), significant progress has been achieved in commercialization of products, prototype manufacturing, establishment of university-venture business, technology transfer, and patent application. In the succeeding cityarea program of Development Stage, a new smart sensing system originating from most promising technology seeds is being constructed. We continue the progressive research, create further intellectual properties, and specialize to the agricultural field which is characteristic of Toyohashi area. The local industrial fields are activated by enhancing the industry-university network under this project, resulting in a new sustainable innovation system in this area. In order to accomplish this goal effectively, we divide this program into two subprojects, as follows:

Subproject (1) Development and application of smart sensing system for supporting industry

Subproject (2) Development and application of smart sensing system for combining IT and agriculture.

Contents of research

Subproject (1). Development and application of smart sensing system for supporting industry

In this subproject, continuous and progressive research and development are carried out from viewpoints of the production technology (high speed-high precision transportation control, perfect layer winder system, and high performance control circuit unit etc.), the communication technology (ultrafast optical cross-connect system devices etc.) and the measuring and detecting technology (simplified surface analysis device, unwired SAW sensor, efficient infrared sensor etc.). Some of the products have been commercialized and some prototypes have been manufactured in this subproject. The progressive production development and new marketing activities are expected by following the big results of the research and development In the previous cityarea program of basic stage. In addition, these kinds of R&D in this field support the basis of the industrial application and contribute to the local industrial fields including automobile industry.

Subproject (2). Development and application of smart sensing system for combining IT and agriculture

Another goal of this smart sensing system is directed to the specialized application in the agricultural field, which is characteristic of Toyohashi area. Since appropriate sensor systems are not found in the current agricultural field, excessive amount of fertilizers, pesticides, and water etc. have been delivered and in negative environmental damages are often induced. The safety and security of food are very important for the customers. In this subproject, new sensing systems are being developed for management of soil, sensing in the greenhouse environment and real-time monitoring of the growth conditions of agricultural products. Additionally, when farm products are managed and selected in the collection process of foods, the more intelligent sensing system is required, guaranteeing safety and security of the products. Hence, the farm sensing system which covers everything "from the farm to the kitchen table" is taken up in this subproject.

The main study results

1. Development of foreign object detector in food with ultra-sensitive SQUID magnetic sensor

The productization of "superconductive magnetic metal detector (liquid and beverage use)" was conducted by a joint research of Advance Food Technology and Prof. Saburo Tanaka of the Toyohashi University of Technology. This product is a device that can surely detect the magnetic metal foreign object of 100 micron orders that exists in food with the flow ability such as the beverage and the minced meat. In particular, since it is difficult to use strainer (filter) in the beverage including the flesh etc., the foreign object inspection equipment that the sensitive detec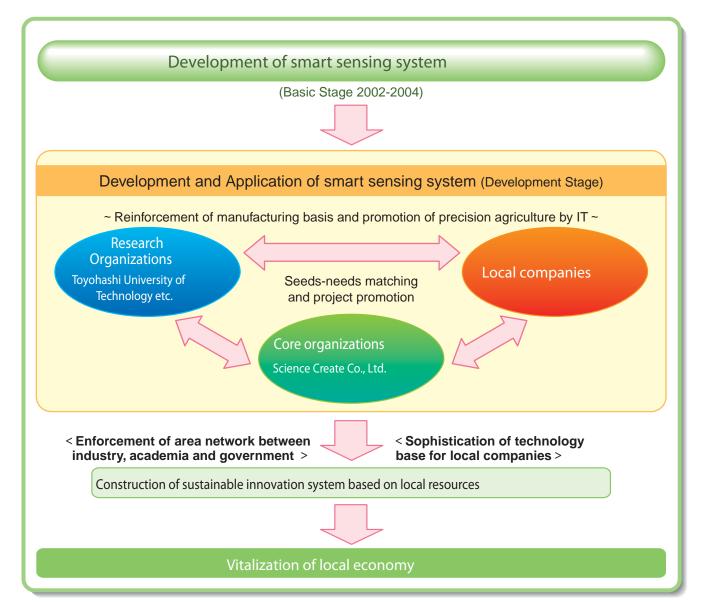tion is possible by the noncontact developed this time is effective. Flow rate of the beverage which flows in the vicinity of the wall of the pipe is lower than that in the center of the pipe because of the difference of the flow rate distribution. The liquid material sometimes might stay in the vicinity of the wall. The beverage in the vicinity of the pipe inner wall receives an X-ray exposure for a long time in an X-ray method. As it is ionized and the quality is degraded, X-rays are not used. Other current method for detection is CCD camera method and image processing, but this method is not so sensible enough.

Superconducting magnetism metal detector [for liquid and drink]
(Advance Food Technology Co., Ltd.)

2. Development of non-invasive measurement machine for fruits sugar content and larval maturity

Development of the nondestructive inspection device that can measure the sugar content and the ripeness is underway for melons, which are the special local product of the Toyohashi area. The device of an inexpensive price was developed by a more convenient method instead of using a conventional spectroscope. The trial product was completed.

Development of smart sensing system

(Basic Stage 2002-2004)

Development and Application of smart sensing system (Development Stage)

Reinforcement of manufacturing basis and promotion of precision agriculture by IT

Research Organizations
Toyohashi University of Technology etc.

Seeds-needs matching and project promotion

Local companies

Core organizations
Science Create Co., Ltd.

Enforcement of area network between industry, academia and government

Sophistication of technology base for local companies

Construction of sustainable innovation system based on local resources

Vitalization of local economy