Handy Hands for Housework
Robot with interchangeable hands

What if we have a robot that assists our everyday duties... A robot with interchangeable hands was developed to approach the realization of this dream. The AIST’s unique invention enables the robot to replace the hands by itself and maneuver a variety of objects.

The hands can be attached and removed mechanically according to the movement of the robot arms.

Unlike conventional industrial tool changers, the robot does not require a drive source specially for mounting and fixing of the hands. This resulted in downsizing as well as weight reduction of the system.

A four-fingered hand, one of the interchangeable hands, is called “WitchHand” and is able to grasp a variety of objects securely by adapting the fingers to the shape of the target object by means of a single axis driving motor.

(*WitchHand® is a registered trademark of AIST.)

Researcher’s Message
We are proceeding with full-scale research projects including the development of hardware other than interchangeable hands as well as sophisticated task teaching technology, aiming at the creation of a robot which can be used as a tool. We will strive for the realization of the system which is beneficial for many people at the earliest possible date.
Vision System for 3-D Perception and Recognition

As human behavior is mostly based on three-dimensional visual information, VVV is developed for an advanced computer vision system that observes 3-D objects stereoscopically to be used for many purposes in many fields.

The principal functions of VVV are range sensing, shape description, object recognition and motion tracking. VVV implements these functions in real time consistently and accurately for any shape of objects in various situations.

There are many needs for such 3-D vision systems, including: manufacturing, transportation, construction, medical services, welfare, security, disaster prevention, etc. VVV is expected to be commonly used to automate a variety of works and the operation of machines which require human vision.

Flexible Manipulation System without Programming

The manipulator, cooperating with the VVV system that recognizes a banana among various fruits, picks it up and places it on a plate. This technology is applied in the development of automatic assembling systems, for example, to classify castings randomly placed on a moving conveyer belt and to insert parts into the holes of a component even in unstable conditions.

Autonomous Vehicle

A battery-driven cart that carries an active trinocular stereo camera system as a 3-D visual sensor can autonomously go to the goal avoiding obstacles on the way with a simple map of the distances between the intersections.
Robot Arm with Tactile Sensor throughout Body

It is extremely important for a robot to have a tactile sense in order to ensure safe operation in an environment with humans. To meet this requirement, a robot which has a tactile sense throughout the body has been developed. This robot will sense being touched by a human and avoids further contact so that it can continue to operate safely. The new tactile sensor is easy to load on a robot arm and conveys various information such as positions and degree of pressure at multiple contact points over a large area. The arm is covered with soft materials, taking into account the safety of the contact with humans. Currently it is planned to improve the response speed of the control system as well as incorporation with other sensors such as a visual sensor. The arm with a tactile sensor is expected to open a path to safer co-existence between robots and humans.

Haptic Interface Carries All Kinds of Force and Motion Information

The six-degree-of-freedom haptic interface invites the users to experience various force and motion in remote places or in the virtual world as if they have entered there. The system enables interactions with remote places and/or virtual reality by taking advantage of its wide range of motion (translation movement: a ball with a diameter of approximately 150 mm; orientation movement: Approx. ±70 degree from each axis) and excellent movement properties.

The haptic interface was originally developed by Prof. Uchiyama of Tohoku University and Prof. Tsumaki of Hirosaki University. Further improvement was pursued in cooperation with AIST focusing on stiffness analysis of the mechanism, for the development of a haptic interface with high and well-ballanced rigidity.