Genotyping Service Using Japonica Array(†)

Toshiba has introduced a service that provides rapid and inexpensive analysis of genotypes using the Japonica Array(†) (*).

The Japonica Array(†) contains approximately 675 000 single-nucleotide polymorphisms, with a base sequence common among the Japanese population, in one chip. This tool can analyze the genotype of a Japanese person in a short time, and is designed to allow pseudo-reconstruction of the entire genotype, consisting of about 3 billion base pairs, based on the analysis results.

More than a month has normally been required to map a genotype using the latest type of sequencer. In contrast, our service utilizing the Japonica Array(†) can analyze a person's genotype in about one week at a low cost approximately 1/25 that of the previous method.

We are offering this service to research institutions to clarify the causal relationships among genes, diseases, and drug efficacy, in order to promote disease prevention and therapies tailored to each individual, and will continue to make efforts to improve the global competitiveness of Japan in this field.

Japonica Array(†) Japanese population genotyping array

(*) The Japonica Array(†) was developed as a tool to analyze the genotype of the Japanese. It is being implemented through the Center of Innovation (COI) program at COI sites in Tohoku based on the "whole-genome reference panel" established by the Tohoku University Tohoku Medical Megabank Organization.

Japonica Array is a trademark of Tohoku University.

Wearable Sensor for Various Applications in Healthcare Field

Sensor fusion devices have been attracting considerable attention from the public with the evolution of the Internet of Things (IoT). Such devices offer high-level recognition functions achieved through analysis of data collected from multiple and/or integrated sensors.

Wearable sensors are a type of sensor fusion device used for monitoring and recording peoples' daily activities and experiences. With these capabilities, they have been positioned as key devices in a broad range of healthcare fields including preventive medicine, diagnosis and treatment, prognosis and nursing care, and health promotion.

Toshiba has developed a wristband sensor incorporating a built-in accelerator that allows quantitative monitoring of activities such as step counts and distances covered, calculation of calories, and recording of sleeping conditions such as hours of sleep and sleep cycles.

This wristband sensor can automatically detect sleeping conditions without the need for any manual operation. It can also monitor living activities over a two-week period on a single charge.

The target can be easily reached by monitoring calorie consumption, which is shown in a graph created through application software in a smartphone.

Effects of calorie consumption management
- People can manage their own health properly and reach their targets easily by digitalizing their daily calorie consumption.
- The sensor gives an opportunity for those who rarely have a chance to exercise to raise awareness of the benefits of being physically active every day.

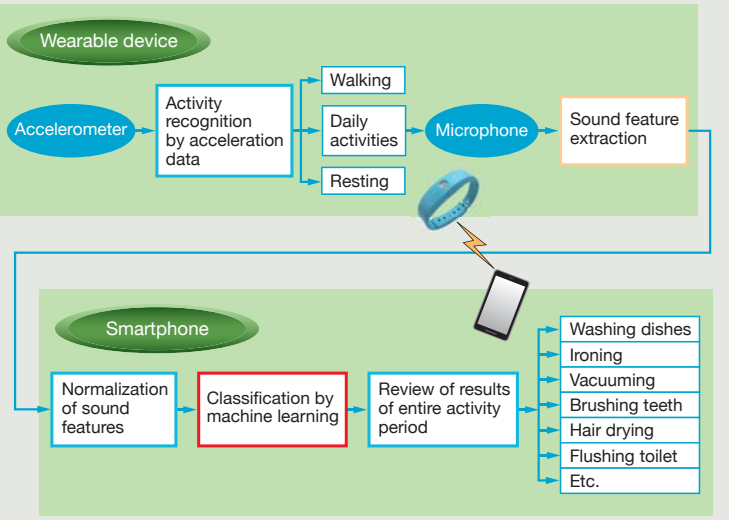
Wearable sensor for long-term sensing of human activities

Distributed Processing Technology for Daily Activity Recognition Using Wearable Device and Smartphone

Toshiba has developed a distributed processing technology to recognize various living activities, for application to personal healthcare, watching over the elderly, and so on, using a wristband type wearable device and a smartphone.

This type of technology has been implemented up to now on a smartphone using an embedded accelerometer and microphone. However, the new technology enables users to monitor various living activities without the direct use of a smartphone by means of sensors embedded in a wearable device.

In view of the volume of calculations and data traffic, we developed a distributed processing algorithm by which a wearable device extracts the features of the sound data and a smartphone carries out the subsequent recognition processes. We have confirmed that the system operates with lower power consumption and recognizes six types of major living activities with an accuracy exceeding 95%.



Outline of living activity recognition system using wearable device and smartphone

Superconducting Rotating Gantry for Compact Heavy-Ion Radiotherapy System

A rotating gantry is a device that rotates the irradiation port of a radiotherapy system in a 360° circle. It reduces both patient stress and treatment time, since the patient can be irradiated from any direction without having to change position.

Rotating gantries are widely used in proton therapy devices. In the case of heavy-ion therapies, on the other hand, large devices are required for emission of high-energy particles, and the development of a technology to downsize the rotating gantries of such devices is an important issue in order to make them available for practical use.

Toshiba has already developed superconducting magnets to realize a compact gantry system for the National Institute of Radiological Sciences (NIRS), Japan. As a result, we have been able to reduce the weight of the gantry by 50% compared with the conventional type. The superconducting gantry system for NIRS is being installed, and is scheduled to become operational in 2016.

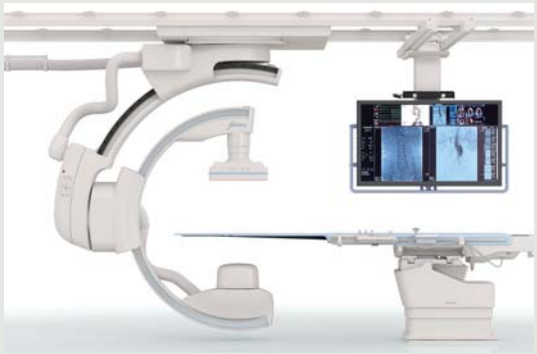
Superconducting magnet for rotating gantry

INFX-8000C X-Ray Angiography System with Newly Developed C-Arm

Toshiba Medical Systems Corporation has developed the INFX-8000C X-ray angiography system with a new ceiling-suspended C-arm (X-ray tube support) that can be used for intravascular interventional procedures throughout the body.

Its main features are as follows:

- Wide stroke
  The C-arm, on which the X-ray tube is mounted, incorporates newly developed double-slide mechanisms. Owing to their synchronized movement, the INFX-8000C has a stroke 1.5 times as wide as that of the previous model while maintaining the same system size.
- High-speed three-dimensional (3D) image acquisition
  Synchronized control of the double-slide mechanisms allows the C-arm to rotate at a speed of up to 80°/s, completing 3D image acquisition in three seconds. This makes it possible to reduce the contrast medium dose and breath-holding time and realize image acquisition programs that are extremely patient-friendly.
- Enhanced system operability
  Since operating switches are provided on the system cover, the operator no longer needs to move to the console to manipulate the system, enhancing system operability in the operating room. Moreover, the function assignments of the operating switches can be changed to meet the user's requirements, further improving the system's ease of use.



INFX-8000C X-ray angiography system with newly developed C-arm

Wide stroke achieved by synchronized movement of double-slide mechanisms

Celesteion Large-Bore PET/CT System Using TOF Technology

Positron emission tomography/computed tomography (PET/CT), or integrated PET/CT scanning, is an essential imaging modality for cancer diagnosis.

Toshiba Medical Systems Corporation has developed the Celesteion PET/CT system, an open and comfortable large-bore system using time-of-flight (TOF) technology that allows whole-body examinations. It is the first PET-CT system to have been developed by a Japanese medical imaging system manufacturer(*).

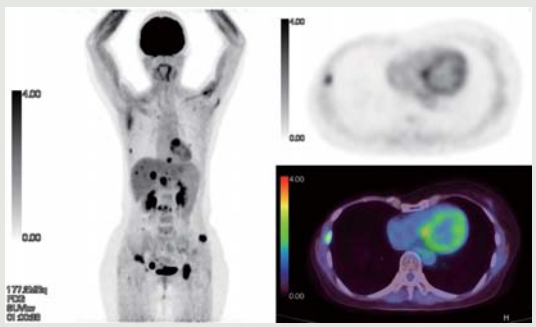
The main features of the system are as follows:

- Improved image contrast
  The area covered by photomultiplier tubes mounted on a crystal array has been maximized to increase the signal strength obtained from gamma rays. This makes it possible to achieve a TOF timing resolution of 450 picoseconds or less, increasing the image contrast. The higher image contrast helps to improve the accuracy of assessments of the effects of cancer treatment.
- Open design and increased patient comfort
  The large bore (CT section: 90 cm; PET section: 88 cm) not only provides an open design and increased patient comfort but also reduces patient movement due to discomfort during examination, thus reducing the likelihood of image quality degradation.

pico: 10^{-12}

(*) As of April 2014 (as researched by Toshiba Medical Systems Corporation)

Celesteion large-bore PET/CT system using TOF technology



(courtesy of Yokohama City University Hospital)

CT and PET images of patient with tumors