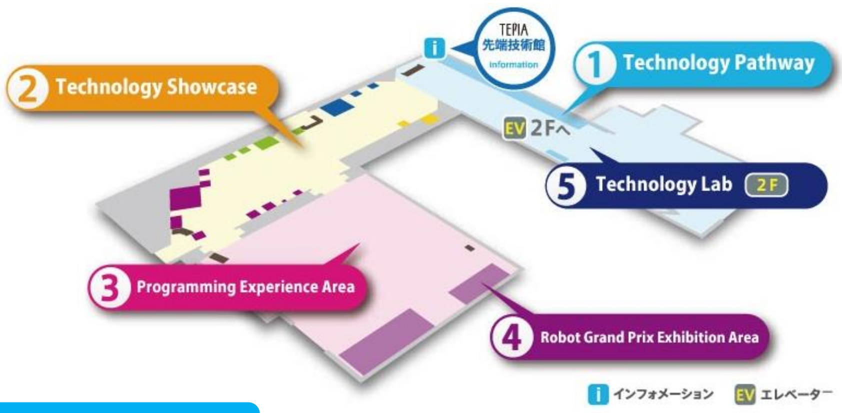
TEPIA Advanced Technology Gallery

EXPERIENCE
THE ADVANCED TECHNOLOGY
OF THE FUTURE



①Technology Pathway

〜 The Future AI and IoT Will Provide 〜
AI and IoT are helpful in solving various societal issues, from the declining population to the increase in regional inequalities. This is an introduction to the changes to our lifestyles and to our societies that will be brought about by the use of AI and IoT.

②Technology Showcase

Population Aging

At present, elderly people over the age of 65 make up approximately 27% of Japan's population. Japan's population will continue to age, and it is projected that in 20 years, one in three people will be elderly.
As the population ages, there is concern about the spike in demand for medical treatment and care, resulting in increased medical expenses, as well as shortages of caregiving facilities and caregivers, to give two examples. It is desirable for society to utilize AI and IoT, so as to increase the number of active elderly people.
In this corner, we will introduce cutting-edge technology that will utilize IoT, robots and more to overcome the declining vitality in society due to the aging population, but at the same time, be useful for creating a society where the elderly can live with peace of mind.

Population Decline

Due to the declining birthrate, Japanese society is undergoing a rapid population decline. Because of the increase in the percentage of elderly people, the working-age population is declining even further, and if the GDP per person decreases, it will become harder to make economic prosperity a reality. In addition, there is concern that "quality of life" factors will deteriorate, such as it becoming difficult to obtain essential goods and services due to labor shortages. In these circumstances, it is desirable to utilize AI and IoT to improve productivity, and bring about an affluent society.
In this corner, we will introduce cutting-edge technology that is expected to reduce the labor shortages caused by the population decline via the use of robots and AI (artificial intelligence).

An Increase in Regional Disparity

Although the population is concentrating in major metropolitan areas, the population decline is not stopping, and it is said that the number of "cities at risk for disappearing," whose continued existence is doubtful, has risen to half of the municipalities in the entire country.
When key agricultural and fishing industries decline due to the lack of successors and other reasons, the dynamism of the entire local society is lost, which invites the decline of services for daily life, and magnifies the regional disparity between urban and rural areas more and more.
In these circumstances, it is desirable to utilize AI and IoT in order to implement "smart" farming, among others, and revitalize industries that support rural areas.
In this corner, we are exhibiting cutting-edge technology, such as IoT and robots, that will be useful for eliminating the regional disparity between urban and rural areas.

Future Living

We introduce a variety of technology that will be realized in the cities,houses,shops and offices in the near future.

③hands-on computer programming experience area

This is the area for experiencing hands-on computer programming in accordance with difficulty levels.

④Robot Grand Prix exhibition Area

Robots Grand Prix exhibition Area shows the participating robots. The theme of the 2018 Grand Prix is 'Develop problem-solving robots to excite junior high and high school students!' Eleven junior high school and high school teams were selected among nationwide entrants to exhibit their robots. Furthermore , you can see the TEPIA Award winner in the 12th Kid's Design Award that recognizes technologies and programs that are useful for kids and for parents raising children.

⑤Technology Lab (2F)

This area presents various robots and VR technologies. This floor also contains a theater and programming workshop space.

List of exhibitors and cooperating organizations

a.a.c., Inc.
Caiba Inc.
Carea Corporation
DENSO WAVE Co.,Ltd
dricos, Inc.
Emfasys Co., Ltd
FRONTEO, Inc.
FUJITSU LIMITED
HATAPRO,INC.
HEARTS Technology Corp.
Hirose-Tanikawa Lab., The University of Tokyo
Holoeyes Inc.
Intelligent System Co.,Ltd.
Japan Airlines Co., Ltd.
Keio University Graduate School of Media Design
Mitsubishi Electric Corporation
MJI Inc.
National Institute of Advanced Industrial Science and Technology
NIPPON TELEGRAPH AND TELEPHONE CORPORATION
OMRON Corporation
Ory Laboratory
Parity Innovations Co. Ltd.
ProgMind Inc.
RT.WORKS co., ltd.
Ryosan Company,Limited
SEIKO HOLDINGS CORPORATION
Shimizu Corporation
SOHGO SECURITY SERVICES CO.,LTD.
TBM Co., Ltd
TOSHIBA VISUAL SOLUTIONS CORPORATION
Towa Denki Seisakusho CO., LTD.
Xenoma Inc.
ZMP Inc.

※Alphabetical order

Entrance

TOSHIBA VISUAL SOLUTIONS CORPORATION
REGZA 84Z8X

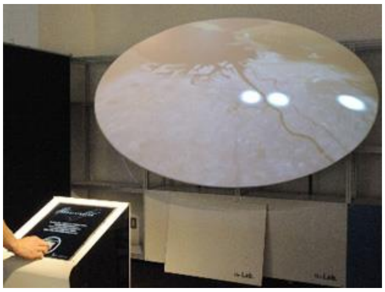
REGZA
REGZA
TOSHIBA
PREMIUM

This TV copes with two elements; larger display and clear detail images, and it reproduces various screen images, including terrestrial digital broadcasting, even more beautifully than before.

OMRON Corporation
Facial Feature Extraction technology

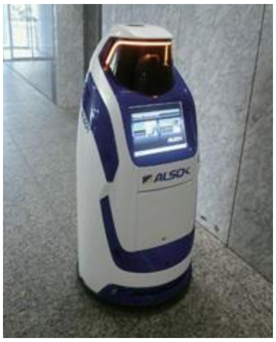
It analyzes image of the face captured by camera and presumes gender and age of that person. Analysis is made mainly on the shape of the face, distances between eyebrows, eyes, nose and mouth corners, and from these characteristics it derives general estimates of gender and age. It takes approximately 0.04 seconds to complete estimation of one person and it can work on plural number of people captured by camera at the same time. It may be used for making analysis of visitor groups at shopping center and event venues. It can be used for marketing data.

Hirose-Tanikawa Lab., The University of Tokyo
Sharelog3D



Sharelog 3D was developed as a public art (Art work put in public spaces and not in limited spaces such as museums) which can be enjoyed using data from a transportation IC card. On a transportation IC card there are maximum of 20 travel information records. It records from which station to which station the cardholder has travelled in the past. When you read the data using an exclusive card reader it matches that with a database of latitude and longitude of the station used and a history of the person's movement is mapped on to a 3D map synthesized with an urban model as a trace of light and projected in front of you as an image art. This is a participation type public art work where the viewer can experience a bird's eye view of their movement.

Sohgo Security Services Co., Ltd.
Reborg-X

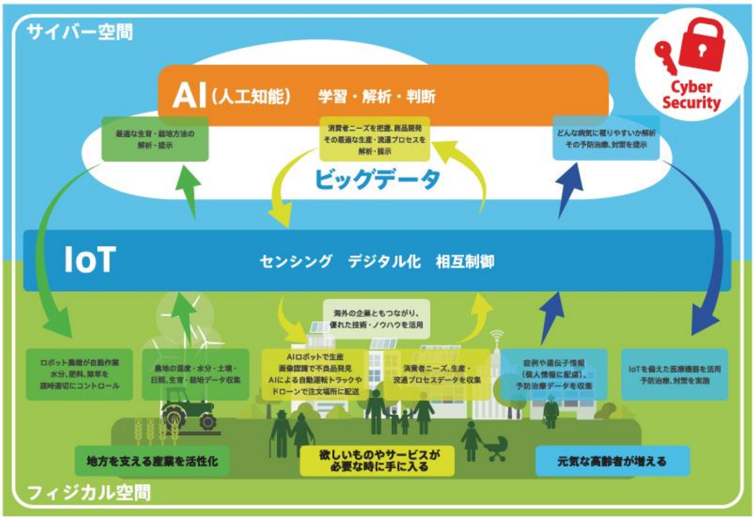


This is an autonomous travel robot with strengthened communication functions with the theme of "Fusion of people and robot." It can be customized according to application purposes and facility environment.

①Technology Pathway

~ The Future AI and IoT Will Bring！~

Currently our society is beset by numerous problems, with particularly major issues including the aging of the population, population decline, and the increasing number of regional inequalities. Expectations are riding high for AI and IoT to solve these social issues.
This is an introduction to how AI and IoT will be used to reduce the labor shortage, invigorate society, and create a more comfortable, convenient, secure, and safe living environment.


サイバー空間
Cyber Security
AI（人工知能） 学習・解析・判断
最適な生育・栽培方法の解析・提示
消費者ニーズを把握、商品開発 その最適な生産・流通プロセスを解析・提示
どんな病気に罹りやすいか解析 その予防治療、対策を提示
ビッグデータ
IoT
センシング デジタル化 相互制御
海外の企業ともつながり、優れた技術・ノウハウを活用
ロボット農機が自動作業 水分、肥料、除草を適時適切にコントロール
農地の温度・水分・土壌・日照、生育・栽培データ収集
AIロボットで生産 画像認識で不良品発見 AIによる自動運転トラックやドローンで注文場所に配送
消費者ニーズ、生産・流通プロセスデータを収集
症例や遺伝子情報（個人情報に配慮）、予防治療データを収集
IoTを備えた医療機器を活用 予防治療、対策を実施
地方を支える産業を活性化
欲しいものやサービスが必要な時に手に入る
元気な高齢者が増える
フィジカル空間

②Technology Showcase

Population Aging

Carea Corporation / Ryosan Company,Limited
Non-contact vital sensor

" Non-contact vital sensor" was developed with the objective of lightening the load of caregivers by constantly monitoring the vital signs of elderly nursing-care residents. It places emphasis on respecting their lifestyles and privacy without compromising the quality of the services provided. It helps ensure safety and peace of mind in the daily lives of the elderly. Another beneficial function that was added this year through the development of a new algorithm was the monitoring of the psychological aspects of a person's health.
Working style reform is a recent initiative being undertaken among Japanese companies. It promotes, among other things, creating a conducive work environment and supporting health management. The new sensors can detect employee stress and concentration levels as well as drowsiness. It can serve as a mental health care system that helps people become more conscious of their health. Additionally the company has begun working on detecting emotions.

dricos, Inc.
healthServer

“healthServer” is the world’s first (according to a dricos study) customizable supplement server, providing users with powdered supplements to mix with their favorite drinks, just by touching the sensor with a finger.

The biometric sensor contained in the unit can read your pulse information in approximately 20 seconds, and calculates a score which measures the extent of physical and mental strain you are under. The unit will then automatically compute the appropriate amount of nutrients your body needs to intake based on that score, and will provide between 100 to 300 milligrams of powdered supplements in a cup. By mixing and dissolving these supplements with your favorite beverage, you can conveniently compensate for any nutrient deficiencies. And by inputting information about your meals taken before drinking your supplements, and your planned activities before and after, into the customized smartphone app, the unit can provide even more precisely tailored nutrients to your particular situation - for example, if you are involved with deskwork, or are suffering from fatigue.

Emfasys Co., Ltd
eye SWITCH

”eyeSWITCH” is a switch that uses the movements of your eyes (eyeballs and eyelids). With the use of call devices, environment control devices, and communication devices, we can call, operate household appliances, and communicate. The device is small, does not need to be attached to the body, and can also be used in the dark.

With progressive muscular atrophies such as the intractable mental disorder ALS (amyotrophic lateral sclerosis), in most cases eye movements (eyeballs and eyelids) are not affected by the disorder. So, by using the motor functions of the eyes, people who had to wait passively until now, such as those with limb disabilities or those confined to the bed, will be able to voluntarily call for help, and operate nearby devices by themselves.

At present, operations using movements of body parts other than eyes, such as the mouth and hands, are being developed.

RT.WORKS co., ltd.
Robot Assist Walker RT.2

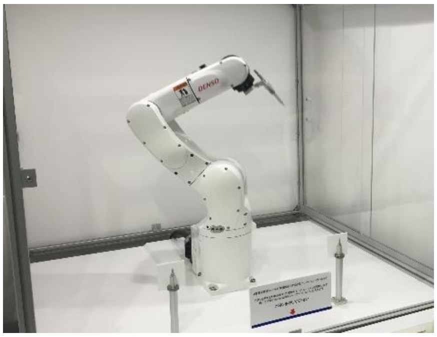
RT2 is a walking assist robot that makes it easier for those who have difficulties in walking.
Just by gripping the handles, it can support walking according to the user’s walking speed and the angle of the slope.
This robot is equipped with a sensor that can detect if the user's hand is on the controls, as well as sensors that detect the slope and condition of the road, and sensors that detect the operating environment. Based on the information detected by these sensors, the movements of the motor can assist walking by automatically switching between offering assisted movement in the direction the user is moving and applying the brake. The robot adds forward propulsion with a power assist on upward slopes, while applying the brake on downward slopes to appropriately slow the speed. This in addition to automatically stopping when hands are off the device allows the robot to support walking by adjusting appropriately to the situation. It is also equipped with a speech function, allowing it to assist with phrases such as, "There is a steep slope here, please be careful." When finished using the device, it also helps you by announcing the distance walked and by offering congratulations of a job well done.

Xenoma Inc.
e-skin

“e-skin” is a lightweight and comfortable, ordinary piece of clothing that is washable. And yet it is also a smart apparel unit which contains sensors that can collect data tracking a user’s movements. Utilizing a modifiable and elastic fabric-type electronic circuit board developed by our company called “Printed Circuit Fabric,” this apparel is highly durable and can withstand intense stretching and pulling.
The “e-skin Developer’s Kit” featured in this exhibit includes an apparel unit containing 14 strain sensors and a Hub (the chest device) which contains a 6-axis motion sensor that allows you to track your body’s movements, posture, and breathing. This product can be used in a variety of ways. For example, to monitor health, or to track your exercise form, etc.
We are continuing our research so that in the future we can enable the apparel to track vital signs such as heart rate, body temperature, blood pressure, etc., so that it can be used for preventative health care as well.

Population Decrease

DENSO WAVE Co.,Ltd
VS-060



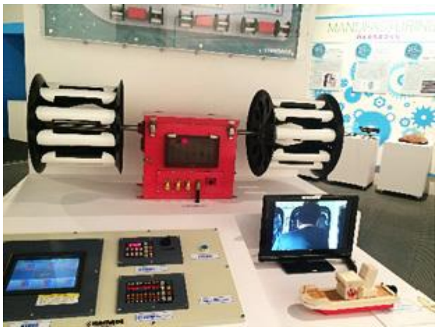
"VS-060" is a 6-axis vertical multi-articulated industrial robot, that achieves the class top level high-speed performance with a load capacity of 4kg.
With its advanced technology it can perform anything from standard assemblies to transport, along with surface inspection of curved and complex shaped products, or polish surfaces and tighten screws with the dexterity of skilled workers.

ZMP Inc.
Logistics support robots 「CarriRo」

"The CarriRo logistics support robot " enables transport to be carried out enjoyably, by everyone.
Robotics has been applied to dollies used for transporting items to give them various functions. They are: an assist function for lightening a load, a "duckling" function in which unmanned dollies follow after a worker, and an autonomous mobility function where the dollies move automatically between specified areas. The robot dollies are capable of 8 hours of continuous operation and have a maximum speed of 6 kilometers per hour. With such high basic performance, they are assumed for use in a variety of settings. These functions will not only lighten the load on workers but also help improve productivity by increasing the volumes transported and automating transport. They are designed to match cityscapes and propose new working styles. Use of the robot dollies to augment human labor will also contribute to alleviating labor shortages in logistics.

An Increase in Regional Disparity

Towa Denki Seisakusho CO., LTD.
Fully Automatic Squid Fishing Machine



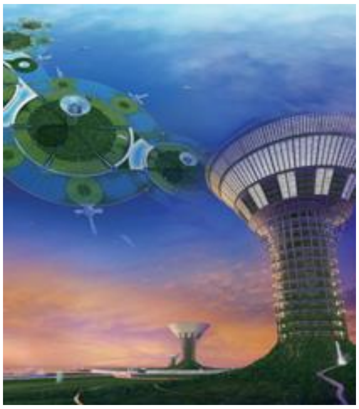
"Full-Automatic Squid-Fishing Machine" is a revolutionary product that has successfully automated the whole process of squid fishing by using the computer, developed at a time when successors of squid fishing have become scarce.
It offers excellent efficiency that allows one man on the bridge (the vessel control room) to control the squid fishing machine (of which 64 units can be installed per fishing vessel) , furthermore, it successfully digitized and computer-controlled the skillful technique called "Shakuri" (jiggling the bait).
In addition, it can use its sensor to capture the ship's rocking caused by changes in weather or tide and automatically control its own movement, to minimize any trouble on the ocean.

a.a.c., Inc.
Aquaponics

"Aquaponics" is an agricultural method combining fish breeding (aquaculture) and tank farming (hydroponics). Excretions of fish are broken down by microbes to become the fertilizer for plants, while fish thrive in the water cleaned by absorption and purification by the plants. The method originated more than 1,000 years ago, but it has drawn attention again as an eco-friendly, environmentally sound system. This product has made it possible to have aquaponics indoors. While indoor plant factories are drawing attention these days, sometimes in the future there may be manufacturing facilities combining fish and plants designed to be like an aquarium to provide people with the solace of nature.

Future Living

Shimizu Corporation
The Environmental Island GREEN FLOAT



"Environmental Island Green Float" is a future ecological city proposed by Shimizu Corporation using the company's comprehensive strengths. It is a plan to construct 3,000-meter-diameter and 1,000-meter-high artificial floating island cities on the equatorial Pacific.

The underlying concept is to create a botanical floating city that is sustainable and maintains a lush natural environment. The company is spreading this concept worldwide as an innovative idea for solving environmental issues.

If the island can be constructed in real life, it would achieve a recycling-based society of the future. There would be food self-sufficiency achieved in a comfortable environment that utilizes the natural offerings of the sea. Shimizu Corporation will continue to carry out technological verification toward the realization of this concept.

TBM Co.，Ltd
LIMEX Sheet

LIMEX
TOPPAN
LIMEX
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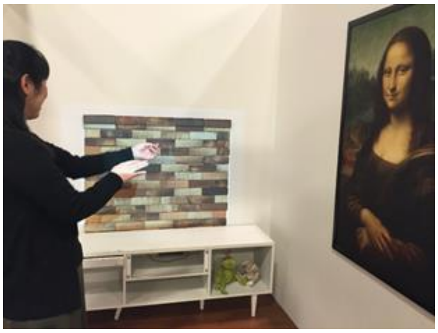
TOPPAN

"LIMEX Sheet" is a material made by combining limestone and polyolefin (resin), and is used as a replacement for traditional paper. It uses almost none of the water or wood normally used in the production of paper. Because it uses limestone, a mineral abundant everywhere on Earth as the main ingredient, it reduces environmental problems such as water shortages or the destruction of forests. Just like regular paper it can be printed or written on. In addition, it is also very water resistant and durable. It can also be recycled semi-permanently. Not only useful for paper, this material can also be widely used as a replacement for plastic products.

Manga Generator Consortium
Manga Generator K.A.I

"Manga Generator K.A.I" is an immersive entertainment system that anyone can take part in and instinctively enjoy. It was developed for a contest by students of the Kanagawa Institute of Technology.
To enable you to jump into the two-dimensional world of manga, your image is taken by camera, and the shot is converted so that it can be incorporated in a manga. Your posture and poses and the emotion expressed by them are picked up through artificial intelligence-based machine learning technology. Suitable backgrounds are generated to match the pose. Stories are also automatically selected depending on the testers height and so on.

NIPPON TELEGRAPH AND TELEPHONE CORPORATION
Hengento Projection



"Hengento Projection" is a technology using monochrome moving patterns projected onto a still object to make it look as if the object is moving. The human brain analyzes the color, shape and movement of an object separately and synthesizes them to perceive movement. The only thing projected by the Hengento Projection is movement, and though the color and shape of the still image is not moving, the brain will use its corrective function to process the inconsistencies of the information. Using this phenomenon, the illusion of movement can be given to an object captured by the human eye.

Keio University Graduate School of Media Design
TECHTILE toolkit

"TECHTILE toolkit and Karada tap" are technologies which make it possible to transmit tactile information to remote areas in real time. As the internet becomes an everyday part of life and the boundary between the "net" and the "real world" becomes blurred, the sense of touch is being recognized as an important way to perceive yourself and the outside world. If tactile information can be conveyed along with video and audio, it can provide information that "feels real" in a manner superior to any previous form of media.

Seiko Solutions Inc.

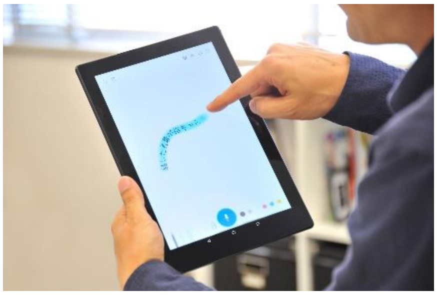
Time Server Pro.

”Time Server Pro. ” was developed in response to needs for “time synchronization”. In the modern society we live in, many devices are connected to the internet and various information are exchanged. In order to accurately send/receive huge amounts of information, the electrical devices that handle such information have to have perfectly aligned clocks. It is called “time synchronization”.

Rendezvous of people only require synchronization of their watches in minutes. But electrical devices need the synchronization at the accuracy of “one millionth of a second”.

Mitsubishi Electric Corporation

User Interface for Voice-activated Drawing



”User Interface for Voice-activated Drawing” is a voice recognition displaying technology that allows spoken words to be displayed on a screen where touched by a fingertip.

There are different ways to deal with hearing disabilities or language barriers, but each method has its own problems.

For example, you can converse with a person with a hearing disability by writing on paper. However, writing can be a bother and takes time. There are translation apps for overcoming language barriers, but all it usually does is display the translation on a screen. In most cases, you are limited to a text-based means of expression.

Because spoken words appear as text along the line traced by your fingertip, the technology can be used easily by anyone.

By combining it with a multi-lingual translation function, a user can also communicate with people from other parts of the world.

Parity Innovations Co. Ltd.

Parity mirror

"Parity Mirror®" is a unique optical device that utilizes the latest nanotechnology to create floating images.

Two corner reflector surfaces (two mirrors set at a right angle) composed of microscopic mirrors are arranged in numerous planes, and by using these mirrors to reflect the light of an object, an image is projected into the air.

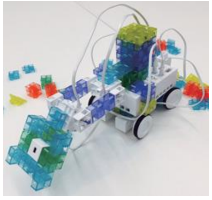
With the floating image created by the Parity Mirror®, you can experience a very realistic presence and impression without the need for special image processing or exclusive content. It can also be combined with various sensors and used for a number of applications as a futuristic IoT interface.

HATAPRO,INC.
ZUKKU

"ZUKKU" is a palm-sized artificial intelligence robot. It is easy and inexpensive to adopt for use. The AI robot was developed with the aim of creating new value by developing hardware for the age of the Internet of Things, or IoT, and Big Data, and by providing analytical prediction through AI.
Retail shops can store obtained recognition data in a marketing information system to visualize information in order to carry out demand forecasting for a sales area or to formulate sales promotion measures. Automatic optimization of ad delivery can also be achieved using optional digital signage.
There is a wide variety of other possible uses, which include serving as a store tender at a shop, as a concierge when the desk has to be unmanned, or as an elderly monitor. There are hopes that it will provide added value through the utilization of artificial intelligence and robotics. The robot is located at the information counter.

③Hands-on computer programming experience area

This is a programming experience area where various kinds of programming materials can be freely experienced.

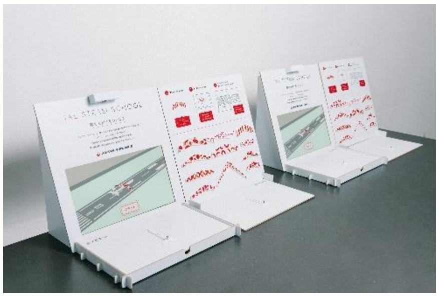


④Robot Grand Prix exhibition Area

This area contains an exhibit of original robots developed by junior and senior high school students through TEPIA Challenge Support Program 2018.
This support program provides financial and technical support for selected teams from throughout Japan. Those teams set challenges, design robots, carry out programming and manufacture robots to develop their completely original robot in accordance with 2018's theme" Problem solving robots to excite junior and senior high school students". Video shows the Fall Robot Grand Prix in 2018 where selected teams are given opportunities to have a presentation of their original robot.

12th Kids Design Award TEPIA Special Award

Japan Airlines Co., Ltd.
JAL STEAM SCHOOL Portable



The "JAL STEAM SCHOOL" is a JAL popular educational program demystifying the world of aircraft and aviation from a perspective of STEAM.
JAL STEAM SCHOOL Portable is a demo version of the JAL STEAM SCHOOL, which demonstrates the fun of how an airplane wing model can affect the airplane flight, using airplane wing models and a simulator app.
（exhibited in Programming experience area from 10thof July to 29thof September and 29th of October to 26th of December）

13th Kids Design Award TEPIA Special Award

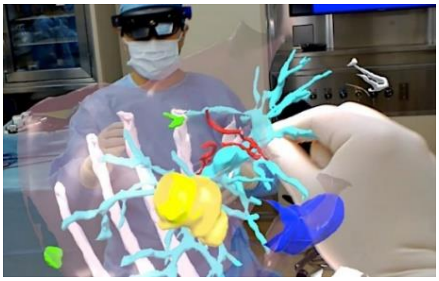
FUJITSU LIMITED
Ontenna

音をからだで感じる
ユーザインタフェース
Ontenna
(オンテナ)

Ontenna is a new kind of user interface you can clip to your hair, ear lobes, collar or sleeve of your shirt. Through vibrations and light, Ontenna conveys the unique features of sound to the user. We have jointly developed this product together with deaf people with the aim of designing a future in which everyone can enjoy the magic of sound.

⑤Technology Lab　(2F)

Holoeyes Inc.
Medical VR “HoloEyes XR”



"Holoeyes" is a cloud-based service which uses the individual CT scans of patients to generate a 3D Virtual Reality application.
By using the Holoeyes VR application, it becomes possible to experience the sense of depth necessary for surgery through intuitive controls.
Holoeyes uses a Mixed Reality wireless headset to make models created from CT scan data visible during surgery. It addresses the problems of surgical procedures, where the site often cannot be seen directly without making extra cuts, and it acts like a car navigation system, allowing the surgeon to see the road they will take in advance. Gathering together data on different cases also makes it possible to create detailed plans pre-surgery, and the device is used to educate students through experience, and for case study conferences.

Ory Laboratory
OriHime

“OriHime” is a robot that can be operated like your body double from a remote place. Built-in web camera, microphone and speaker enable you to speak to people face to face over a great distance. It can take action such as tilting its head and raising one arm to greet by a remote control. While “OriHime” does not have a facial expression, it can express many feelings by its voice and movements. The objective of “OriHime” is to enable people to easily communicate with their loved ones while they are away due to medical reasons or relocation for business.

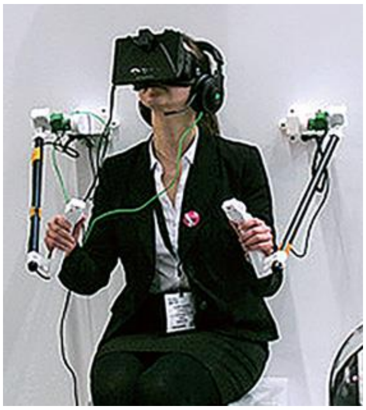
FRONTEO, Inc.
Kibiro

"Kibiro" is a robot with a monitoring function that helps bring together families who live apart. It promotes communication with loved ones and brings security and smiles to people's daily lives.
By using the monitoring function, Kibiro's internal camera and a smartphone app enables you to see elderly and other family members, who live on their own, as they interact with the robot.
You can also use Kibiro to communicate with them through voice and text messages. It will help you feel like faraway family members are close by.

MJI Inc.
Tapia

"Tapia" is a communication robot with learning functions that is customized to be personally attached to a user according to its use frequency. Tapia's round body is equipped with a camera, speaker, microphone, and touch panel monitor. You can enjoy daily conversations thanks to the voice recognition, voice synthesis, and facial recognition features required for conversation, in addition to a cloud-based response system. Her system adjusts the expression of her eyes in response to conversation as well as her enjoyment in response to conversation, allowing her to learn, develop, and become closer to you the more she is used. She can help with phone calls, weather reports, schedule management, news reading, and even aid in video conversations with family in far-off places. She can even help you watch over the room while you are out and about.

Caiba Inc.
Telexistence robot“ caiba”



"Caiba" is a "Telexistence robot" working through the Internet.The operator wears a head-mounted display and operates the robot from a cockpit. The robot and the cockpit are connected via the internet. The connection is P2P after passing through the authentication server. The robot follows the head and arm movements of the operator, providing easier operation than with a joystick. The built-in camera and microphone send video and audio from the location to the operator, allowing for the possibility of real-time communication using conversation as well as gestures.

National Institute of Advanced Industrial Science and Technology / Intelligent System Co.,Ltd.
PARO

"Paro" is a seal-type therapeutic robot. It was developed for use by people who cannot keep pets or at facilities where animal-assisted therapy cannot be readily adopted. Unlike real dogs, cats and other animals that people are familiar with, a seal was chosen for Paro because they are not very well known to people, and the robot cannot be compared with a real seal. That makes it easier for people to accept the robot.

It has been confirmed through research and verification at many nursing care facilities and pediatric wards that robot-assisted therapy using Paro has the same effect as animal-assisted therapy.