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ITRI Demonstrates Two Cutting-Edge Technologies at CES 2017, Booth 2015: Intelligent Vision System for Companion Robots and Drone Fleet Management System

The Intelligent Vision System robot can play chess, pour coffee, and learn experientially; the ICT Solution for Drones can remotely control LTE-connected drones for fleet management

HSINCHU, TAIWAN -- December 8, 2016 – Industrial Technology Research Institute (ITRI), Taiwan's largest and one of the world's leading high-tech applied research institutions, today announced it will demonstrate two cutting-edge technologies at CES 2017: Intelligent Vision System for Companion Robots and ICT Solution for Drones. ITRI invites potential partners and attendees to [booth 2015](#), [Tech East, Westgate](#), to play chess and have coffee with a robot commanded by ITRI's Intelligent Vision System; and view the drone fleet management system enabling drones to be managed and charged from any distance.

ITRI's **Intelligent Vision System** enables robots and other machines to interpret the visual world, act on visual information, and learn from experience. The Intelligent Vision System can be applied to consumer and industrial requirements and delivers the following technology breakthroughs:

- **Intelligent Vision Technology and Developmental Learning Position Detection for perception of objects:** In ITRI's companion-robot demonstration at CES 2017, the robot is able to distinguish between various chess pieces and their locations; and between various

coffee cups, their locations and fill levels.

- **Smart Grip Technology for interaction with objects based on perception:** In addition to perceiving different objects based on size, shape, color and location, ITRI's Intelligent Vision System enables a robot to grip, move and interact with the objects, while avoiding collisions with other objects. In the CES 2017 companion-robot demonstration, the robot is able to play chess with attendees and fill coffee at various fill levels while the coffee cup is at random locations.
- **Deep learning:** The Intelligent Vision System enables a robot to adapt to changing conditions and act accordingly. Unlike most current robots that are programmed to repeatedly perform a specific task at a specific time and location, robots equipped with ITRI's Intelligent Vision System can change their behavior and perform tasks based on random events and requirements. In the CES 2017 chess demonstration, the robot must evaluate the random moves of its human opponent and move its chess pieces according to its current abilities. It learns to play chess better by experience, similar to the way humans do. In the coffee-filling application, the robot continually improves its ability to fill coffee cups of various sizes at random locations within its range.

ITRI's **ICT Solution for Drones** delivers world-leading ability to control more than one LTE-connected drone from one fleet management system; to integrate the operation of multiple drones; and unlimited range even across continents via LTE, a vast improvement over current remote control ranges of under seven kilometers within visual line-of-sight. Its potential applications include aerial photography; security patrol; solar panel, wind turbine, and power line inspection; landslide inspection; and transport.

ITRI's **ICT Solution for Drones** includes three components:

- **Remotely-Operated Autonomous Drone (ROAD)**, which can engage in intercontinental out-of-sight operation throughout the world using LTE. The ROAD features a fail-safe communications system that includes disconnection recovery; three control channels (cellular network, 2.4 GHz remote control, and 915 MHz long-range telemetry); emergency

handover between control channels; emergency landing capability; the ability to fly away from LTE dead zones. An Intelligent multiple-flight fleet management system integrates drone flight data and three streaming cameras; allows the user to select the drone to control; and simultaneously displays the positions of all drones on a map.

- **Tribrid Real-Time Streaming for Drone:** A heterogeneous video multi-streaming gateway architecture simultaneously provides hybrid data streaming of three cameras: first person view (FPV) over LTE; 30x optical zoom high-definition eagle-view surveillance; and a thermal camera for inspection and night vision.
- **Super Range:** In addition to intercontinental remote operation over LTE, the ROAD can operate one month off-grid with an autonomous recharging system, which includes an automatic stabilized landing stage; a charging safety subsystem monitor; support for versatile power sources such as a highly efficient direct methanol fuel cell (DMFC) power module, regular power line, or DC sources from solar cells or other generators; and an additional buffering system for continuous and stable charging supply for the drone.

"We are looking forward to demonstrating at CES 2017 two of our leading technologies in vision systems and drones, which are important trends in consumer and industrial markets," said Dr. Ming-Jer Kao, Deputy General Director of ITRI's Electronic and Optoelectronic System Research Laboratories. "ITRI's Intelligent Vision System has many potential applications for companion robots that can assist seniors, families and individuals, while our ICT Solution for Drones is a promising drone fleet management system, which can operate across continents and off-grid for extended periods."

Other innovations that ITRI will exhibit at CES 2017 include **Portable Sanitizer**, which can sterilize cutlery and kill germs in 90 seconds with UVC LED light; **Intelligent Lighting System** that is based on the IPv6 standard to provide bespoke lighting solutions such as VLC indoor positioning services and human-centric lighting; **itri-patch**, a smart sensor that can detect when a person falls or wanders off and connect to an alert system; **USBsync**, a portable cloud storage and sharing device that allows one-to-many synchronous file transfers.

About ITRI

Industrial Technology Research Institute (ITRI) is one of the world's leading technology R&D institutions aiming to innovate a better future for society. Founded in 1973, ITRI has played a vital role in transforming Taiwan's industries from labor-intensive into innovation-driven. It focuses on the fields of Smart Living, Quality Health, and Sustainable Environment.

Over the years, ITRI has cultivated more than 140 CEOs and incubated over 240 innovative companies, including well-known names such as UMC and TSMC. In addition to its headquarters in Taiwan, ITRI has branch offices in the U.S., Europe, and Japan in an effort to extend its R&D scope and promote opportunities for international cooperation around the world. For more information, please visit <http://www.itri.org/eng>.

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