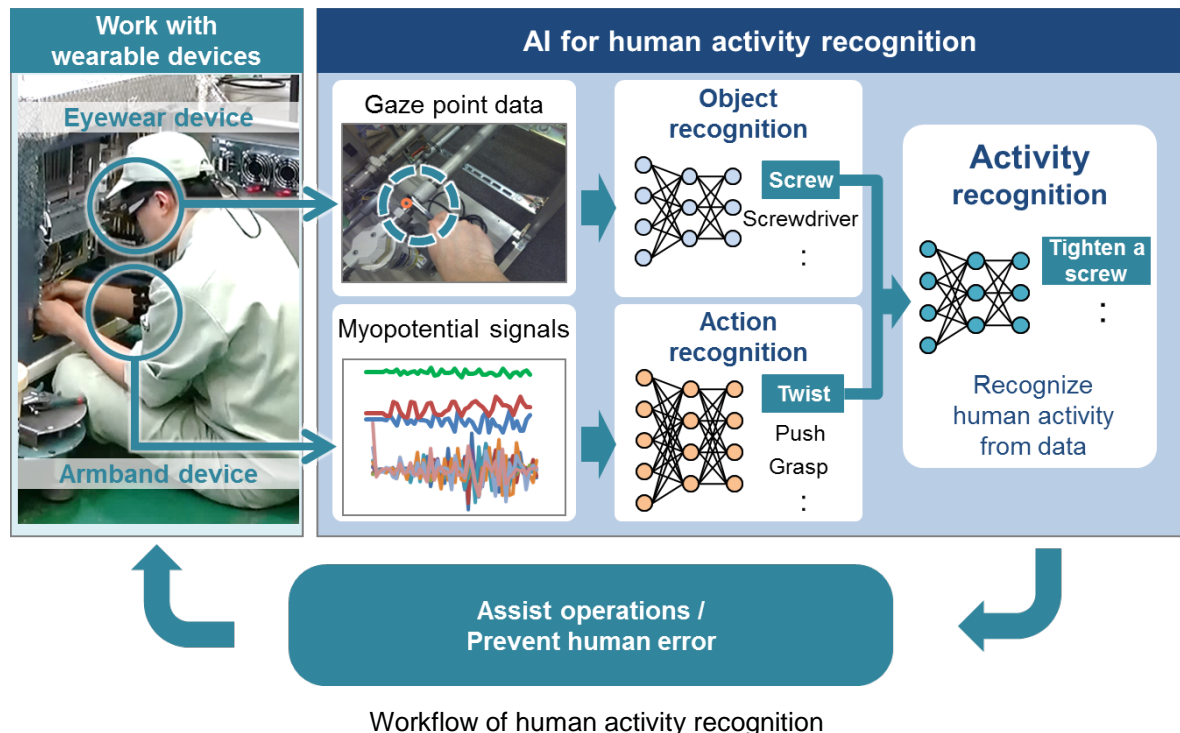


FOR IMMEDIATE RELEASE

**DFKI and Hitachi jointly develop AI technology  
for human activity recognition of workers using wearable devices**  
*With view to utilizing AI to assist operations and prevent human error in manufacturing*



**Germany and Japan, March 8, 2017** --- Deutsches Forschungszentrum für Künstliche Intelligenz (German Research Center for Artificial Intelligence, "DFKI") and Hitachi, Ltd. (Hitachi) today announced the joint development of AI (artificial intelligence) technology for human activity recognition of workers using wearable devices. The AI technology performs real-time recognition of workers' activities by integrating technology in eye-tracking glasses<sup>(1)</sup> to recognize gazed objects with technology in armband devices to recognize action. The recognition ability of each activity is achieved by having the AI understand the tools or parts used at the production site as well as anticipated actions through Deep Learning<sup>(2)</sup>. DFKI and Hitachi will use this newly developed AI technology to assist operations and prevent human error, to contribute to enhancing quality and efficiency on the front line of manufacturing.

In line with initiatives such as Industry 4.0<sup>(3)</sup> in Germany and Society 5.0<sup>(4)</sup> in Japan, the manufacturing industry is accelerating steps towards innovating production using

AI and robotics, and the automation of menial tasks. At the same time, IoT technology is being called for to collect and recognize the condition or movement of all things, including people and equipment, to assist in operations and prevent human error. As a result, in recent years, monitoring systems using cameras have been developed for predictive diagnosis of inappropriate worker movement or equipment failure in production lines.

Researchers from the DFKI research department, Smart Data & Knowledge Services and Hitachi developed AI for human activity recognition to recognize the activity of workers using various data collected through the wearable devices, not image data from cameras. Features of the AI developed are as below:

**(1) Technology to recognize gazed objects by using eye-tracking glasses**

This technology is to recognize targeted objects like “screw” or “screwdriver” without being disturbed by its surrounding environment such as background or other objects. This technology extracts the data of gaze points from the movements of eyeballs of workers who wear the eye-tracking glasses and utilizes the image recognition technology by Deep Learning.

**(2) Technology to recognize basic human actions through armband device**

This technology is to recognize basic human actions that require arms movements such as “twist” or “push”. This technology extracts the data relating to body actions from the microscopic and instantaneous signals that are measured by sensors attached to the arms.

**(3) “Hierarchical activity-recognition model” that recognizes workers’ activities by integrating gazed objects and human actions**

This technology integrates the two technologies mentioned above to develop “hierarchical activity-recognition model”, which is to recognize activities such as “twisting a screw.” As a result, recognizing a variety of working activities is capable if all the actions and objects involved in the activities are learned in advance.

Based upon these technological developments, the AI technology that can recognize activities such as “twisting a screw” or “pressing a switch” as part of “inspection task” in real-time was realized. DFKI and Hitachi will advance the technological development for assisting operations and preventing human error on the front line of manufacturing, where operation guidance and inadequate action detection are required, by utilizing this newly developed AI.

DFKI and Hitachi will exhibit a part of this technology at “CeBIT 2017”, a leading global exhibition of digital business to be held from 20-24 March 2017 in Hannover, Germany.

- (1) Eye-tracking glasses: A glass-type device to record first-person-view and eye movement.
- (2) Deep Learning: A type of neural network learning method, marketing a mechanism of neural cells. Deep Learning is realizing a high recognition rate in vocal recognition, image recognition and so forth.
- (3) Industry 4.0: National strategic project by German Government, aiming to advance the manufacturing sector. It is also referred to as “Fourth Industrial Revolution”.
- (4) Society 5.0: Activities related to the realization of a shared vision for a "Super Smart Society" where the cyber space and the real world (physical space) are intricately connected. The naming describes a new type of society that will be led by innovations in science and technology, following on from hunter-gatherer, pastoral-agrarian, industrial and information.

### **About DFKI**

The German Research Center for Artificial Intelligence (DFKI), with sites in Kaiserslautern, Saarbrücken, Bremen (with an associated branch in Osnabrück) and a project office in Berlin, is the leading German research institute in the field of innovative software technology. In the international scientific community, DFKI ranks among the most recognized "Centers of Excellence" and currently is the biggest research center worldwide in the area of Artificial Intelligence and its application in terms of number of employees and the volume of external funds. The financial budget in 2015 was 42,5 million Euro. DFKI projects cover the whole spectrum from application-oriented basic research to market- and client-oriented design of product functions. Currently more than 478 employees from 60 countries are conducting research focusing on Smart Data & Knowledge Services, Cyber-Physical Systems, Multilingual Technologies, Plan-Based Robot Control, Educational Technology Lab, Interactive Textiles, Robotics Innovation Center, Innovative Retail Laboratory, Institute for Information Systems, Embedded Intelligence, Smart Service Engineering, Intelligent Analytics for Massive Data, Intelligent Networks, Agents and Simulated Reality, Augmented Vision, Language Technology, Intelligent User interfaces, Innovative Factory Systems. Impact: more than 98 professorships of former DFKI employees, and 70 spin-off companies with approximately 2,500 highly qualified jobs. <https://www.dfki.de/web>

### **About Hitachi, Ltd.**

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, delivers innovations that answer society's challenges. The company's consolidated revenues for fiscal 2015 (ended March 31, 2016) totaled 10,034.3 billion yen (\$88.8 billion). The Hitachi Group is a global leader in the Social Innovation Business, and it has approximately 335,000 employees worldwide. Through collaborative creation, Hitachi is providing solutions to customers in a broad range of sectors, including Power / Energy, Industry / Distribution / Water, Urban Development, and Finance / Government & Public / Healthcare. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

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