

Axis network cameras contribute to Sensing Web Project, a research project on the next generation of sensor systems. Pioneer project aims to increase privacy protection in image recognition and processing of surveillance society.



Organization:
Sensing Web Project
(Kyoto University)

Location:
Sakyo-ku, Kyoto, Japan

Industry segment:
Education

Application:
Research and develop-
ment

Mission

Recently, security cameras and other sensors have been installed in various locations, and information obtained from these devices have begun to be used in many ways. For example, just like being able to see traffic congestion by viewing footage from cameras on the Internet, there are ways to utilize information from cameras and other sensors for uses beyond mere security. On the other hand, there is the problem of how to keep the privacy of those individuals filmed in consideration, since people's faces and bodies can be seen from visual data coming straight from the camera. For this reason, use of information from sensors and security cameras is typically limited to the building/property management companies that installed the cameras.

The Sensing Web Project was started for a more multi-faceted utilization of information from cameras and other various sensors. The theme of this project is to realize the publication and use of data from sensors in a way that does not violate any individual's privacy, by removing information regarding privacy in real-time as it is recorded.

This was a large scale research project that was implemented with assistance from the Ministry of Education, Culture, Sports, Science and Technology of Japan over a 3 year period from April 2006 to March 2010, with the participation of Kyoto University, Wakayama University, Osaka University, the University of Tsukuba, Kyushu University, Toyohashi University of Technology, Nagoya University, and Kyoto Sangyo University.

Solution

Among the various sensors, visual data from cameras is most prone to privacy issues because it contains information about individuals' figures. Technologies used for the removal of private information in visual data became an important topic of research in the Sensing Web Project. Making full use of technologies for image recognition/processing, private information contained in the visual data will be converted to numerical or symbolic data (such as whether or not people are present and the number if any are present) when recorded.

"Axis network cameras have detailed settings, and the API is open so program development was easy. Axis products are highly compatible with products from other companies, and were my preferred choice as a research developer."

Ikuhisa Mitsugami, Researcher, Kyoto University.

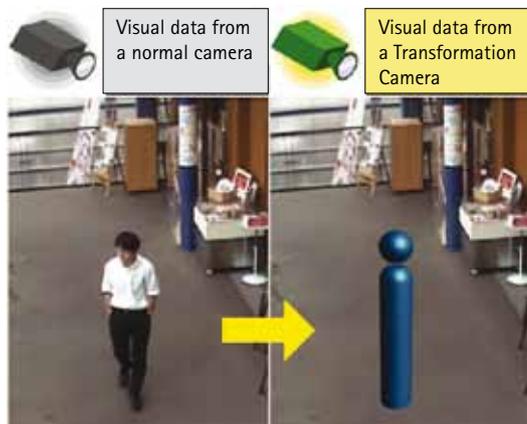
The technology of visualizing people's figures as icons and numbers using this technique is called the "Transformation Camera". The Transformation Camera analyzes captured visual data, generates a background image, and shows icons in place of people on the generated background. The Transformation Camera can protect individuals' privacy because it enables the user to see the number of people and where they are, but it does not show the actual images of the individuals.

Not only are cameras used, but microphones that record people's voices, cell phones, and IC cards are also widely used. The ultimate goal of the Sensing Web Project is to implement privacy protection processing in these sensors and tags, and change all types of sensors to "safe sensors".

By changing all sensors to "safe sensors", usage and viewing of sensor data would be open for all. However, if the format for sensor data is different according to type and specification of each sensor, it would be harder for the user to view and use this information. Therefore, this project discusses the format of data distribution and description for "safe sensors" from the standpoint of network technology and software design, and developing technologies.

Results

Even if all the sensors in the world were made into "safe sensors", this would be meaningless if there was no benefit to viewing/using the data obtained from sensors.



In this project, various universities and research institutions propose and implement applications so that people will better understand these benefits. Some examples of applications are the "Festivity Map" that shows congestion in each area on a 2-dimensional map, the "Digital Diorama" that shows people, their positions, and their movements in a building in 3D computer graphics, and "See-through Vision" that shows supplementary visual data taken by a separate camera of what is beyond/beneath obstacles.

"Technology to attain information about the real world by using cameras and other various sensors while protecting privacy", which this project developed, and the new sensor network that will be realized because of this technology have been named "eye-i-net", and the research activities and social experiments of "eye-i-net" have been promoted.

Future of the project and experiments in commercial facilities

In 2009, and with the cooperation of commercial facilities in the city of Kyoto, a large-scale sensor networking system, "eye-i-net" was established in the facility, and experiments over a six-month period. 20 AXIS 211 Network Cameras and 14 AXIS 243SA Video Servers were installed within the system. Surveys were collected from the general population regarding people's opinions and thoughts after experiencing "eye-i-net".

In the future, along with analyzing the survey results, the plan is to take the legal opinion of those in the field of law into consideration and sum up research results (not only technical but also incorporating operational aspects) to create a base for practical application.

"We have spent roughly a year analyzing visual data for this experiment. In practical use, it will be possible to conduct real-time analysis with chips built into the cameras. An information society can transform into a surveillance society if we're not careful, and so we plan to continue our research in search of a sensor than can be used in a healthy way as a base for society," said Michihiko Minoh, Professor at Kyoto University.



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Sensing Web Project
Content Engineering for Social Use of Sensing Information
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