

Instructor Name	Yoichi Sato, Professor	Laboratory Location	Institute of Industrial Science	Research Area	Computer vision
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We are working on various research topics in the field of computer vision by leveraging pattern recognition and computer graphics technologies, toward the main goal of improving interfaces between humans and information systems in the real world.

Lab URL <http://www.hci.iis.u-tokyo.ac.jp/>

1. Collective Visual Sensing for sensing and understanding group activities

We are actively studying computer-vision based technologies to enable the real-time sensing of human activities in the real world and to understand human behavior, as well as their use for various applications. In the real world, people can easily understand how others behave and what they are doing through the observation of their behavior. It is not easy for computers to do so, however. When we simply say "human behavior," it includes a diversity of cues, such as the location of people, body and hand gestures, facial expressions and gazes. Our lab has developed a number of techniques for sensing human activities based on these cues. We recently started a collaborative project with other groups from Japan, Germany and United States. The project aims at developing technologies, which we call **collective visual sensing (CVS)**, to understand group attention and activities by analyzing information gathered from multiple wearable devices, such as wearable cameras and eye trackers. In particular, the project will focus on: (1) developing technologies for extracting measurements through the use of collective visual sensing, (2) developing technologies for understanding group activities and intent, and (3) building assistive systems based on developed technologies for various applications such as supporting collaborative work in an operation room.



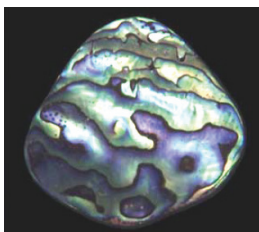
First person views captured by a wearable camera



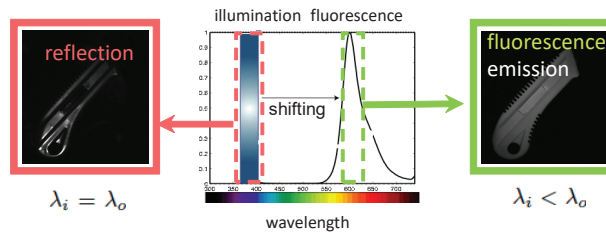
Supporting collaborative work with CVS

2. Reflectance analysis

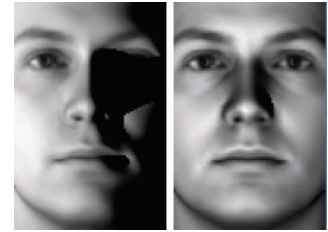
An image taken by a camera captures a distribution of light rays in the real world. The image is generated from interaction among three elements: light sources emitting light, objects which reflect, absorb or refract light, and an imaging sensor measuring incoming light energy. As opposed to computer graphics dealing with a forward process of rendering images, reflectance analysis in computer vision tries to solve the inverse process of rendering. In other words, given an image, we try to figure out under what lighting condition, an object of what shape and what reflectance property exists in the scene. Our past and current research projects on reflectance analysis include learning and synthesis of object appearance under complex illumination, fast spectral reflectance imaging, separation of fluorescent components and its applications, and illumination invariant face recognition.



Learning and synthesis of appearance under complex illumination



Separation of fluorescent components and its applications



Illumination invariant face recognition

We are working on various projects on the above mentioned topics in close collaboration with other groups both domestic and overseas. We welcome individuals who have flexible ideas and intellectual curiosity and who enjoy conducting research in an active manner. We are actively looking for talented students from outside Japan. Please do not hesitate to contact Yoichi Sato (ysato@iis.u-tokyo.ac.jp) if you have any questions or to arrange a lab tour.