Image and Multimedia Processing

Image and multimedia technology is expanding into two directions: one is big data processing and the other is human centric computing. Specific issues and technical problems are diverse. The below are brief description of our current research issues. The entire members of our laboratory are 1 professor, 2 associate professors, 1 lecturer, 2 research associates, 13 PhD students; 21 master students, and 12 undergraduate students. Questions are welcome. Send them to aizawa@hal.t.u-tokyo.ac.jp. Our Web page https://www.hal.t.u-tokyo.ac.jp

1. **Fundamentals: Image Recognition**
   Deep Learning accurately works for closed dataset containing large number of data per class. However, in reality, unknown classes and new classes with small amount of data frequently appear. We are investigating identification and recognition techniques for such open world situation. We are investigating effective methodology for noisy training data, out-of-distribution detection, positive-unlabeled learning, open-set data learning, representation, sequential learning framework, uncertainty estimation etc.

2. **Multimedia Life Log Technology: FoodLog**
   We have been pioneering life logging technology. Starting from generic purpose lifelogging, we now pursue specific purpose lifelogging. We focus on research on capture and analysis of our daily food logs (FoodLog). Using the smartphone app we developed, food records we captured exceeds 10 million. We are investigating various processing of FoodLog data, such as perosonalized food recognition, recipe and food record multimodal analysis, development of a new tool for athletes and dietitians, prediction of healthy index, etc.

3. **Omnidirectional Video Processing**
   We are building "movie map" for walkers to explore in a city. Using omnidirectional street videos, we work on many different research issues such as hyperlaspe omnidirectional video, accurate SLAM, intersection detection of street videos, real-time route view generation based on user input, building database of automatically segmented video sections etc. We prototyped our first version MovieMap by which we can freely explore in a certain area in a city.

4. **Manga & Comic Processing**
   Manga, our unique culture, is our research target, which has rarely been discussed in the field of image processing. They are binary monochrome images, and image processing methods developed for natural images do not work well for them. We are investigating image processing techniques such as retrieval, segmentation, recognition, colorization etc. We have built the world largest dataset of Manga available for academic use.

5. **Design, Interaction**
   We are investigating image technology for creation, retrieval of designs of fonts, products etc. We built Emotype - a mobile messenger in which we can express our emotions via different typo-graphics. We investigate social font search by multimodal inputs, user assistance for association search of fonts, font search across various languages, font generation using a small number of samples, etc. We also work on design of bags.

6. **Learned Image Compression**
   We are investigating new image compression techniques using deep learning. Although image compression is a long traditional area of signal processing, a lots of research issues exist. Learned compression makes ultra low rate coding possible. We investigate new bit assignment, quantization for learned compression, entropy estimation framework etc.