Humanosphere database and wood collections
- Aspects of computer vision wood anatomy -

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The database for the humanosphere (http://database.rish.kyoto-u.ac.jp/index-e.html) consists of two types of data accumulated from research at our institute. One is the collection of wood samples and wood microscopic preparations maintained in the xylarium; the other is the collection of digital data related to the humanosphere. These electronic data are already open to the public via the Internet. In the decade, we have been looking for the way to make wood collections more accessible, and found that microscopic image database could be an excellent resource for AI-aided wood identification and anatomy. In this presenttion, we would like to discuss about the potentials and future perspectives of our new database.

There are two ways to realize wood identification by computer vision. One is a conventional pattern recognition procedure, sometimes called "shallow learning" in comparison to the word "deep learning". In this process, man-designed features are used for classification. Our first approach using GLCM/Haralick parameters was targeted for identification of CT image (Kobayashi et al, 2015) and integrated software was developed (Sugiyama & Kobayashi, 2016). The similar approach was extended to study stereo-micrographs (Kobayashi et al, 2017). Regarding the optical micrographs, the features that are more modern, rotation-, scale-invariant, such as SIFT was found more promising in identification as well as in quantification of anatomical similarity and dissimilarity (Hwang et al, 2017).

The second approach is the "deep learning". In this case, the machine designs and optimizes the feature extractors to execute classification, and learn species characteristics by itself. This algorithm calculates lots of features from hierarchical image layers, which means that features are considered from fine texture to coarse shape from an image, as human brain does. As this method is excellent to achieve high accuracy of identification, understanding what computer vision looks seems more interesting and challenging.

Fig 1 Microscopic images from our Wood collections are now used in AI-based wood identification. The micrograph database will be open to the public from our repository in the near future.

References
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