

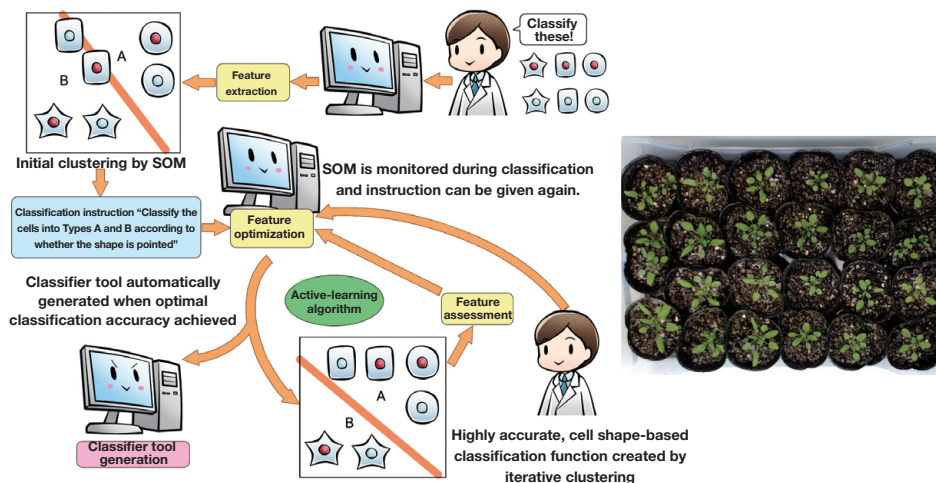
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Purpose of Research

The active learning software of the present study can automatically classify bioimage data to achieve “amateur-friendly agriculture,” by converting a wide spectrum of skills and hidden knowledge of proficient farmers to standardized objective data. Growth management of agricultural plants (e.g. seedling selection) has been a labor-intensive task of proficient farmers. In their place, the present software, which has learned from their “skilled eyes,” can achieve standardized growth management, labor-saving, improved productivity, and a higher level of quality control. When combined with a portable imaging device, it also allows remote growth management. The present software does not limit itself to images of certain organisms, making it a versatile tool for the rationalization of the production/distribution of agricultural and fishery products.

Summary of Research

Humans (even infants) can identify the items of a sample group which are different from the others even though no selection criteria has been set, something conventional learning software cannot do well. Our “active learning” software automatically classifies any kind of bioimage data, like humans do. Once given a small amount of “training data,” it iterates analysis of this data and learns the standards of “professional skills” and “skilled eyes” so as to classify any bioimage, whatever animal, plant, or cells. This is an outstanding feature not found in conventional systems and software.



Automatic growth monitoring system: automatic image recording of a cultivation shelf by a Web camera, automatic image upload, and image analysis by a remote PC

Comparison with Conventional or Competitive Technology

Conventional image analysis requires separate software for each type of object and a lot of “training data.” In contrast, our software

- operates without much training data;
- can be used for automatic classification of any kind of bioimage;
- is amateur-friendly and simple.

Expected Applications

- Smart management of agricultural and fishery production.
- Smart management of agricultural and fishery product distribution.
- Labor saving by remote monitoring.

Challenges in Implementation

- Customization/optimization for particular purposes and incorporation into systems if necessary.
- Acquiring patents for the above.

What We Expect from Companies

Proposal of new applications of the software. We can optimize/customize the software on request.

Points

- **Highly reliable growth management not dependent on high skill of the user**
- **Labor saving, simple growth management**
- **Widely applicable to all processes from production to distribution**

- Patent: JP04521572 “Cell evaluation method, cell measurement system, and cell measurement program” (basic patent of this method)
- Publication: “Active learning framework with iterative clustering for bioimage classification” Kutsuna, N. Higaki, T. Matsunaga, S. Otsuki, S. Yamaguchi, M. Fujii, H. & Hasezawa, S. Nature Communications 3, Article number: 1032 28 August 2012