

Advantages of hybrid image processing (image)

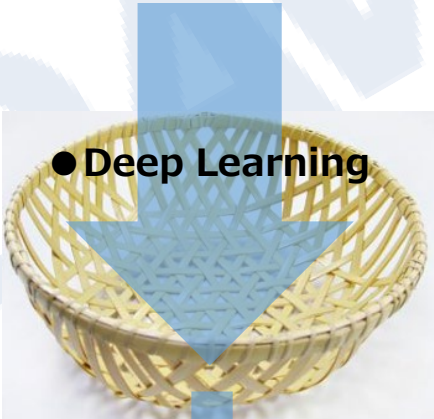
The inspection recipe setting (including numerical setting) is completed in overwhelmingly shorter time!



Mutual complement between deep learning X rule-based processing

Hybrid processing

Rule-based processing



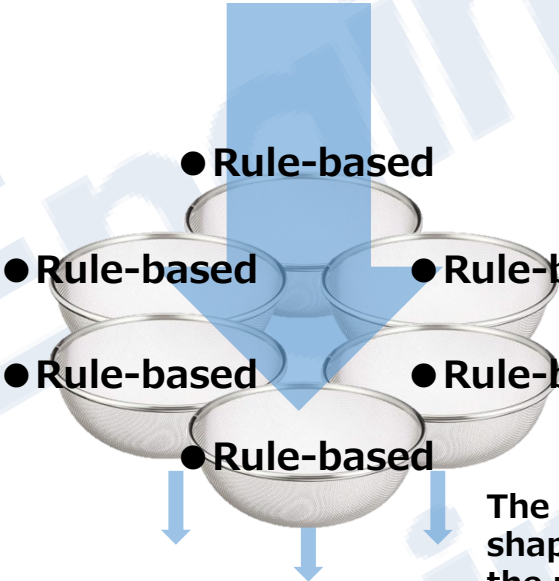
Deep Learning

Roughly sorts complex shapes by AI processing without detailed inspection conditions

Rule-based

Then detects only necessary portions by rule-based processing

The above are image diagrams. Reverse and parallel processing may be combined.



Rule-based

Rule-based

Rule-based

Rule-based

Rule-based

Rule-based

The more complex shape the object has, the more detailed conditions are required.

Advantages/disadvantages of respective image processing systems

DAVI HYBRID is a system which has realized mutual complement between the advantages and disadvantages of the deep learning and rule-based processing.

AI (deep learning) system

Rule-based (conventional) system

Advantage	<ul style="list-style-type: none"><li>- Easy setting and operation.</li><li>- Can easily process complex shapes.</li><li>- Can easily obtain information on position coordinate, mask region data, and area.</li></ul>
Dis-advantage	<ul style="list-style-type: none"><li>- Unclear indices and standards due to its black box style.</li><li>- Difficult to instruct in the intended direction, and can determine the numerical determination level only through training.</li><li>- Cannot set numeric thresholds (measures, areas, etc.).</li></ul>

Advantage	<ul style="list-style-type: none"><li>- Can control the determination level numerically (threshold)</li></ul>
Dis-advantage	<p>It is necessary to create rules for each assumed defect, which takes a lot of time.</p> <p>It is also more prone to excess detection.</p>



The above is generalized descriptions of the system. There are products to partially complement.

### ● Features of AI (deep learning) libraries adopted in **DAVI Engine**

(i) An overwhelmingly small number of learning samples  
(about 1/1000 or less)

(ii) High-precision image processing straight out of the RAW image

- ✓ No programming as required conventionally is not necessary; you have only to make it learn defects or features in an interactive manner. In addition, the result can be obtained in several tenths of the conventionally required development time.
- ✓ The human analytical approach used in this system enables detections as used to be very difficult by conventional image processing methods (ex. fray in cloth, scratch without contrast, and indistinct OCRed letters).
- ✓ While deep learning usually requires a lot of learning using big data, this library requires only several thousandths of the normal number of samples because **it learns by itself detecting the areas to perform feature extraction**. Therefore, it finishes learning in a shorter time.
- ✓ Can capture and process raw (uncompressed) images.

● Required sample qty. may vary

### ● Features of **DAVI HYBRID**

(i) Realized automatic recombination by tool blocking of the AI learning function

(ii) Can easily create inspection recipes by drag-and-drop operations of the tool block

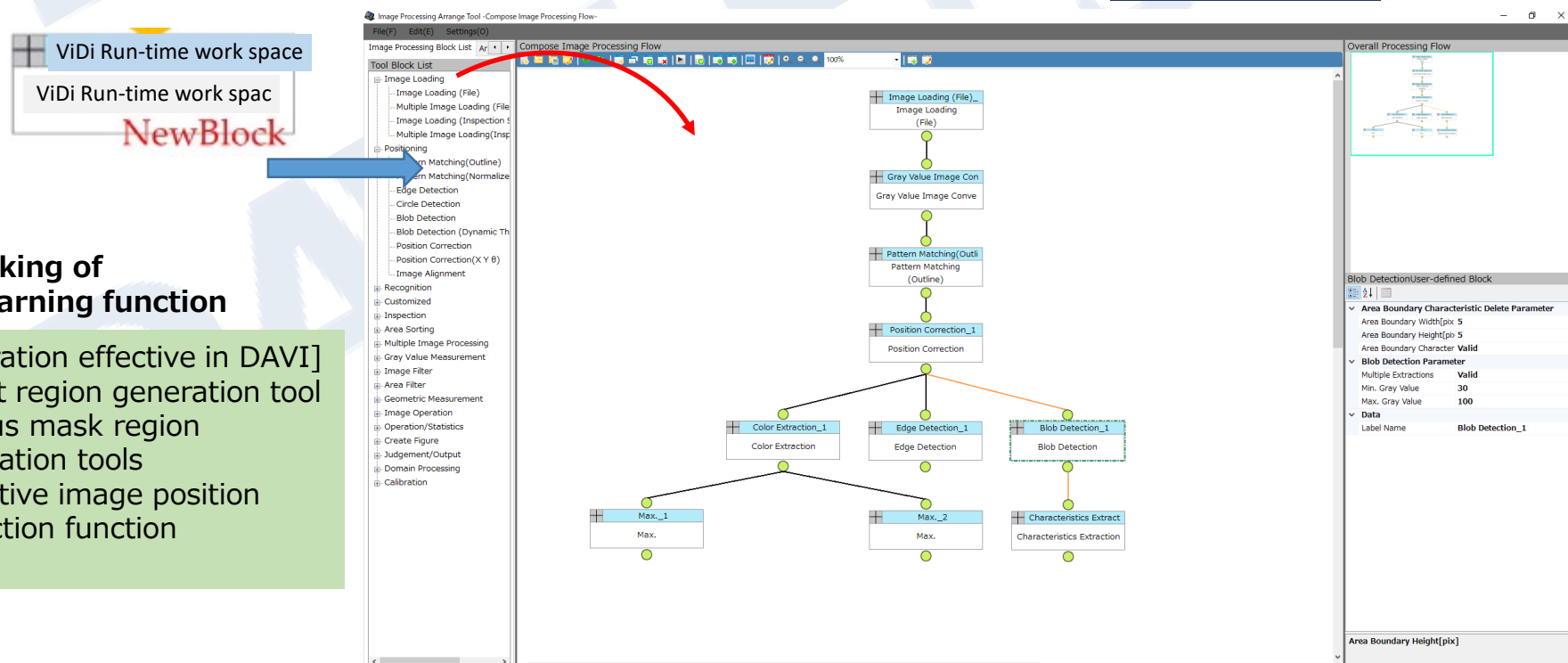
\* *Original recipe creation tool*

**DAVI Editor**

#### Tool blocking of the AI learning function

[AI operation effective in DAVI]

- ✓ Defect region generation tool
- ✓ Various mask region restoration tools
- ✓ Collective image position correction function
- ✓ Other



● The actual screen may be different.