Rux2000 Project "**Study Group on Machine Vision for Bio-production**"

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What is Study Group on Machine Vision for Bio-production (Bio-Vision)?

Today's technologies on machine vision for Bio-production have turned into an actual utilization stage such as many TV cameras in grading facilities, and contribute in bio-production field for laborsaving, informatization and traceability to keep safety and security of food. As our journals of JSAM and EAEF have shown so far, a lot of researches using machine visions have been reported: harvesting robots, autonomous vehicles, remote sensing, product inspection systems, monitoring systems and etc. It is expected that those researches may assist to solve problems in Japanese agriculture on aging of farmer, missing successor, low food self-sufficiency, worry about food and agricultural products. Because importance of machine vision in bio-production field is increasing and machine vision technologies have been spread widely, we raised this study project as a RUX 2000 project, JSAM in order to learn and exchange techniques on machine vision in bio-production and started an algorithm contest since last year (2009). Any researchers and students who are interested in machine vision in bio-production are welcome to join this Study Group.

Main objectives

There are two main objectives in this project as below.

1. To improve techniques on machine vision by exchanging information among members
2. To raise motivations of young researchers including students to study machine vision by holding study meetings and contests

Main activity

1. Algorithm contest of image processing for Bio-production
2. Study meeting

Algorithm contest of image processing for Bio-production (ALCON) will be held once in a year. An assignment about image for Bio-production is given and algorithms (exe. files) to solve the assignment are collected. Excellent two algorithms are selected as the best algorithms. **A study meeting is held on the date of JSAM meeting (Japanese Society of Agricultural Machinery)** and persons who received the best algorithm award explain the algorithms in the meeting. Participants in this meeting can learn programming techniques and knowledge on image processing in Bio-production.

2011 Algorithm Contest Guidance

1. Assignment

To create an image processing program for counting number of grains in images and for listing XY coordinate positions of them.

2. Explanation on grain images

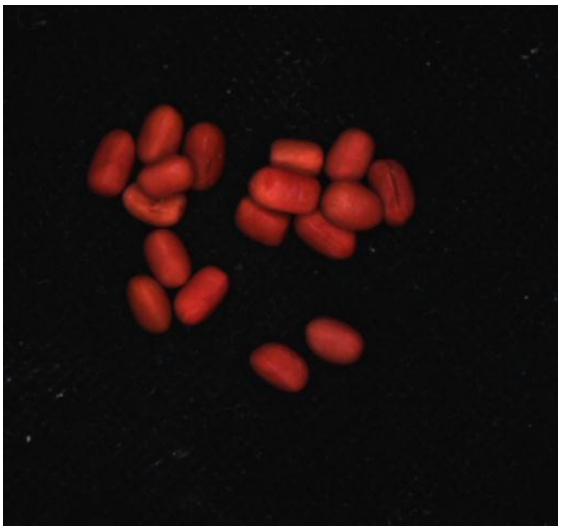
Grain varieties: polished rice, husked rice, red bean (*Azuki*), and soybean

Images were acquired by using white LED and a CCD color camera (VGA). Please pay attention below two points when creating algorithm:

1. **To exactly count number of overlapped grains, too**
   Some grains were overlapped, but **human can count all the grain numbers on image.** It is important to create an algorithm for handling the overlapped grains.
2. **To create algorithm to count four varieties of grains in one program**
   Although images of four different variety grains were assigned, single variety of grain is in an image. Make a program to count grain numbers of all four types of grains.

Four sample images of the four variety grains are below. First, make a program to count these grains by use of the images and send it to Tomoo Shiig, a contact person of this contest by e-mail. Competition will be conducted by use of the four images and **additional unknown 16 images (these images are opened at the study meeting)**. That means that created programs are supposed to **execute for 20 images.**

Download these sample images from following URL:
http://www.aptech.kais.kyoto-u.ac.jp/BioVision/2011E/down.html



Red bean (*Azuki*)

Soybean

Polished rice

Husked rice

3. Reviewing points

1. Accuracy of grain number counting
2. Accuracy of grain gravity center position (XY coordinate)
3. Processing speed (This point may be used in case of no difference observation in the above two points.)

4. About program

The algorithm is not required originality and you can modify or apply an existing algorithm to this contest. Submitted program (EXE file) should load one after another image file automatically when executed and should output a text file containing grain numbers, center positions of grains with 20 image file names.

Image format:

All color images are BMP format and have 512 x 480 pixels with 24 bit depth (8 bit each R, G, and B.). Number of images for reviewing algorithm is 20. Image names are given from "sample1.bmp" to "sample19.bmp".

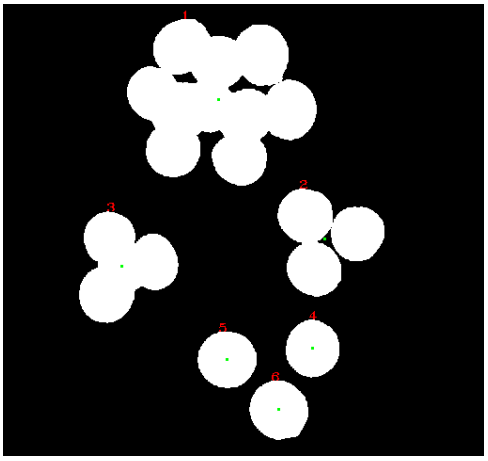
Output file:

In the outputted text file, image name, grain number and center position of grains should be described.

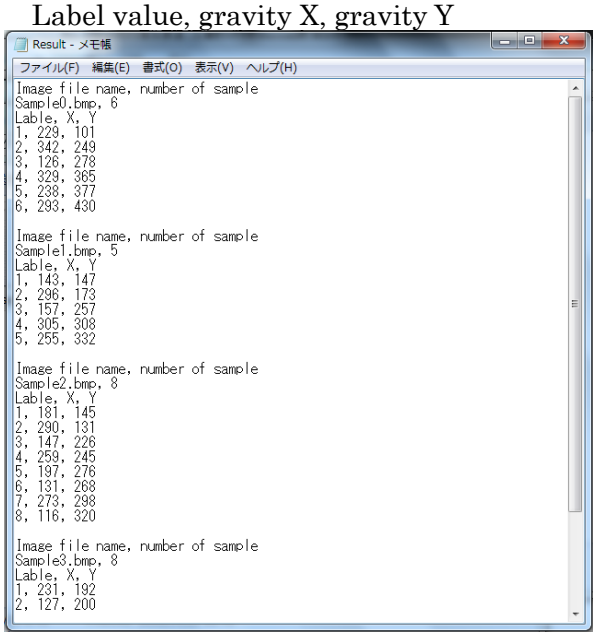
Directory name for output file is "C:¥your name".

For example)

Output image (White are indicates target object, red number is label value , green point is gravity position)



Text file
Name of image file, number of sample
Label value, gravity X, gravity Y



Result - メモ帳

ファイル(F) 編集(E) 書式(O) 表示(V) ヘルプ(H)

```
Image file name, number of sample
Sample0.bmp, 6
Lable, X, Y
1, 229, 101
2, 342, 249
3, 126, 278
4, 329, 365
5, 238, 377
6, 293, 430

Image file name, number of sample
Sample1.bmp, 5
Lable, X, Y
1, 143, 147
2, 296, 173
3, 157, 257
4, 305, 308
5, 255, 332

Image file name, number of sample
Sample2.bmp, 8
Lable, X, Y
1, 181, 145
2, 290, 131
3, 147, 226
4, 259, 245
5, 197, 276
6, 131, 268
7, 273, 298
8, 116, 320

Image file name, number of sample
Sample3.bmp, 8
Lable, X, Y
1, 231, 192
2, 127, 200
```

PC specification which will be used for reviewing algorithms
CPU: Core i5 2.4 GHz
Memory: 4 GB
OS: Windows 7 Pro
Make a program which is executable in this PC environment.

5. Deadline of submission

~~Deadline: 17:00, 29th (Fri.), July, 2011~~
Deadline: 17:00, 12th (Fri.), August, 2011
Submission files: Program (EXE file)
Document how to use program
Document for algorithm (please check exhibit paper)
Send **Tomoo Shiigi, contact person** through e-mail or post

6. Excellent Algorithm Awards

The following awards are given to excellent algorithms:

The best algorithm award (1 algorithm, highest score) certificate with 20,000 JPY.
Outstanding algorithm award (1 algorithm) certificate with 10,000 JPY.

7. Other Information

Notice

Authors of the programs can hold the copyright of the algorithms. Submitted programs are not used for other purposes. If the third party claim the damages or infringement of rights, authors must deal with the damages and infringement of rights by an own responsibility, and the organizer assumes no responsibility.

Schedule

Study meeting will be held during JSAM annual meeting. We will announce details (exact day and room) of the meeting after schedule determination. Determined schedules of ALCON and JSAM annual meeting are followings.

April 26th (Tue): Announcement of assignment
~~July 29th (Fri): Deadline of algorithm submission~~
August 12th (Fri): Deadline of algorithm submission
~~August 1st (Mon)-5th (Fri): Review period~~
August 15st (Mon)-18th (Thu): Review period
~~August 8th (Mon): Announcement of best algorithm awards~~
August 19th (Fri): Announcement of best algorithm awards
September 26th (Mon)-29th (Thu): Study meeting in JSAM annual meeting 2011 (Hirosaki University)

Agenda of Study meeting (about 1 hour during lunch time)

1. Awarding ceremony
2. Explanation of the best algorithm and outstanding programs
   (Persons who received awards explain algorithms by using PPT.)
3. Discussions

Contact person

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