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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

TECHNICAL WORKING PARTY ON AUTOMATION AND COMPUTER PROGRAMS

Thirty-Third Session
Natal, Brazil, June 30 to July 3, 2015

THE NEW PLANT VARIETY PROTECTION IMAGE ANALYSIS SYSTEM IN CHINA

Document prepared by an expert from China

Disclaimer: this document does not represent UPOV policies or guidance

1. The Technical Working Party on Automation and Computer Programs (TWC), at its thirty-second session, held in Helsinki, Finland, from June 3 to 6, 2014, received a presentation from China on "PVP Database in China", as set out in Annex II to document TWC/32/6. The TWC noted that the new software included modules for the management of applications, variety description database, data analysis and image analysis. The TWC agreed to request China to make a presentation on the particular features of the software, including image analysis, at its thirty-third session (see document TWC/32/28 "Report", paragraph 82).

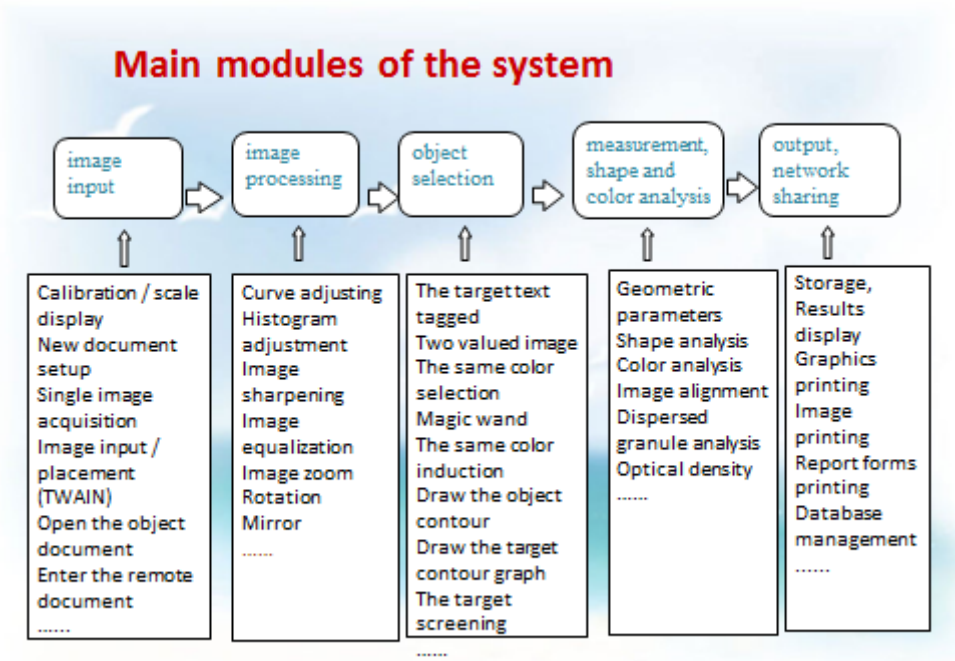
2. The Annex to this document contains a copy of a presentation on "the new plant variety protection image analysis system in China" that was made at the thirty-third session of the TWC.

[Annex follows]

Introduction

The image analysis system for agricultural new plant variety protection is one of the important components of crop computer analysis system (DUSP) for the protection of new varieties of agricultural crops.

It is mainly used for collecting the visual images during plant different growing stages and through computer image processing technology, the characteristics such as the plant shape, size, color value, color distribution were quantified, analyzed and matched, so as to help us carry out the new plant variety test or identification work more comprehensively, accurately and quickly.


Main modules of the system
image input
image processing
object selection
measurement, shape and color analysis
output, network sharing
Calibration / scale display
New document setup
Single image acquisition
Image input / placement (TWAIN)
Open the object document
Enter the remote document
.....
Curve adjusting
Histogram adjustment
Image sharpening
Image equalization
Image zoom
Rotation
Mirror
.....
The target text tagged
Two valued image
The same color selection
Magic wand
The same color induction
Draw the object contour
Draw the target contour graph
The target screening
.....
Geometric parameters
Shape analysis
Color analysis
Image alignment
Dispersed granule analysis
Optical density
.....
Storage, Results display
Graphics printing
Image printing
Report forms printing
Database management
.....


登录农业部植物新品种保护图像分析系统
农业部植物新品种保护图像分析系统
DUSP V1.0 T20120612-X1143
进入系统时启动色彩校正系统参数（推荐）？
请输入密码：
确定
取消
北京泰克仪器有限公司 (Beijing TECH Instrument Co., Ltd)

Image collection

The system has the feature of openness:

——support images catched directly from analogic vidicon, digital vidicon, digital camera, scanner, microscope (Biological or stereologic, etc.).

——support many image storage format, such as: .BMP,.JPG,.TIF etc..

Image processing

1. Image processing functions: image enhancement, histogram adjustment, curve adjustment, image stepless gray processing, image denoising (mean, median), edge sharpening, image filtering of any color, image restoration, negative image, two value image and the gray transformation, image screening, the extraction of contour and other functions.

2. Image transformation and editing functions: image zoom, rotation, mirror, clipping, Montage, repair, and filling etc..

3. Image adjustment functions: to adjust of brightness, saturation, coloration and contrast of real-time activity images, so as to reproduce a true image.

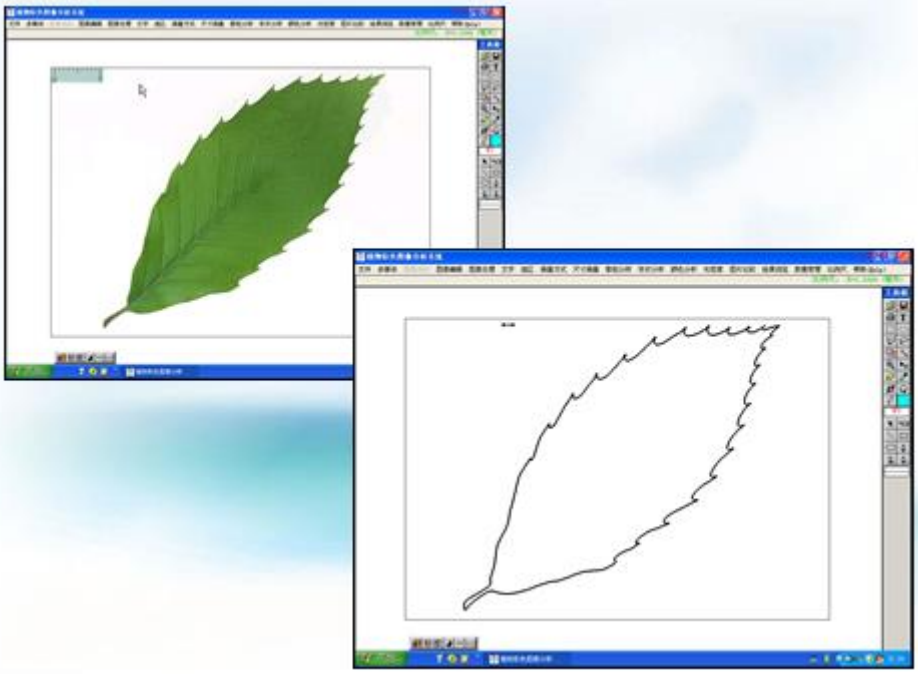


Image measurement

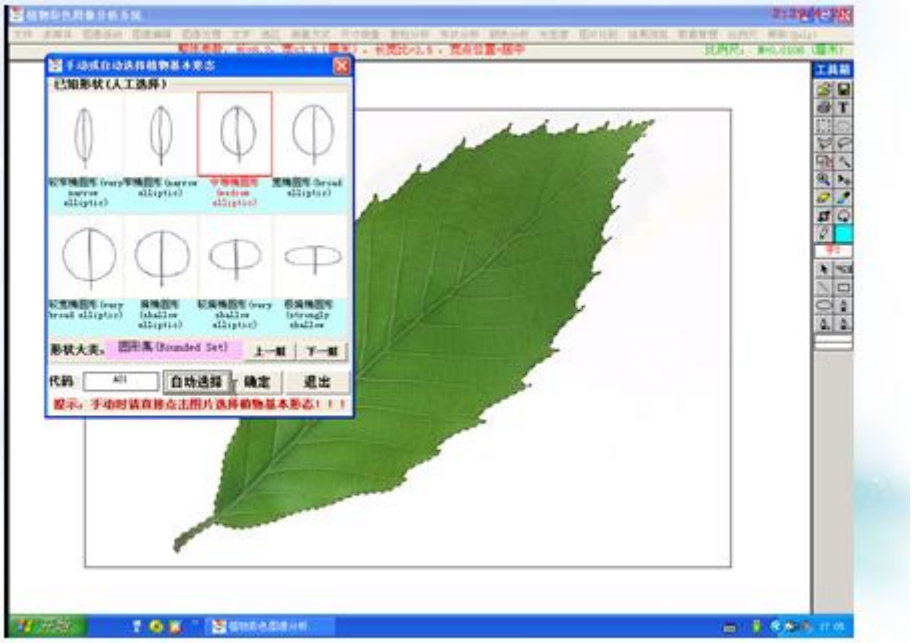
The measurement module provides measurements of the object as following:

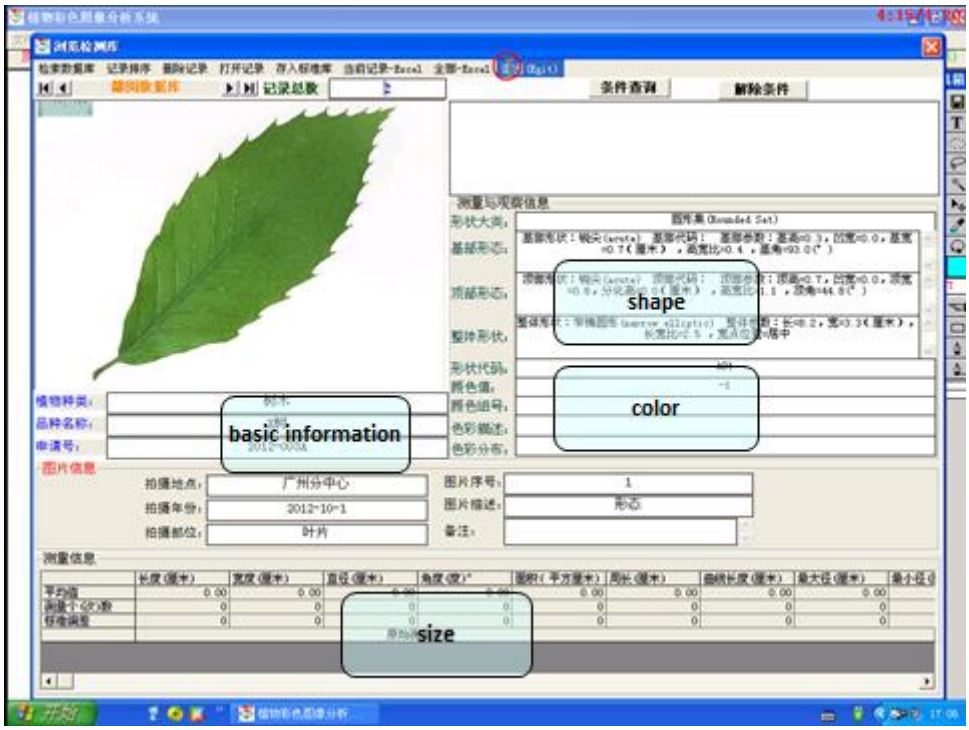
1. geometry parameters: length, width, angle, diameter, perimeter , length of any curved line, perimeter of any closed form, area and permeability.
2. shape parameters: maximum / minimum diameter, equivalent diameter, length width ratio, shape of leaf base and tip, classification of leaf shape.
3. granule parameters : total number, area percentage, target total area, covered area.
4. light density parameters: the average gray level, average transmittance, average optical density, integral optical density.

Image shape analysis

Based on measured parameters, the system also provides in electronic version the illustrations of the common shapes of four main types along with the subdivision graphs of each type.

After the measurement of the target through the software, by using man-machine combination, the description of the target shape could be automatically determined .
(this system also support manual selection and determination)

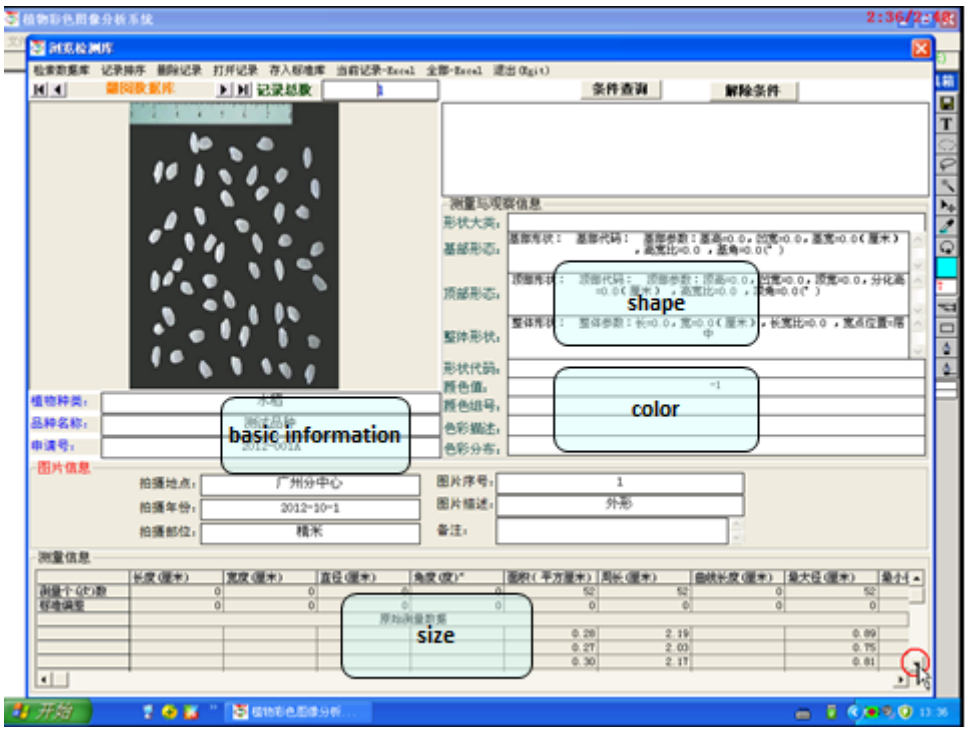



shape
color
basic information
size

Analysis of dispersed granule

With the purpose of measuring and analyzing the parameters of the granular targets; with a greater number , the system dedicated a dispersed granular analysis module, which could fulfill the one-time measurement of dispersed targets with a large number.

The measurable parameters include: the total number of granules, the geometry parameters of each granular, t he shape parameters, the area percentage, the target total area and the region area etc..



Using this software the lettuce seed area during germination were calculated and the related results were published in JXB
（SCI impact factor 6.019）

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This paper is available online free of all access charges (see http://jxb.oxfordjournals.org/open_access.html for further details)

RESEARCH PAPER

Involvement of reactive oxygen species in endosperm cap weakening and embryo elongation growth during lettuce seed germination

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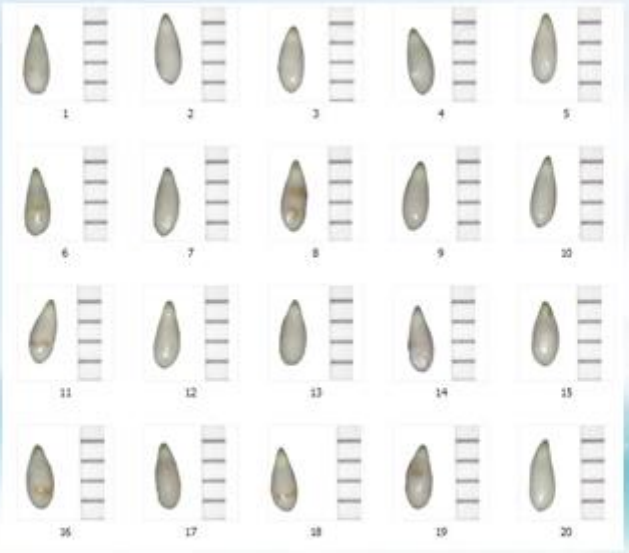
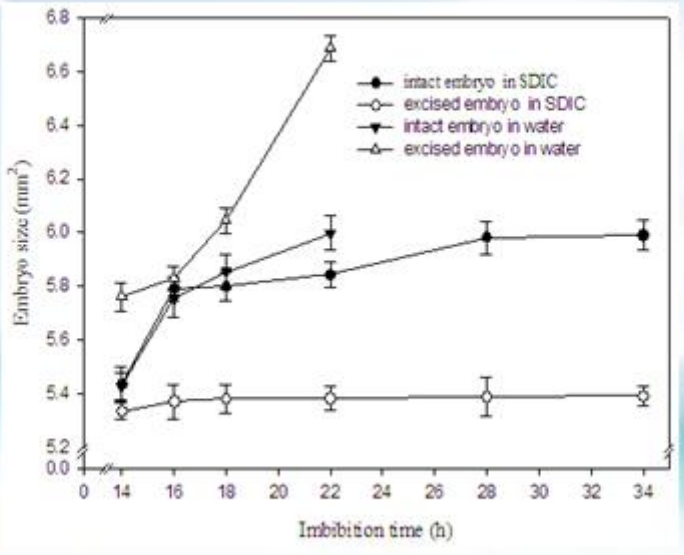



intact embryo in SDIC
excised embryo in SDIC
intact embryo in water
excised embryo in water
Embryo size (mm²)
Imbibition time (h)
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
0.0
0
14
16
18
20
22
24
26
28
30
32
34

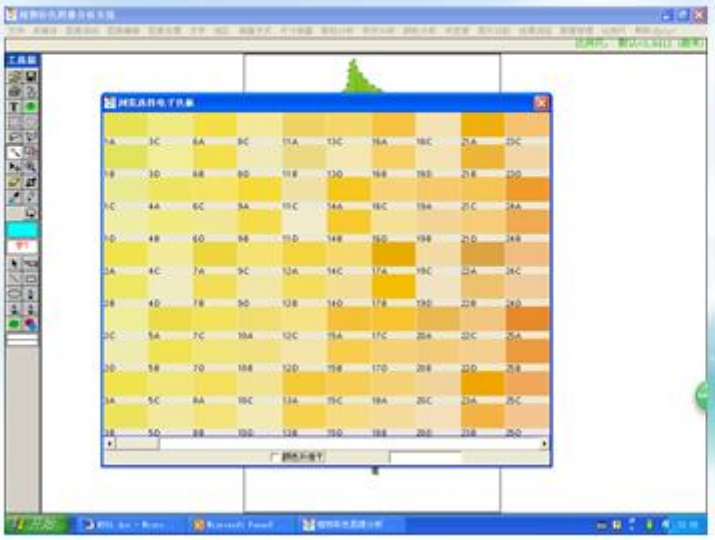
Analysis of image color

1. In this system, more than 800 kinds of color chart of RHS were collected and conducted a quantitative correction, which formed a standard digital color chart library.

2. After the target color is collected by the system, automatic alignment analysis with the standard color chart library was carry out and 6 most closed color chart were selected. (The system also accept manual selection, then the manual selection will be stored as the best fit color.)

3. Color distribution: the system has built-in 20 kinds of sketch maps of the common color distribution, the aligning results could be chosen and confirmed manually.

standard color chart library of RHS for color analysis

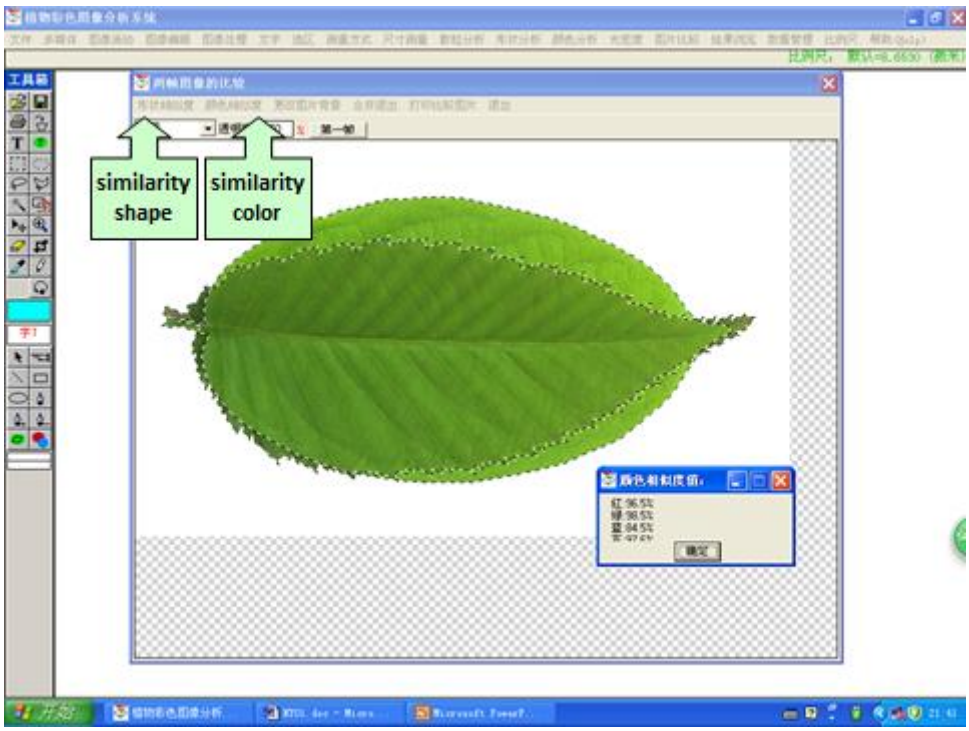


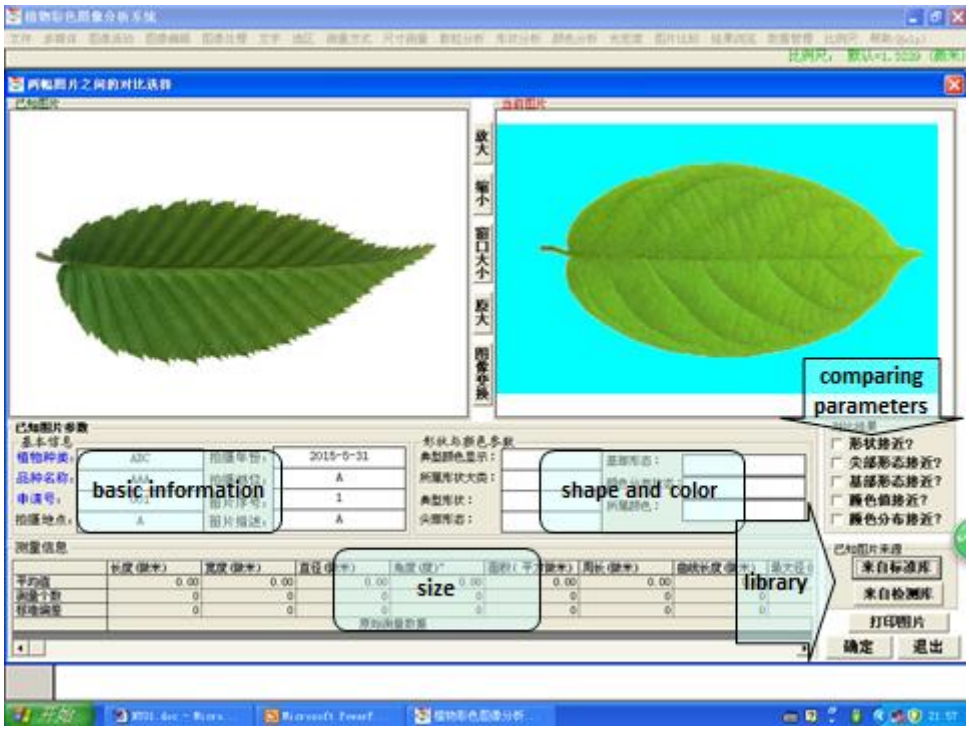
Automatic tests of color analysis

Image comparation analysis

The system provides two kinds of image comparation methods: single window overlay comparation and double windows comparation, which could achieve the fast comparison of two images of plant shape or color.

the single window overlay comparation can calculate the similarity coefficient of two images.

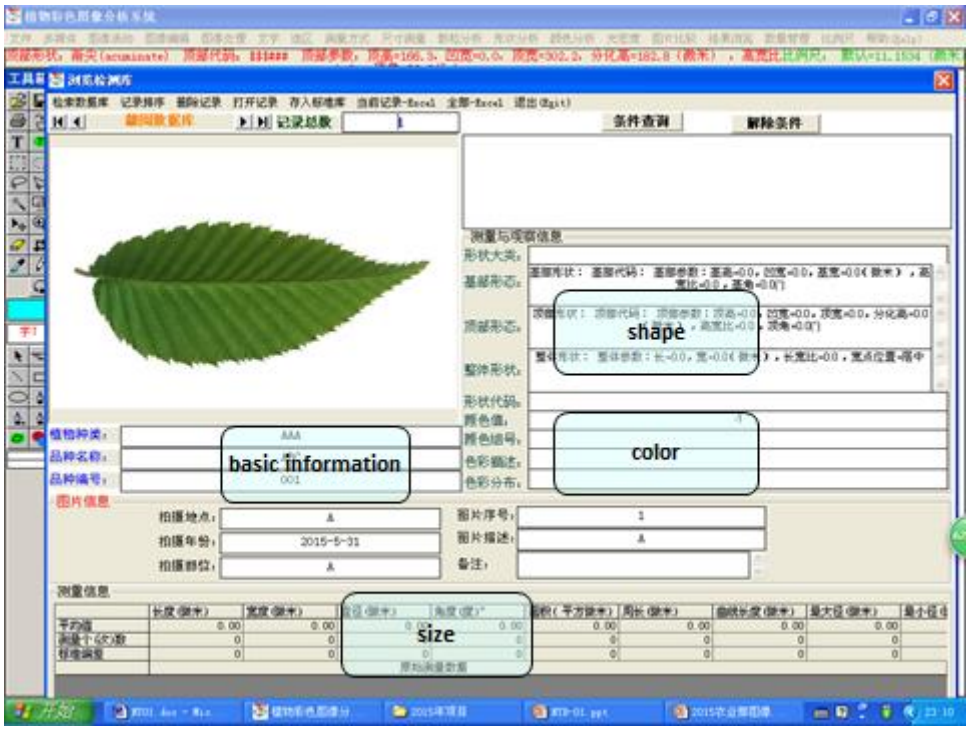

similarity shape
similarity color

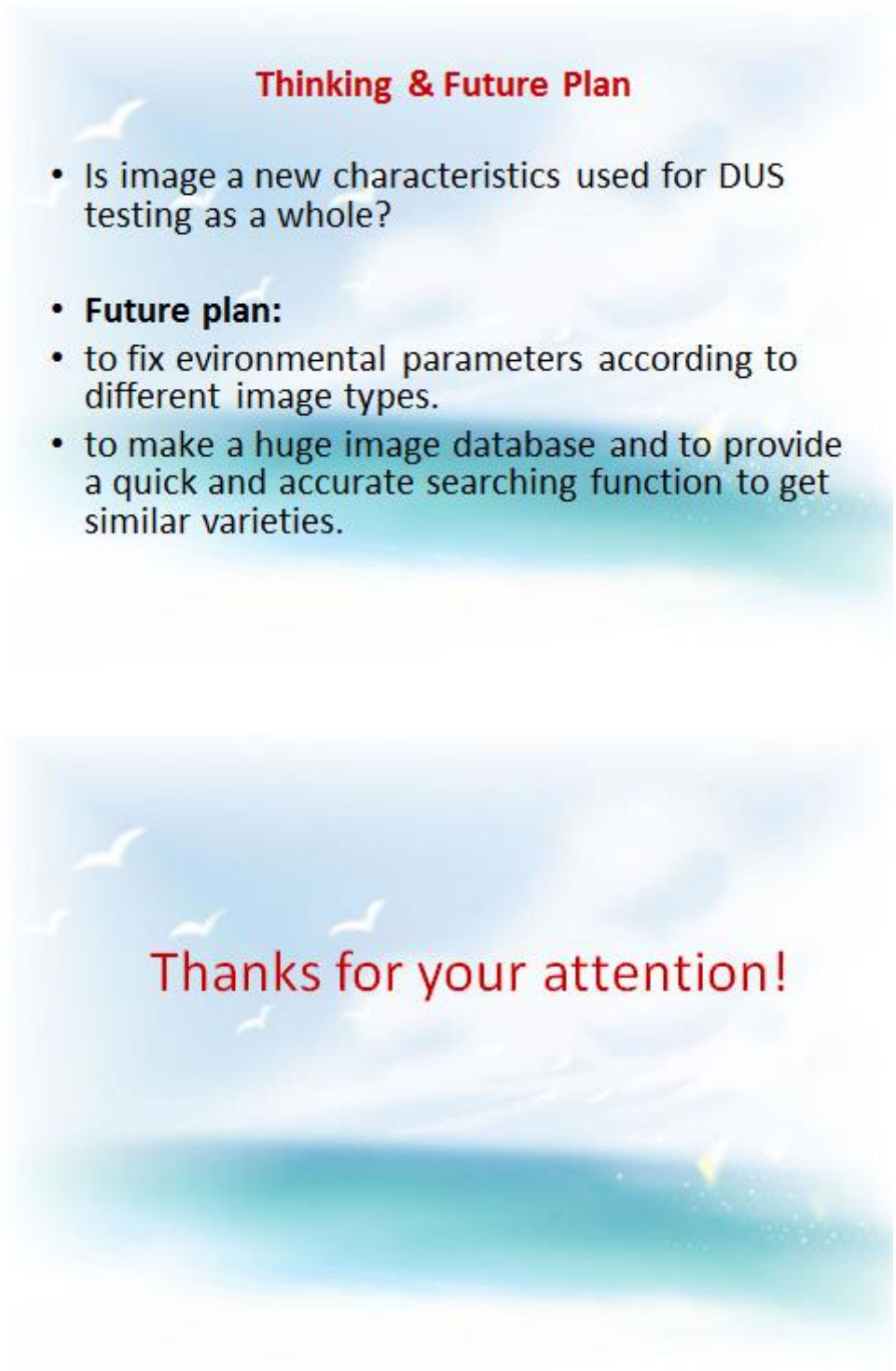

comparing parameters
basic information
shape and color
size
library

Management of data

1. All the data will be stored in a database provided by this system, and will be used for the purpose of archiving, retrieving, contrast analyzing. There are two kinds of database, named raw library and standard library.

2. All the data can be export to EXCEL for further calculation, analysis and data sharing, within the system there are a huge statistical analysis tools.





[End of Annex and of document]