UPOV

International Union for the Protection of New Varieties of Plants

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Technical Working Party on Automation and Computer Programs **TWC/39/7**

Thirty-Ninth Session
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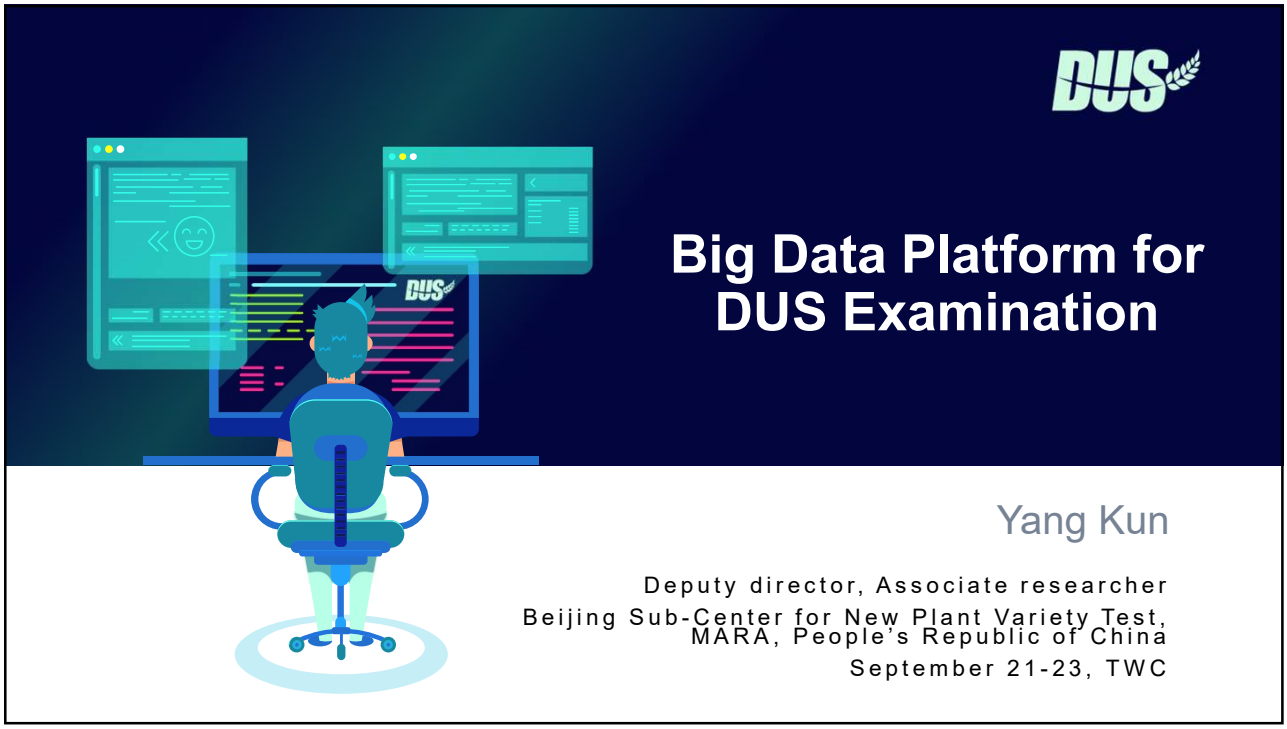
BIG DATA PLATFORM FOR DUS EXAMINATION

Document prepared by an expert from China

Disclaimer: this document does not represent UPOV policies or guidance

The annex to this document contains a copy of a presentation on “Big Data Platform for DUS Examination”, prepared by an expert from China, to be made at the thirty-ninth session of the Technical Working Party on Automation and Computer Programs (TWC).

[Annex follows]


DUS
Big Data Platform for DUS Examination
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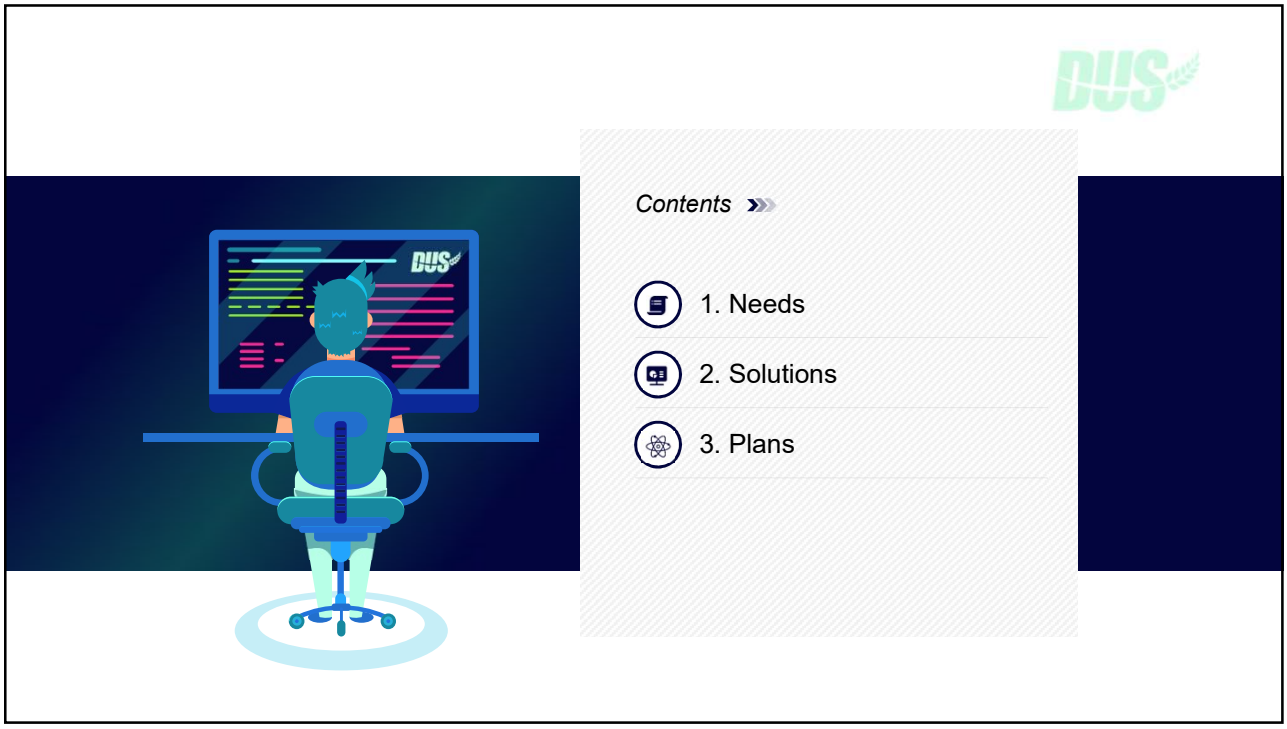
September 21-23, TWC


DUS
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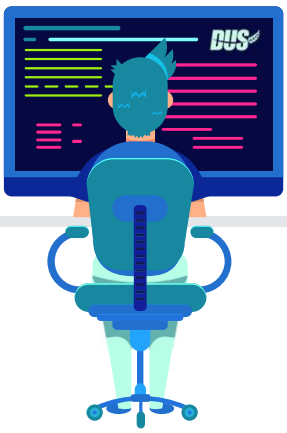
2. Solutions
3. Plans

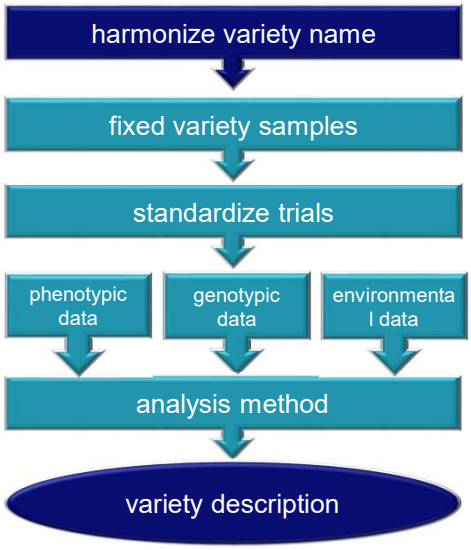
01 Needs

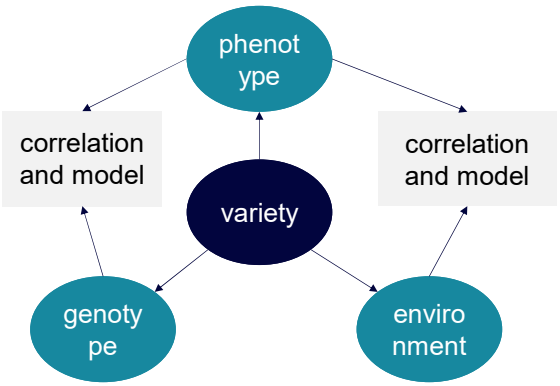


How to store the big data?

- 1 center and more than 30 stations
- more than 200 Test guidelines
- more than 300 trials and 10,000 samples per year
- 1TB data per year
- TBs picture and environmental data per year
- TBs molecular data per year
- 1TB procedural and log data

How to ensure the result right?

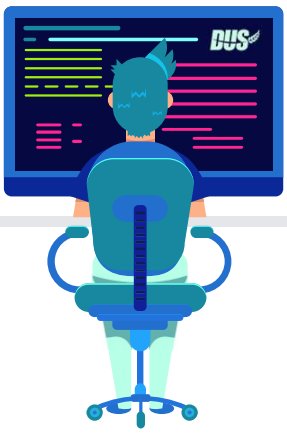




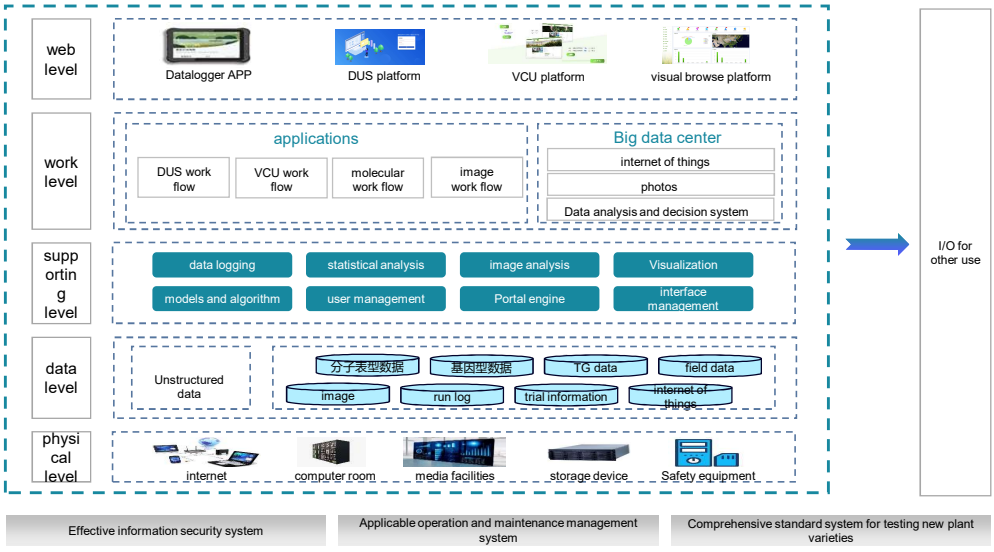
How to do DUS testing efficiently?

numeration	intellectualization	automation
SAAS platform design: variety database, samples database, Test guidelines database, trials database, photos and videos, morphological data, molecular data, environmental data	auto record, auto remind, auto back tracing, image analysis, statistical analysis, model establishment	unman vehicles and drones, sky and soil watchdogs, auto photography studio , Water fertilizer integrated machine

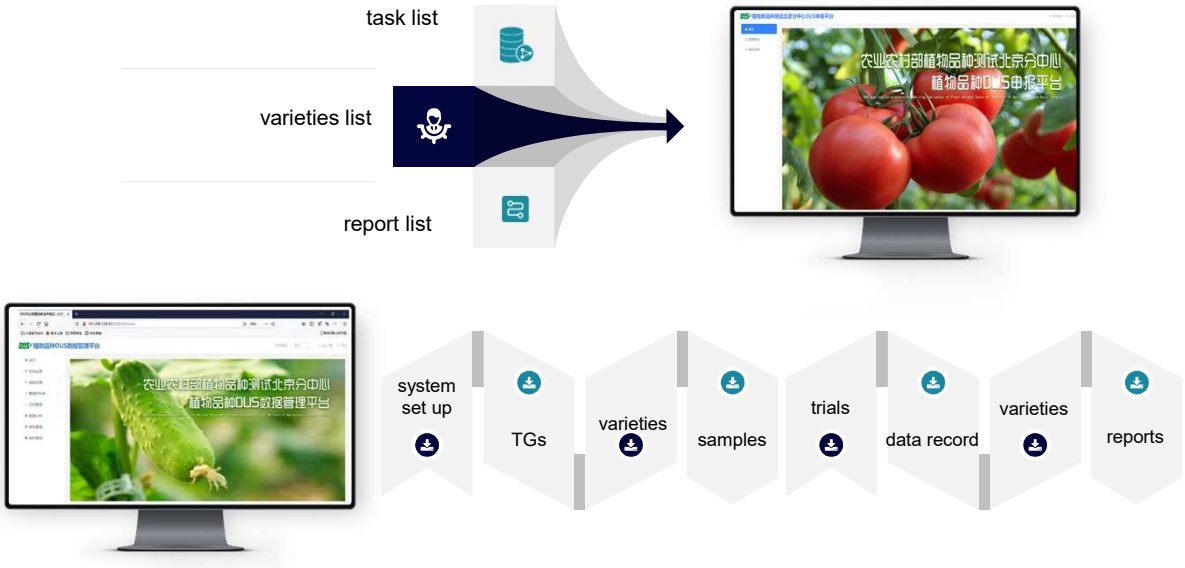
02 Solutions



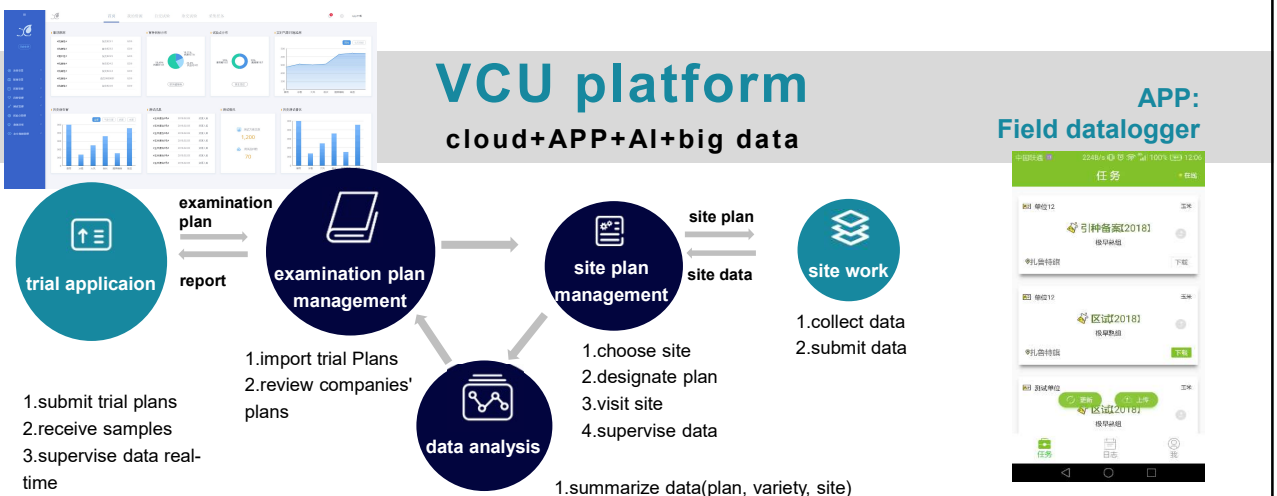
Structure of whole system



DUS platform

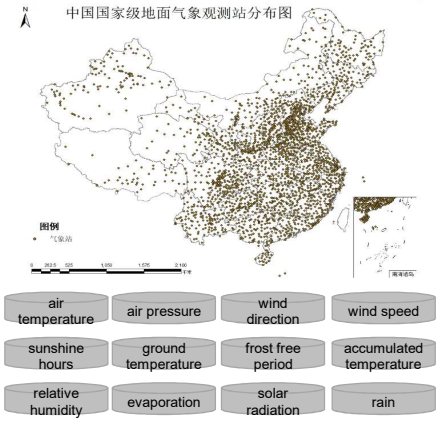


VCU platform



environmental data collection

official weather data

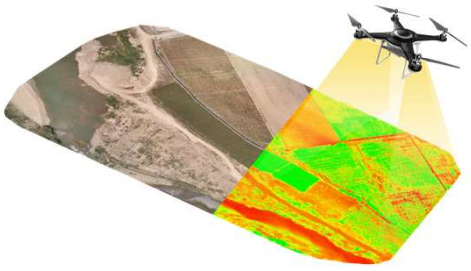


internet of things

- Field weather station: air temperature, humidity, solar radiation, wind direction, wind speed, precipitation, etc
- Video monitoring station: Crop Growth videos, pictures, etc
- Soil monitoring station: soil moisture and soil temperature (four layers)
- Pest monitoring station: crop pest monitoring, early warning, etc

taking photos by unmanned drones

Plot vectorization and automatic division, and varieties correspond to plots one by one



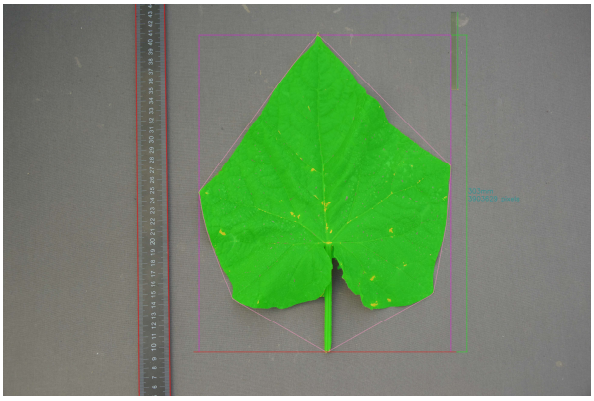
Monitoring parameters

1. Plant height (maximum, minimum and average)
2. Lodging rate and lodging area
3. Vegetation coverage
4. Chlorophyll content
5. Lai (leaf area index)
6. NDVI (normalized vegetation index)
7. Crop canopy temperature
8. Crop drought index

taking photos by man or professional box

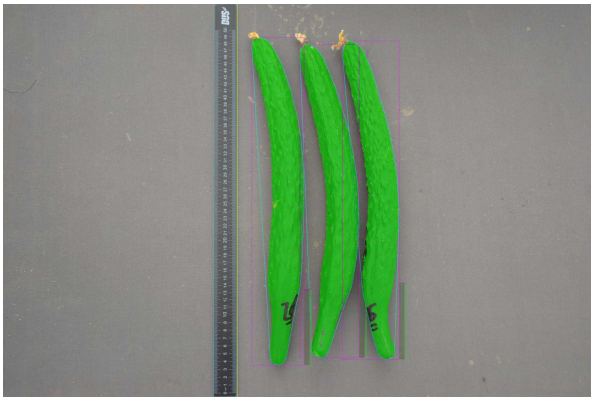
batch image analysis

cucumber leaf



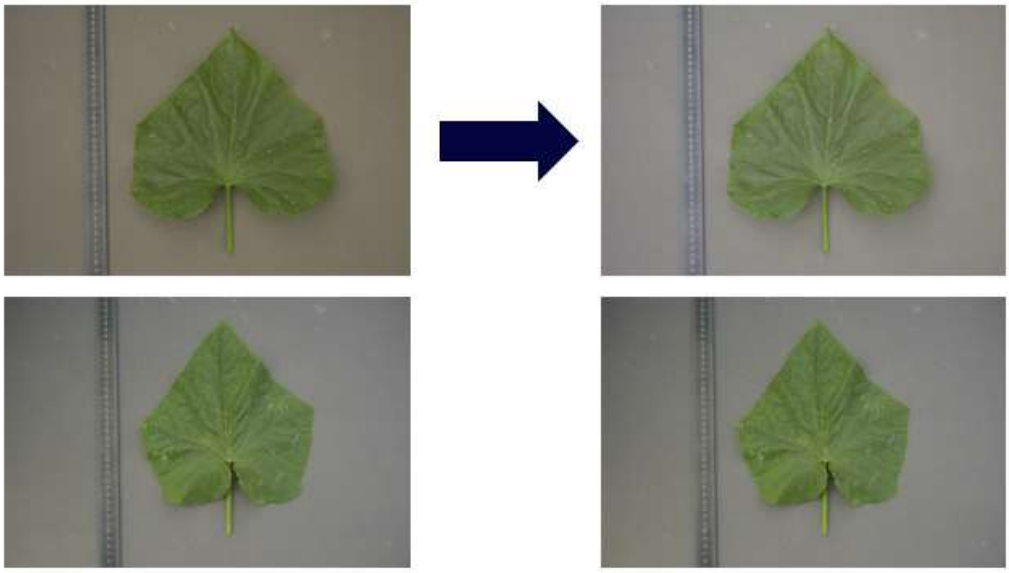
- Automatically recognize the size of the ruler to calculate the size of the leaf
- Acquire multiple parameters of the leaf including leaf area, width, length, convex hall features, angle of the tip, intensity of dentation of margin、shape of leaf, shape of apex of terminal lobes intensity of green color etc..
- Exploring using AI to automatically dig more traits difficult for human to describe.

cucumber fruit

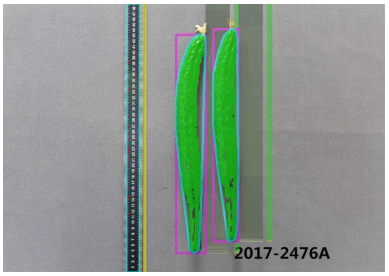


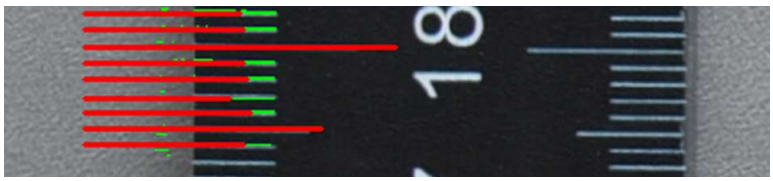
- Automatically recognize the size of the ruler to calculate the size of the leaf
- Acquire multiple parameters of the fruit including fruit area, width, length, shape of calyx end, length of stem end, ground color of skin, secondary color of skin, distribution of secondary color, intensity of glossiness, density of vestiture etc..
- Exploring using AI to automatically dig more traits difficult for human to describe.

Color calibration

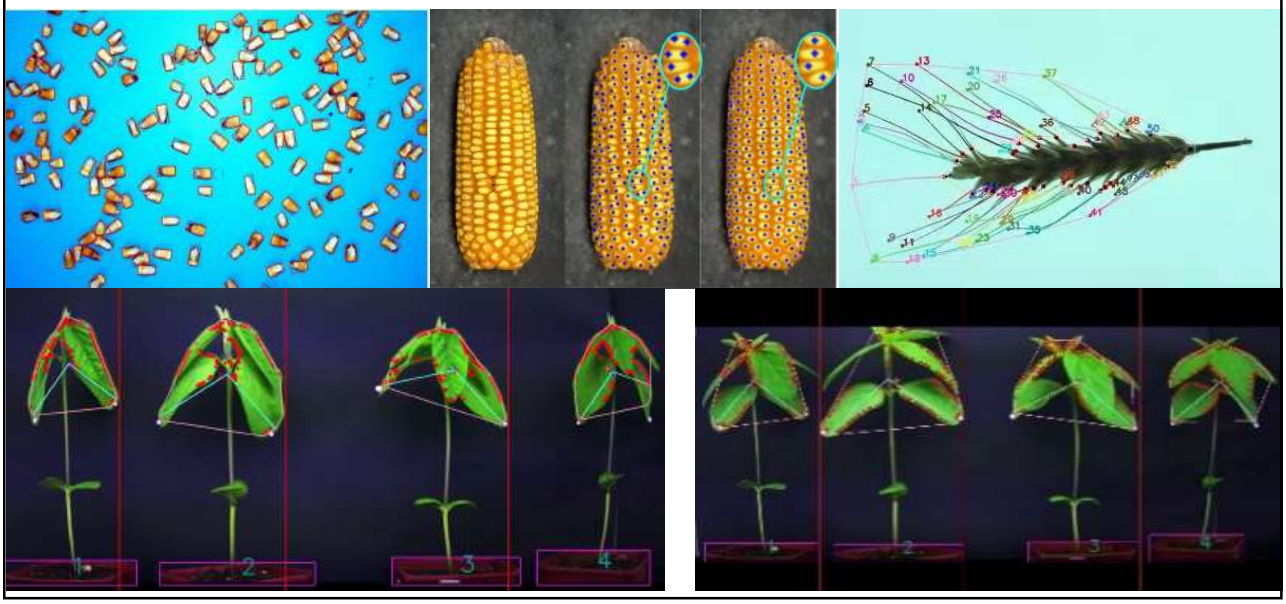


Ruler calibration



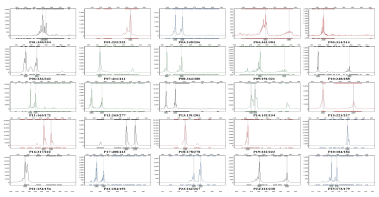


Other image analysis algorithm

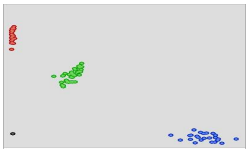


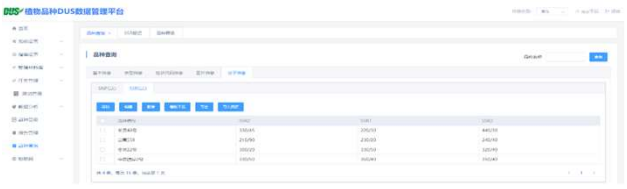
molecular data

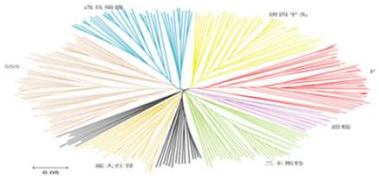
raw data



raw data



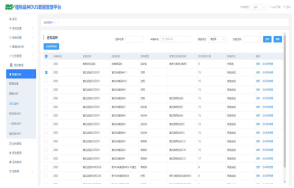




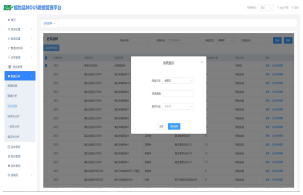
SSR or SNP data management

cluster analysis

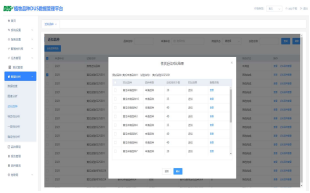
solution for distinctness analysis



candidate varieties list



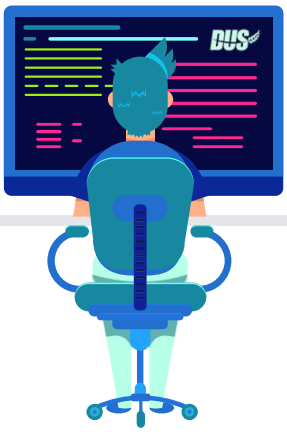
choose method for selecting similar varieties



review the result of selection

judge distinctness report for detailed information

03 Plans



Keeping update

2025 v8.0 automatic test for all time and all space

2024 v7.0 automatic machines

2023 v6.0 forcast model between pheno-, geno-, enviro-data

2022 v5.0 integrated system for DUS, VCU, DNA, chemical contents, resistance

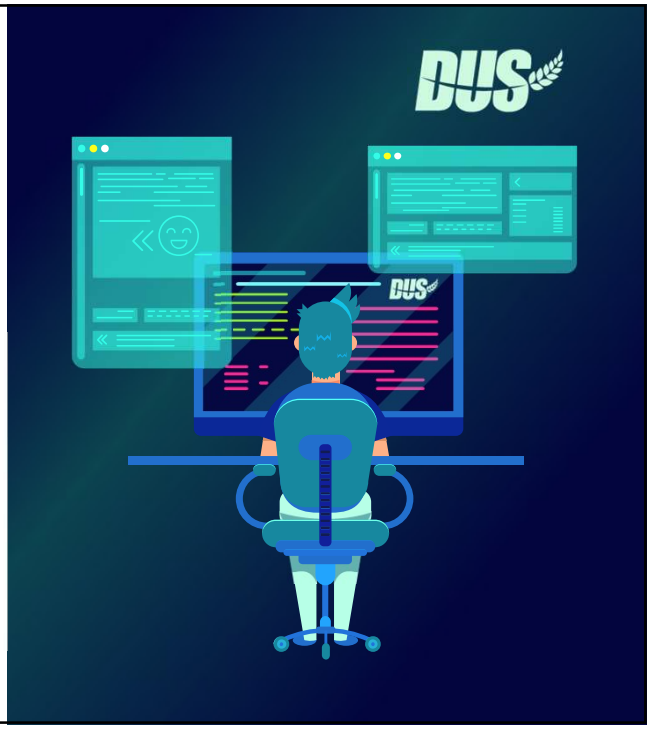
2021 v4.0 SAAS design, image analysis, statistical analysis

2020 v3.0 deep design for DUS from task to report

2019 v2.0 management platform for data

2017-2018 v1.0 electronic data recorder

Thank you for your attention!



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