Package 'FWRGB'

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Type Package

Title Fresh Weight Determination from Visual Image of the Plant

Version 0.1.0

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Description

Fresh biomass determination is the key to evaluating crop genotypes' response to diverse input and stress conditions and forms the basis for calculating net primary production. However, as conventional phenotyping approaches for measuring fresh biomass is time-consuming, laborious and destructive, image-based phenotyping methods are being widely used now. In the image-based approach, the fresh weight of the above-ground part of the plant depends on the projected area. For determining the projected area, the visual image of the plant is converted into the grayscale image by simply averaging the Red(R), Green (G) and Blue (B) pixel values. Grayscale image is then converted into a binary image using Otsu's thresholding method Otsu, N. (1979) <doi:10.1109/TSMC.1979.4310076> to separate plant area from the background (image segmentation). The segmentation process was accomplished by selecting the pixels with values over the threshold value belonging to the plant region and other pixels to the background region. The resulting binary image consists of white and black pixels representing the plant and background regions. Finally, the number of pixels inside the plant region was counted and converted to square centimetres (cm2) using the reference object (any object whose actual area is known previously) to get the projected area. After that, the projected area is used as input to the machine learning model (Linear Model, Artificial Neural Network, and Support Vector Regression) to determine the plant's fresh weight.

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Encoding UTF-8

Imports e1071, imager, neuralnet, stats

RoxygenNote 7.1.1

NeedsCompilation no

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R topics documented:

Biomass.Estimation   *Fresh Weight Determination from the Projected Area of the Plant*

Description

The projected area obtained from the visual image of the plant is used as input to the machine learning model (Linear Model, Artificial Neural Network, and Support Vector Regression) to determine the plant's fresh weight.

Usage

```
Biomass.Estimation(Biomass, PA, model = c("lm", "ANN", "SVM"), newPA)
```

Arguments

Biomass	ground truth fresh biomass of the above ground plant parts for the model development
PA	a numeric value representing projected area (in cm square) of the above ground plant parts from the visual image of the plant
model	the applied machine learning model i.e., "lm" or, "ANN" or,"SVM"
newPA	out of sample projected area (in cm square) of the above ground plant parts from the visual image of the plant

Value

Fresh weight in gm

References

Patil, S. B., & Bodhe, S. K. (2011). Betel leaf area measurement using image processing. *International Journal on Computer Science and Engineering*, 3(7), 2656-2660.
Misra, T., Marwaha, S., Arora, A., Ray, M.,Kumar, S., Kumar, S. (2021). Leaf area assessment using image processing and support vector regression in rice. *Indian Journal of Agricultural Sciences*, 91 (3), 388–92.

Examples

```
y=c(28.3,19.8,13,17.4,13.8,18.5,8.5,19.1)# Ground truth fresh biomass
x=c(4426.7,2993.9,1913.5,1966.3,2008.8,2297.6,1564.9,2541.6)# projected area of the plant
x1=c(3683.062,2548.309,2677.843,2669.239,1933.728)# out of sample projected area (in cm square)

Biomass.Estimation(Biomass=y,PA=x,model="ANN",newPA = x1)
```

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projected.area	*Above Ground Projected Area Determination from Visual Image of the Plant*

Description

In the image-based approach, the fresh weight of the above-ground part of the plant depends on the projected area. For determining the projected area, the visual image of the plant is converted into the grayscale image by simply averaging the Red(R), Green (G) and Blue (B) pixel values. The grayscale image is then converted into binary to separate the plant area from the background (image segmentation). The segmentation process was accomplished by selecting the pixels with values over the threshold value belonging to the plant region and other pixels to the background region. The resulting binary image consists of white and black pixels representing the plant and background regions. Finally, the number of pixels inside the plant region was counted and converted to square centimetres (cm2) using the reference object (any object whose actual area is known previously) to get the projected area.

Usage

```
projected.area(p, a)
```

Arguments

p	character string containing file path of the visual image
a	a numeric value containing known pixel area (in cm square) of the reference object

Value

Pixel area along with the projected area in cm square

References

4. Misra, T., Arora, A., Marwaha, S., Ray, M., Raju, D., Kumar, S., ... & Chinnusamy, V. (2019). Artificial neural network for estimating leaf fresh weight of rice plant through visual-nir imaging. *Indian Journal of Agricultural Sciences*, 89 (10), 1698-1702.

Misra, T., Marwaha, S., Arora, A., Ray, M.,Kumar, S., Kumar, S. (2021). Leaf area assessment using image processing and support vector regression in rice. *Indian Journal of Agricultural Sciences*, 91 (3), 388–92.

Xu, X., Xu, S., Jin, L, and Song, E. (2011). Characteristic analysis of Otsu threshold and its applications. *Pattern Recognition Letters*, 32(7), 956–61.

Examples

```
file.path= system.file('extdata/test1.jpg', package = 'FWRGB')
projected.area(file.path, 0.025)
```

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