INTRODUCTION TO IMAGE PROCESSING AND COMPUTER VISION

LABORATORY PROJECT 1 (LABORATORIES 1 & 2)

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REALIZATION

- algorithms elaborated with OpenCV library
  - OpenCV (C++)
  - SimleCV/OpenCV (Python)
  - EmugCV (C#)
- solution for the laboratory task should contain:
  - source code with description (GUI is not obligatory, source file or Jupyter notebook)
  - folder containing segmentation results (prediction masks) – DO NOT INCLUDE DATASET!!!
  - documentation (report in pdf file)
- solution should be sent up to 31.12.2022

DOCUMENTATION

- documentation should contain:
  - introduction, problem definition (task description, data set description)
  - description of solution (algorithm, step by step explanation and visualization, proposed improvements)
  - results:
    - mean results for whole data set
    - examples of good and bad segmentation results (with result per individual image) – present 5 best and worst cases
  - comments and conclusions

LEAVES SEGMENTATION AND LABELING

- input: images of leaves
- **PlantVillage-Dataset – public dataset (available via GitHub or via Kaggle)**
  - dataset of diseased plant leaf images and corresponding labels
  - dataset to enable computer vision approaches **to help solve the problem of yield losses in crop plants due to infectious diseases**
- **38 categories by species and disease**
  - available original color leaves images (raw), grayscale converted (grayscale) and segmented leaves (segmented)

https://github.com/spMohanty/PlantVillage-Dataset
https://www.kaggle.com/datasets/abdallahalidev/plantvillage-dataset

LEAVES SEGMENTATION AND LABELING

- output: segmented leaves (leaves masks)
- binary segmentation
- assessment according to Intersection over Union metric (IoU, also referred to as the Jaccard index) and Dice coefficient
- mean results for whole data set (induvial results only for examples)

Ground truth (A, target) – binary mask

$$IoU = \frac{target \cap prediction}{target \cup prediction}$$

$$Dice = \frac{2\,|A \cap B|}{|A| + |B|}$$

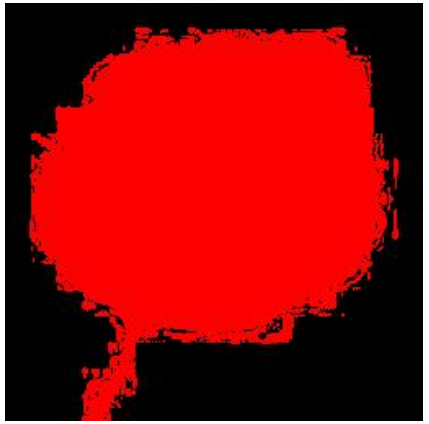
Original image

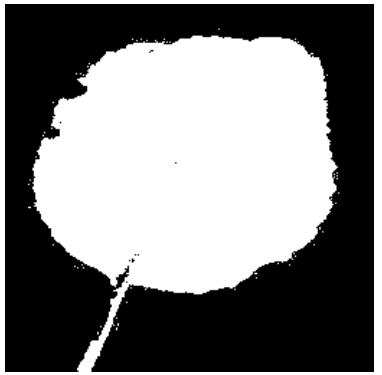
Segmentation result (B, prediction) – binary mask

LEAVES SEGMENTATION AND LABELING

- subtask 1 – preparing ground truth binary labels
  - simple thresholding form segmented results in dataset but …
  - … small corrections need to be defined

Original image





Ground truth (A, target) – binary mask

LEAVES SEGMENTATION AND LABELING

- subtask 2 – main segmentation algorithm
  - start with color image (not form grayscale) and find optimal representation
  - watch out for shadows
  - think about preprocessing and postprocessing (of segmentation results)

Original image

Segmentation result (B, prediction) – binary mask

ASSESSMENT

- source code with description (idea, meritorical (content-related) assessment) – 15 pts (10 pts for main algorithm + 5 pts for GT mask preparation)
- documentation – 15 pts
  - introduction, problem definition – 1 pts
  - description of solution (explanation and visualization – both preparation of binary masks and main algorithm) – 5 pts
  - results (mean results for main segmentation algorithm, examples of good/bad results) – 5 pts
  - comments and conclusions (discussion of results, problems and possible improvements) – 2 pts
  - visual quality, overall impression – 2 pts