UAS-DTU

Unmanned Aerial Systems - Delhi Technological University

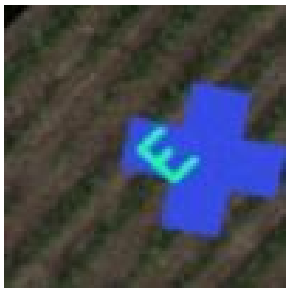
ROUND 2: Technical Round
Software Department

Background

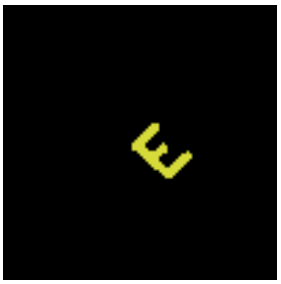
Autonomous image segmentation is an important aspect of image processing. Image segmentation is the process of “partitioning a digital image into multiple segments". The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze.Unlike the broader task of image classification, which assigns a label to an entire image, segmentation delves into finer details by identifying and isolating individual components. These concepts are widely used in military and civilian UAV missions to gather information about areas out of human reach, such as disaster-stricken or mountainous areas.

Task

The task is character segmentation.A UAV is capturing image of characters of different colors on a circular background.The goal is to segment the character ,you may use some preprocessing techniques to improve the result.You must develop an algorithm that works correctly on all the images.The sample image is given below:

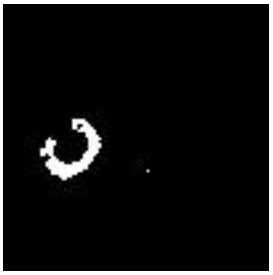


Sample input -1



Sample output-1

Sample input-2



Sample output-2

Step By Step

1. [Optional] Install Ubuntu in your disk partition, refer to this link (https://www.youtube.com/watch?v=-iSAyiicyQY) for details on how to do this. Note that this task often takes time but we highly encourage you to use Ubuntu once recruited so doing this might give a head start. But note that this is purely optional and you will not be evaluated on the basis of this.
2. Learning and picking up new things is the key to work we do. Download and learn Python3, get comfortable with basic data structures used in Python3 (lists, dict, strings, etc). If you know CPP this might not be a steep learning curve. Refer to the beautifully written documentation python has to offerhttps://www.python.org/downloads/release/python-378/. Also, refer to youtube and blogs for learning quickly.
3. Learn the basics of NumPy. It is the fundamental package for scientific computing with Python. NumPy brings the computational power of languages like C and Fortran to Python, a language much easier to learn and use. With this power comes simplicity and

speed. You can refer to these tutorials: https://www.codecademy.com/learn/intro-statistics-numpy/modules/dspath-intro_-numpy. If you want to go deeper you can read the official documentation of NumPy on https://numpy.org/ or YouTube videos.

4. Learn the basics of OpenCV (Open Source Computer Vision Library), It is an open-source computer vision and machine learning software library which is available in multiple programming languages. You can refer to this video lecture series to learn the basics quickly: https://pythonprogramming.net/loading-images-python-opencv-tutorial/. You can also refer to the official documentation of OpenCV on https://opencv.org/ or YouTube videos.
5. Maintain a logbook or write a short report of details showing on a google doc. Share this with your mentor on his/her email address.
    a. What did you do each day?
    b. What changes did you make to your code to improve its performance?
        i. Error Analysis
        ii. Identify areas of improvement
        iii. Make changes
        iv. Write it down

The task should be compulsorily done on GitHub and should have a comprehensive readme.

Evaluation Criteria:

1. Your overall approach to understanding the basics of python
2. Understanding of basic NumPy and OpenCV
3. Code writing skills (is the code clean, well commented)
4. Skills in understanding and usage of new tools which are integral to the work that we are doing here.
5. Documentation.
6. Ability to think analytically and critically.
7. Ability to do the error analysis appropriately.
8. Most importantly grit and commitment!

Task Deadline : 9 Feb '24 22:00 IST

Relevant Links:

- Dual boot Ubuntu 20 and Windows 10: https://www.youtube.com/watch?v=-iSAyiicyQY
- Python 3.7: https://www.python.org/downloads/release/python-378/
- Learn Python 3: https://automatetheboringstuff.com/ (First 6 chapters are sufficient)
- Learn OpenCV: https://docs.opencv.org/4.x/d6/d00/tutorial_py_root.html [Video Lecture]
- Learn GitHub : https://docs.github.com/en/get-started/quickstart/hello-world

End Note:

For those of you with a background in programming and knowledge of python we assume this task won't be very difficult for you. Similarly if someone's just starting off with python this may seem overwhelming and impossible. We need you to know **that's okay and your previous knowledge will not play a role in our selection.** We will make sure it's a level playing field for everyone, so in case you're just starting out we don't expect you to complete this task 100% but we expect 100% follow through and dedication from all. If you are able to complete this task earlier than stipulated time we will assign more things to you, the purpose of this task is to see your adaptability to new environments so we encourage you to ask doubts search the internet and find solutions and most importantly enjoy (you will most likely have a good looking project by the end of this recruitment)

We wish you all the best, and hope to work with you soon!