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| **mage result for aston uni logo**  **EAS Assignment Brief** | |
| CS3330  Digital Image and Video Processing | Foreground Segmentation in Image Sequences |
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| Assignment Brief/ Coursework Content:  **Foreground segmentation** is a family of image processing techniques whose goal is to classify the pixels of an image sequence as part of whether the foreground or the background. You will be required to:  • Conduct personal research to choose a potentially suitable segmentation algorithm for foreground segmentation in image sequences.  • Implement your chosen algorithm in Matlab and apply it to the provided test image sequences.  • Analyse the results (either subjectively or objectively) of applying your chosen segmentation algorithm and draw conclusions from them.  While it is expected that you will segment at least one of the provided image sequences with reasonable accuracy, the aim of this coursework is NOT to perfectly segment all provided test sequences. However you are expected to understand the performance of your chosen algorithm.  You will report on this work in the style of an academic paper, making clear your experimental **methodology** and your **results and conclusions.**  Coursework Image Sequences  Some sequences of the type which you are required to segment can be found on Blackboard, within the file named Coursework\_Sequences\_19\_20.zip. Unzipping this archive, you will find that it contains 8 folders, **each of which** contains 2 folders:  • **input:** these folders contain the image sequences that you will need to segment. They are taken from the Scene Background Modeling and Initialization (SBMI 2015) dataset and have been chosen to contain a range of features which may pose challenges for different foreground segmentation algorithms.  • **groundtruth:** these folders contain the ground truth version of each of the test images. A ground truth image is an image designed to contain the correct result of the segmentation. In this case, the pixels in the ground truth images have non-zero values if and only if the pixels in the same position of the corresponding input image from the test image sequence belongs to the foreground. Your segmentation algorithm **must not make use of these ground truth images** to generate the segmentation, but you may want to use them to assess the performance of your chosen algorithm.  The images in the sequences should be read in lexicographical order. While it would be possible for you to focus on binarising the provided test images for your coursework, you are encouraged to find (or produce) other image sequences on which to test your algorithm’s performance. | |
| Descriptive details of Assignment:  You are required to work individually and produce a technical report of between 1000 and 2000 words (excluding references and appendices), accompanied by figures and tables where appropriate, on the topic outlined above.  As this report is largely research based, you are expected to peruse significant texts or web-based material to prepare the report, but it is essential that the report itself is your own work. You should cite a minimum of **FIVE** relevant sources excluding the lecture notes and Journal Class 3 presentation slides. These should be clearly citied at the points at which they are relevant using the Harvard referencing system. **Any direct quotes should be clearly delineated from the text with quotation marks, and should be clearly attributed**, although it is expected that the report will be written in your own words. **Failure to acknowledge the sources of your work will result in a penalty to your mark or, in serious cases, may amount to plagiarism.**  If you make a claim in your report, you should either give evidence for the claim (*i.e.*, cite the resource in which you found it) or explain how this claim follows from earlier information in the report. One of the key features that should be present in the report is well reasoned argument. For instance, don’t just state what an algorithm outputs – also, explain why this output is useful compared to what we had before applying the algorithm.  **Report Structure**  Your report should be organised according to the following structure. This section also gives the proportion of marks available for each section along with indicative content.  **1. Background (15%)**   * What is the aim of foreground segmentation? * Why is segmenting an image useful? Hint: segmentation is a mid-level image processing technique, and the output of mid-level techniques is often fed into high-level techniques. * What are the existing approaches to foreground segmentation? Briefly outline **THREE** different algorithms for foreground segmentation found through your research and discuss the way in which the aims and performances of these algorithms differ in academic literature.   **2. Algorithm (20%)**   * Choose an algorithm to apply to the coursework test images. Note that if it is too simple, or already implemented in Matlab library function, the algorithm which you choose may limit your marks for the implementation. If you are worried that your approach is too simple, please contact the module tutor. * Once you have chosen a method, you should:   + Motivate why it would be suitable for foreground segmentation, making reference to the literature.   + Discuss any drawbacks to the algorithm, again, making reference to the literature.   + Describe how the algorithm works in your own words (*e.g.*, using high-level pseudocode). * Marks are available in this section for well-justified novelty.   **3. Results (25%)**   * Describe how you will test the applicability of your method to your chosen problem application (your **methodology**). You may want to propose some subjective or objective analysis of your results.   + At minimum, you should use Matlab to apply your method to a set of test image sequences and comment on the results.   + You may gain extra marks for objective analysis (comparison to ground truth images is a good candidate). * Visually demonstrate the results of applying your segmentation algorithm and discuss how well it has binarized each document image. As stated above, you should aim to binarize at least one of the test image sequences with reasonable accuracy. * Present and discuss any further evidence that you have gathered, as per your methodology.   **4. Conclusions (5%)**   * Summarize the findings from your report and attempt to draw general conclusions or make a general hypothesis based on your results. * Discuss any limitations of your research.   **References**   * All major sources of research must be acknowledged with the use of appropriate detailed references. You should use the Harvard style of referencing and, where appropriate, cite your sources in the main body of the report.   **Appendix A (35%)**   * Appendix A should contain your implementation: Include all the code necessary to generate the figures and data used in your results section. You should include a Matlab script called **generate\_results.m** which, when run, will generate and display the aforementioned figures and data. **If this script does not run correctly** (generating all the results in the report without editing) **you will receive a penalty of up to 10% of the mark for this section**. * Each function or script file used should have its own page in the report and their filenames should be clear. * You must implement your chosen algorithm in Matlab. You may make use of any Matlab library functions which you need**.** However, if you are simply applying a set of library functions one after the other, with little logic of your own, do not expect to receive a high mark for your implementation.   **Further Appendices**   * Any other files which you want to include, but which you feel break the flow of the report. | |
| Recommended reading/ online sources:   * Solomon C, Breckon T. Fundamentals of Digital Image Processing: A practical approach with examples in Matlab. John Wiley & Sons; 2011 Jul 5. * Lecture recordings (available on Blackboard). * Include online websites/ journals/ sources | |
| Key Dates:   |  |  | | --- | --- | | 08/11/2019 | Coursework set | | 12/11/2019 | 3rd Journal Class | | 12/12/2019 | Due date, 11:59 am | | 09/01/2020 | Expected feedback return date | | |
| Submission Details:  Please submit your completed work in the following locations (in the “Module Content > Coursework” folder on Blackboard):   * The report document in: “Image Segmentation Report” * The code, as a zip file containing all of your code (but no images), in: "Image Segmentation Code"   + Your code should also be included in the appendices of your report   + Your code should assume that the directory containing the image sequences is found in the same directory as the code   The report and code are worth a combined 25% of the overall coursework mark. Combined with your marks for journal class 3, your total coursework mark contributes 30% to your overall module mark. | |

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| Marking Rubric:  Marks are available for quality of writing as well as content. Ensure that you use appropriate technical language and presentation. The report should be written mainly as a sequence of paragraphs in standard English, although the nature of the material will justify some variations (e.g., bullet points may be employed where enumeration of a series of technical points is appropriate). Your code should be easily readable and contain detailed, informative comments.   |  |  | | --- | --- | |  | **Fail** | | **0-29** | There is little or no evidence of background research; there are serious flaws in the code, the report and/or referencing. The work is irrelevant or out of the module scope. | | **30-38** | There is some evidence of background research, but the presentation is not appropriate in style and/or structure, the extent of research is limited. Some relevant knowledge is showcased in the program, but deployed on scale below threshold requirements for the module. | |  | **Pass** | | **40-50** | The report and the program present a relevant image processing technique relevant to the module, but the outcome is limited in scope and depth and/or is of low technical relevance. | | **51-59** | The report and the program present a relevant image processing technique relevant to the module. The context and technical details are set out in sufficient depth and detail, with relevant references cited. | |  | **Merit** | | **60-69** | There is substantial, well-presented, evidence of systematic investigation. The implementation is reasonably efficient and effective. | |  | **Distinction** | | **70-79** | There is evidence of thorough and depth insight into the subject. The code implements a pipeline that goes beyond a single algorithm. | | **80-89** | Most of the accessible, recent and substantial precursor work is formally cited and critically reviewed. The report shows a detailed understanding of the subject of the coursework and its applications. | | **90-100** | There are some original insights related to the topic at hand. The standard of writing is similar to literature review in academic publication. The implementation is of outstanding efficiency. |   Table 1: Criteria adapted from EE3RCS. |