

Assignment: Dynamic Compositing

Augmented Reality (AR) and Mixed Reality (MR) applications dynamically composite synthetic and natural content. A realistic composite requires adjusting the appearance of the synthetic and natural content so that they appear compatible.

In this assignment, you will investigate how to composite synthetic and natural content, adjust the dynamic range of the content and perform colour transfer between the natural and synthetic content in real-time.

Deliverables

In this assignment you will work individually to deliver the following

- A Processing sketch to **composite, adjust the dynamic range** and **transfer the colour properties** of the natural content to the synthetic content at a frame rate at least 12fps
- A **report** (around 500 words) describing how you achieved the required frame rate

Details

This Processing sketch should take as its input a natural video and a video of synthetic content and generate a composite of these sources, where

- The **dynamic range** of the synthetic content has been adjusted to match that of the natural content
- The synthetic content has been **colour matched** to the colour properties of the natural video

In this assignment you will be working with HD content, so efficiency of implementation is important. You will need to identify the achieved presentation frame rate to ensure that your solution meets the required acceptable frame rate. You must comment in your report how you achieved (or did not achieve) the required frame rate of 12fps or greater.

You should test your solution using the different background and synthetic content and comment in your report on the effectiveness of compositing for each combination.

Some Things To Consider

- Examine the supplied sketches, they give you some ideas about how to composite synthetic and natural video content
- Regarding the dynamic range and colour transfer you need to consider if all the pixels in the synthetic content should contribute to the calculations

- It is easy to match the white point and the black point – is this sufficient? Does it help? When should it be performed, before or after the colour transfer?
- Perhaps the frame rate is too low. Do you need to work with the full resolution for the synthetic content

Resources

The following Processing sketches are available for you to use (if you so wish)

- `A01_SaveKeyValues` which allows you to save the details of chromakey process in JSON format
- `A01_Composite` which composites content using the the output from the sketch `A01_SaveKeyValues`
- Three natural video sequences; `motocross-720p.mp4`, `running-720p.mp4` and `skateboarder-720p.mp4`
- Two synthetic video sequences; `TRex-01-720p.mp4` and `aliens-720p.mp4`

Grading

- Functionality
- Design and implementation of the programs
- Approach used to achieve the required frame rate
- Report

Deadline

An assignment upload link is on the Digital Video Compression and Delivery MOODLE website. All unique material that your solution requires (programming elements, such as Processing sketches, content that you prepared specifically for your solution) and the report should be uploaded by **23:00 on Tuesday 10th April 2018**.

References

François Pitié, Anil C. Kokaram, Rozenn Dahyot, Automated colour grading using colour distribution transfer, *Computer Vision and Image Understanding*, Volume 107, Issues 1–2, July–August 2007, Pages 123-137, ISSN 1077-3142, <http://dx.doi.org/10.1016/j.cviu.2006.11.011>.
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Chung-Ming Wang, Yao-Hsien Huang, Ming-Long Huang, An effective algorithm for image sequence color transfer, *Mathematical and Computer Modelling*, Volume 44, Issues 7–8, October 2006, Pages 608-627, ISSN 0895-7177, <http://dx.doi.org/10.1016/j.mcm.2006.01.029>.
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S. Xue, A. Agarwala, J. Dorsey, and H. Rushmeier, Understanding and Improving the Realism of Image Composites, *ACM Transactions on Graphics*, vol. 31, issue 4, no. 84, New York, NY, USA, ACM (2012)
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