Module Assessment

Augmented Reality CS7GV4/CSU44054 2021

Module assessment is based 100% on a project. There are 2 options to choose from

1. A default project as detailed below,
2. A self-defined project as detailed below.

Grading for both options will be equivalent:

- 30% originality/creativity
- 30% technical quality/functionality
- 40% report

Selecting a self-defined project will result in 15% for originality/creativity to start with.

Project reports have to be uploaded to Blackboard by May 26th. They should follow the structure of a technical report or scientific paper, e.g. as follows:

- Introduction (motivation, relevance, ...)
- Theoretical background
- Implementation
- Experiments, results
- Analysis, discussion of results
- Summary, conclusions, future work
- References

Additionally any developed code and an illustrative video have to be uploaded to Blackboard by May 26th. Details will be announced in due course.

1. Specification of default project 1

Create a **video mosaicking** application. Start by taking a video of a scene e.g. the Trinity facade, by rotating the camera to capture a large field of view. Align and stitch the images of the video sequence to create one global panorama.

How this can be done has been explained in detail during the lectures.

It is DISCOURAGED to use the pre-defined OpenCV stitching class, which will result in decreased scores for demo/code. The pipeline should be implemented from individual modules (e.g. feature extraction, matching, warping) to document detailed understanding.

3 example videos to be used in the project are provided on Blackboard. These have to be processed and results have to be documented in the report.

Additionally, at least one of the panoramas that is reported, has to include a virtual object, i.e. implementing an aspect of augmented reality. This can be done e.g. as explained in Exercise 3 based on OpenCV (see Blackboard).

Additionally, at least one video (your own choice) has to be augmented by a virtual object first and then used to generate a panorama.

Completing this task perfectly with corresponding report could result in 70% achievement. This may then be extended by own ideas to get up to additional 15% for originality/creativity. Example ideas may include evaluations of properties of different elements of the video mosaicking algorithms, experimentation with different scenes, influence of moving objects, using a subset of images (e.g. every N^{th}, varying N), etc. Any ideas are welcome and can be discussed.

2. Specification of default project 2

Complete the Virtual Field Trip as explained in detail by Dr. Gareth Young in the tutorials. Details can be reviewed in the tutorial videos and here:

https://v-sense.scss.tcd.ie/research/6dof/virtual-field-trips/

Dr. Young is available to help: youngga@tcd.ie

Additionally, Exercise 3 has to be completed, which is about building an AR application in OpenCV. Details can be found here on Blackboard.

The report has to cover both parts, the Virtual Field Trip and Exercise 3 in the structure as outlined above.

Completing this task perfectly with corresponding report could result in 70% achievement. This may then be extended by own ideas to get up to additional 15% for originality/creativity. Example ideas may include evaluations of properties of different elements of the 3D reconstruction (SfM) algorithms, experimentation with different scenes, influence of different surfaces, using a subset of images (e.g. every N^{th}, varying N), etc. Any ideas are welcome and can be discussed.

3. Rules and guidelines for self-defined project

The goal of this option is to encourage and motivate own exploration and experimentation in the broad area of the course, i.e. augmented reality, virtual reality, 3D vision, image processing, etc. Ideas are not restricted and anything can be proposed.

The task is to perform a mini scientific project from idea to report, including implementation, experimentation, analysis, evaluation, presentation, report and documentation. It does not necessarily have to include a large amount of code implementation. It may very well start with some freely available software, or use functionalities from standard libraries and tools like Matlab or OpenCV. These may be applied extended as needed. Focus is rather on creativity and experimentation than on related implementation.

Ideas and suggestions for project directions have been given during lectures, and corresponding software packages and tools have been introduced (ARToolKit, OpenCV, Vuforia, ARCore). Based on that but also apart from that any project idea is welcome and can be proposed and discussed. These discussions shall make sure that scope and magnitude of projects are suitable and achievable. This shall result in a written project definition of 1⁄2 - 1 page as follows:

- Title
- Introduction/motivation

        - I am going to work on xxx. This is important/interesting because yyy.
- Approach
    - I plan to use the following SW, implement the following things, use the following test data, do the following experiments/evaluations.
- Expected outcome
    - Results will be documented in a report containing, images, measurements, conclusions about, illustrations of zzz.

These project definitions have to be approved by the Professor by Friday, April 30th, 5:00pm. Everyone with no approved self-defined project by that date has to decide for one of the default projects.

Self-defined projects may be done in groups. In that case they have to be larger and more ambitious in scope and magnitude. Projects with more than 3 participants are discouraged and would have to be very well justified.

As all this is very experimental, it is understood that not everything may work out as planned and expected in the beginning. This is the very nature of research. If things fail it may not necessarily affect the course grade negatively as long as it is all well explained and justified in the demo and report.