Research Master’s program: Information Processing and Complexity of the Living

Mastère de recherche : Traitement de l’Information et Complexité du Vivant (TICV)

TC : Tronc commun, SPI : Option Signal Perception Image, Option BioS : Biosystémique

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|  | **SPI - Video Sequence Analysis** |
| **Semester:** Fall, **Academic Year:** 2020/21 |

**Instructor information**

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| **Name** | Nicolas LOMENIE Associate Professor |
| **Contact Info** | Nicolas.lomenie@u-paris.fr  |
| **Office location / Affiliation** | University of Paris |

**Course Description**

In this course, the aim is to be able to model and calculate motion in digital image sequences following this sequence :

Chapter 1: Description of a camera and problem of camera calibration including the PnP problem for pose estimation.

Chapter 2: Characterization of apparent motion in sequences and optical flow calculation using two reference methodologies: Lucas-Kanade and Horn-Shunck and two generic theoretical frameworks.

Chapter 3 : the tracking of points, objects or shapes by classical methods such as heuristic matching, Kalman filtering, particle filtering and active contours.

**Objectives and Learning Outcomes**

Upon successful completion of the course, students will have an understanding of video sequence analysis and associated topics. Specific learning objectives are:

* **Camera calibration**
* **Pose Estimation**
* **Augmented Reality**
* **Optical Flow**
* **SVD decomposition and implementation of linear algebra basics**
* **Library openCV (python and C++)**
* **Tracking methods such as Lucas and Kanade tracker**

**Prerequisites**

* Linear Algebra
* Basic image processing

**Learning Resources**

* Laptops or computer stations with C++ and python

**Assessments**

The final course grade will be calculated using the following categories:

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| **Assessment** | **Percentage of Final Grade** |
| Final exam | 60% |
| **Based on** Reading and problem sets | 25% |
| And Programming assignment | 15% |