VIDEO FLOW ANALYSIS WITH OPENCV

OBJECTIVE : Become familiar with techniques for processing and analysing real-time video streams using the OpenCV library (ArUco).

Targeted skill : Design applications capable of acquiring, processing, and analysing video sequences from a camera or file.

AUDIENCE: This training course is open to all PEPR DIADEM staff:

- Doctoral or post-doctoral students
- Teachers-research
- Researchers / research engineers

PREREQUISITES:

- Personal laptop required (install Python 3.x)
- Intermediate level of Python programming

PROGRAM:

Tuesday 09/12 morning: (optional)
Visit to Diadem's targeted projects: AMADEUS, GRENAT and RUBIS.
Discussion with digital engineers.

Tuesday 09/12 afternoon : Raster image encoding

Discover the basics of image processing with Python, Numpy, and Matplotlib through three mini-projects:

- **Matrix representation of an image:** creation of synthetic images (patterns, gradients, circles) from Numpy arrays.
- **Manipulation of real images:** conversion to greyscale, thresholding, zooming and extraction of regions of interest from a colour photo.
- **Analysis of simple objects:** detection of circular grains in a binarised image, calculation of their centre, radius and bounding box using “scipy.ndimage”.

Wednesday 10/12 morning : Getting started with OpenCV

- **Live capture and processing of a video stream:** display of images in greyscale or colour, drawing of elements (circles, text) on images, real-time animation, keyboard interaction.
- **Naive tracking of a visual object:** simple threshold detection of a black ‘spot’ on a sheet, calculation of its position in real time and tracking by an animated circle.
- **ArUco marker detection:** automatic identification of markers, display of their number, corner detection.

PROGRAM:

Wednesday 10/12 afternoon: Practical application

Completion of a **mini-project** tailored to the learners' level of progress and interests. The focus is on autonomy, code structuring, and mastery of the libraries used.

Possible examples:

- **Tracking an object in a moving scene,** with augmented visualization (tracking area, trajectory, speed, etc.).
- **Recognition of and interaction with ArUco markers** (simulation of a control system or gesture interface).
- **Creation of an interactive application** (a simple game, a measurement tool, or an artistic or scientific demonstration using the camera).

TRAINEUR :

Damien ANDRÉ : Lecturer at the University of Limoges.
Researcher at the IRCER laboratory (ceramics research institute)

SESSION :
IRCER : 09 - 10 december 2025
(Limoges – 87)

DURATION :
½ day visit (optional)
+ 1 day ½ of learning (10h30)

MODALITY :
Face-to-face

MEALS (paid for) :
Ice-beaker lunch on 09/12 (optional)
Plate lunch on 10/12

TARIFF :
This training course is fully funded by the PEPR DIADEM

Information and registration:
Places are limited (10 max)

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