

MASTER MUMET. Intermediate project

Objectives:

The intermediate project is a chance to test and evaluate the skills acquired during the first set of master lessons. It is a small project that aim at testing the capability of planning, design developing and presenting a concrete application in the topics presented in these months.

During the project the candidates must provide

- a) The design of the application, discuss the motivation of the choices, select the constraints and requirements and predict the possible performance
- b) The software solution that gives the answer to the defined computer vision and multimedia task
- c) The discussion about the set of chosen performance indicators, the best way for presenting results and the set of data needed for training and testing the developed algorithms, and the limitation of the achieved solution.

Topic: *outdoor people surveillance*

All the projects will addresses a video-surveillance task. Candidates can choose among different tasks, which share the same the initial steps; they should be the same for all the candidates (and could be shared across working groups).

Mandatory Steps (all should be done):

- 1) **Acquisition:** candidate can define and acquire the data they want to work on. The choice can be made between
 - a) data acquired from the Axis camera mounted at UNIMORE, with video, people and situation semi-constrained and controlled (better choice). There is not the need to control camera in PTZ but it can be fixed in a given position.
 - b) web-crawled data (e.g. Videosurveillance datasets).

The choice should be motivated and at least 10 videos (minimum 1 minute each) should constitute the test data; half of them should contain more than one target. The complexity of the video depends on the solution you would like to propose. You can also select some additional

video where your proposal do not work and discuss the motivation.

- 2) **Detection:** In the video, pedestrian, or more in general people should be detected using the preferred approach. Any method is acceptable, either based on background suppression if camera is static, either based on an existing pedestrian detection, with whichever pattern recognition approach. The method should take into account possible occlusion among people and object in the scene. Crowd situation are not required.
- 3) **TASK:** the task can be chosen among the following tasks (in a growing level of difficulty; you can do also more than one task):
 - i. **Long term counting:** The number of people present in the scece should be counted using temporal windows of 10 seconds. Every time a person exits and enters the scene inside the temporal window is counted as one. The final outcome is the number of people every 10 seconds.
 - ii. **People trajectory on the ground plane:** People should be tracked as long as possible and trajectories projected onto the ground plane by means of a homographic warping.
 - iii. **Retrieval:** The system should be capable of retrieving all the snapshot containing a specific (query) person. The user provide a query snapshot to the system and all the snapshot of the person should be returned ranked by similarity. (in this case the number of video and pedestrians should be large enough)
 - iv. **Counting using IOT sensors.** People should be counted using the data fusion between visual data and IOT sensors. (you can acquire some video of people mounting some sensor, or with GPS in their phone..)
 - v. **Access Identity recognition.** Given a high resolution image on an entry zone (e.g. A door, or a selected zone by the axis camera) the system should detect and recognize the face of the people entering/exiting the door and count the number of accesses for every person.
- 4) **Presentation:** the candidate can choose the suitable way of presenting the results of the system. Possible solutions can be a web page, a mobile app, a software for augmented reality superimposed to video , some computer graphics or 3D facilities.
- 5) **Performance:** the system performance should be measured and results discussed both in success and failure cases. The candidates should choose the proper set of performance indicator according to the chosen task.

Working plan:

Candidate can work in **groups of two or three people**. The preferred programming language is python but software can be written in different languages.

The group should prepare a 2 page project draft including a description of the activities, the chosen task, expected results and a workplan (e.g. GANTT diagram or similar). At the end the group will be discuss the result with a short presentation and a demo

Deadlines

The 2 page draft proposal should be send to prof Rita Cucchiara and Simone Calderara (via email) by Monday **Sept. 11**.

The draft project should be delivered by **Friday Sept. 8**.

The project should be delivered by **Monday Oct. 2**.

The groups will present the projects using slides where each member of the team will present separately a part of the work (approx on **mid October**).

Evaluation

Projects will be evaluated by the MUMET scientific committee.