Topic:
Visual quality and utility on large video surveillance databases using Deep-learning

Context:

Filter2, a French funded project in collaboration with the French homeland security ministry, is in the field of video protection (CCTV) and aims at developing an efficient video selection process in case of major events (attacks, crimes, ...). In this context, a PhD fellowship is proposed between the GREYC Laboratory (Caen, France) and the XLIM Laboratory (Poitiers, France) for a three-year co-localised position. The successful candidate will work under the supervision of Dr. Christophe Charrier (GREYC) and Dr. Chaker Larabi (XLIM).

Description:

The recent demand for video surveillance systems to reduce security threats and criminal activities has brought challenges due to both the overwhelmingly large amount of content to be monitored and the limited physical/human resources to perform such tasks. Automated artificial vision technology is becoming more widely adopted for monitoring and surveillance applications to reduce the need for physical resources and human intervention. One way to help police investigators during the monitoring task is to perform a preselection of the sequences having the best characteristics for detection, recognition and identification (DRI) tasks. This selection relies on several criteria such as the visual quality, the camera features, the embedded metadata, the usefulness of the content for DRI, and so on. Obviously, the visual quality is an important aspect of the study especially for this case where there is no access to pristine sequences. Moreover, the term quality has also to be adapted to the context of the study where it deals with the identification of faces, persons, license plates, vehicles, etc.

The aim of this PhD thesis is to develop Video Quality Assessment (VQA) algorithms adapted to the context of the Filter2 project. Yet, instead of scoring the quality of video by a single value, a continuous notation of the quality will be preferred. The problem of perceptual video quality assessment is a significantly more complex problem than the still image one for the following reason: while there exist highly reliable models of still natural scene statistics, the literature for regular natural video statistics models is almost absent. For instance, the interaction between motion and spatio-temporal changes is of particular interest, especially with regards to whether motion is involved in masking distortions. The type of motion which occurs in a video is a function of object and camera movements. One challenge is how the aforementioned phenomenon can be modelled.

Another challenge is to develop models that work directly in the compressed domain taking into account the variability of codecs and the specificity of video coding. The aim being to extract strong features that can be used to predict the quality of a video, a frame or an object from the scene. Finally, the extracted features will be used to build tools describing the utility and usefulness of a video or part of it for the context of video-surveillance: how is it possible to qualify the utility of a video sequence for DRI? How is it linked to visual quality?

The candidate will investigate the design of features in the wavelet domain, frequency domain and/or spatial domain to improve the process of quality prediction, and by the way the detection of objects of interest. The use of Deep Learning to design such a VQA scheme is an important direction of this work.

Candidate profile:

Prospective candidates should have good skills in Matlab/C/C++. Good skills in several of the following fields are appreciated: Computer vision, pattern recognition, quality assessment, image and video compression, machine learning. Applicants should demonstrate good oral and written communication skills in English, and be motivated to work as part of a multidisciplinary team. Besides, the candidate should show the motivation of working in the framework of a collaborative project with the constraint of being alternatively in two different geographical sites (Caen and Poitiers).

Application:

Applications should include the following :

- Letter of interest
- Official transcripts (with grades and ranking) for Master 1 and Master 2 (or equivalent)
- Scientific CV
- List of publications (if any)
- Name & contact information of at least 2 Referees

Application deadline: September 30th (application will be processed on the fly).

PhD start: November/December 2017.

This position is subject to security clearance because of the ZRR qualification of the labs.

Benefits:

Salary : 1800 euros monthly gross salary .

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