Automatic video analysis of human motion for high-level sports

Context and objectives: This research internship in computer science in the LJK laboratory and the INRIA Grenoble research center aim to participate in a software development project for the automatic video analysis of human movement in high-level sports. It is part of the PerfAnalytics national project for technical and scientific support in video analysis for the French Olympic teams in Climbing, BMX Race, Gymnastics, Boxing and Wrestling. This project is a collaboration between research teams in Computer Science, Biomechanics and Sport Sciences, notably the INSEP in Paris, and sport federations (http://www.perfanalytics.fr).

Two related contributions are expected from this research internship in Computer Science:

(1) to accelerate the automatic learning procedure of a specific 3D model per athlete (or "3D digital twin"), calculated from video and biomechanical data collected during training on the sports centers and measurement platforms of the project partners;

(2) to improve the robustness of automatic movement tracking software based on video alone, in a direct situation of athlete performance, by comparing the benefits of integrating personalized 3D digital twins with the use of a generic model.

The work of the internship will be based on the state of the art in computer vision, in connection with machine learning and 3D human pose estimation. It will support the PerfAnalytics R&D teams already working on these topics (Figure 1). The internship will benefit from access to multi-view video data sources from equipment in sports centers and labs.

Environment: The internship will take place under the supervision of Lionel Reveret (INRIA researcher) on the Saint Martin d'Hères campus, in the LJK laboratory. The LJK laboratory is a research unit dedicated to Computer Science and Applied Mathematics, located on the Saint Martin d'Hères campus and associated with CNRS, Grenoble-INP, UGA and INRIA. An access to the INRIA Grenoble research center (Montbonnot) is foreseen for the experimental aspects of the Kinovis multi-camera platform which allows the generation of dynamic 3D meshes.

Figure 1 - Preliminary results in Boxing and Speed Climbing

Skills: Initial skills are required in computer vision, 3D geometric modeling, and machine learning as well as an interest in the study of human movement in the context of high-level sports. Development will be done in Python or C++.

Application: The remuneration is subject to the public institution rules, namely 577 euros per month. The internship will begin no later than March 1, 2022, for a period of 5 to 6 months. It is possible to apply in pairs for two separate internships, the work being explicitly divided between the two tasks described. Applications should be sent to Lionel Reveret, lionel.reveret@inria.fr