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Activity representation with motion hierarchies

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Complex activities, e.g., pole vaulting, are composed of a variable number of sub-events connected by complex spatio-temporal relations, whereas simple actions can be represented as sequences of short temporal parts. In this paper, we learn hierarchical representations of activity videos in an unsupervised manner. These hierarchies of mid-level motion components are data-driven decompositions specific to each video. We introduce a spectral divisive clustering algorithm to efficiently extract a hierarchy over a large number of tracklets (i.e., local trajectories). We use this structure to represent a video as an unordered binary tree. We model this tree using nested histograms of local motion features. We provide an efficient positive definite kernel that computes the structural and visual similarity of two hierarchical decompositions by relying on models of their parent-child relations. We present experimental results on four recent challenging benchmarks: the High Five dataset, the Olympics Sports dataset, the Hollywood 2 dataset, and the HMDB dataset. We show that per video hierarchies provide additional information for activity recognition. Our approach improves over unstructured activity models, baselines using other motion decomposition algorithms, and the state of the art.

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Simulation & modeling: Realistic human and traffic behaviour simulation in 3D visualization

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There had been an emphasis of simulation tools for transportation industry since early 80's whereas on pedestran movements, several studies and models had been researched since 90's. Today, there are tools that can provide the methatical analysis of the behaviours and pridections regarding the proposed development. These mathematical interpretations can only be understood by specialised transport planners or engineers, whereas most critical decisions regarding any proposed development is the virtue of political and public will. The need for simplifying the mathematics and converging into a simplified visual medium that can be understood by public and polititians to asscess the impact is the reason behind the development of the algorithm that defines this paper. The raw mathematical outputs from the traffic simulations are converted to high quality 3D visualisation using a virtual reality rendering processor. Traffic simulation software concentrates on mathematical accuracy of the traffic behaviour rather than realistic and accurate visualisation of the traffic and its surroundings. This is primarily due to the inability of existing software to handle detailed, complex 3D models and structures in the simulation environment. This technology (VR Platform) is currently under the exclusive IP of Sunovatech and is used as the core part of visualisation process wherein thouans of vehicles and pedestrians are animated as an automated process. Using the VR platform a highly realistic and accurate simulation of vehicles, pedestrians and their traffic infrastructure such as signals and buildings can be achieved. This technology offers decision makers, the traffic engineer and general public a unique insight into traffic operations. It is highly cost effective and an ideal tool for presenting complex ideas in any public consultation, presentation or litigation process. This presentation will focus on how to combine the realistic human and trasportation simulations in a 3D visualization along with urban design elements. The use of simulation in all 3D visualization projects gives an accurate results to planners, engineers, architects and emergency response department to test and approve the design of the infrastructure. With this technology, we have created stunning visualization and provide solutions to multi billion projects, with the integration of 3D visualisation software with the traffic micro-simulation tools to create a close to real environment in terms of behaviour, volumes, and routings. Caliberated and validated micro-simulation models are being combined with the powerful rendereing tool to visualise proposals before they are implemented on ground.

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