Paper review: MoGlow: Probabilistic and controllable motion synthesis using normalising flows

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Data-driven modelling and synthesis of motion data is an active research area with applications that include animation and games. This paper introduces a new class of probabilistic, generative motion-data models based on normalising flows, specifically Glow. Models of this kind can describe highly complex distributions (unlike many classical approaches like GMMs) yet can be trained stably and efficiently using standard maximum likelihood (unlike GANs). Several model variants are described: unconditional fixed-length sequence models, conditional (i.e., controllable) fixed-length sequence models, and finally conditional, variable-length sequence models. The last type uses LSTMs to enable arbitrarily long time-dependencies and is, importantly, causal, meaning it only depends on control and pose information from current and previous timesteps. This makes it suitable for generating controllable motion in real-time applications. Every model type can in principle be applied to any motion since they do not make restrictive assumptions such as the motion being cyclic in nature. Experiments on a motion-capture dataset of human locomotion confirm that motion (sequences of 3D joint coordinates) sampled randomly from the new methods is judged as convincingly natural by human observers.