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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 nor- malising flows, specifically Glow. Models of this kind can describe highly complex distributions (unlike many clas- sical approaches like GMMs) yet can be trained stably and efficiently using standard maximum likelihood (unlike GANs). Several model variants are described: uncondi- tional fixed-length sequence models, conditional (i.e., con- trollable) fixed-length sequence models, and finally condi- tional, 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 restric- tive assumptions such as the motion being cyclic in nature. Experiments on a motion-capture dataset of human loco- motion confirm that motion (sequences of 3D joint coordi- nates) sampled randomly from the new methods is judged as convincingly natural by human observers.