UT Austin Villa: Machine Learning through Morphing of Heterogeneous Robot Models

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Description

New for this year's 3D simulation competition is the addition of heterogeneous robot models given out only a few days before the competition. When the dimensions of a robot model are changed this often requires the modification and re-tuning of parameterized motion primitives such as walking, kicking, and getting up after falling. Given the short amount of time before the competition to re-tune things, automated machine learning algorithms are preferred over time-consuming tuning approaches that require manual human input and intervention.

Typically a requirement of machine learning algorithms is the need to be initialized with a stable starting point or "seed" value to begin searching for good values over a parameter space. When changing the dimensions of a robot model this can become problematic as values used for a previous model may not work at all with the new model; this is particularly true of getup routines for which a robot may be unable to stand up after falling when the body dimensions of the robot have changed. Rather than having a human attempt to manually come up with new stable values to use as a seed for machine learning algorithms, instead we propose the novel idea of slowly morphing the original robot model (for which a stable seed exists) to the new model during the course of optimization. Morphing the robot model negates the need to come up with new seed values for different robot models and allows for a fully automatic machine learning approach to re-tuning parameters for heterogeneous robots.

Presentation

The presentation will include a few slides and related videos as to how morphing a known robot model to a new one can be used to fully automate machine learning approaches for tuning motion primitive parameters for new robot models. The presentation will conclude with a live demonstration of learned getup motion primitives for a new robot model.