UT Austin Villa: Optimizing Robot Body Morphologies for Maximizing Performance and Potential in Running and Kicking Tasks

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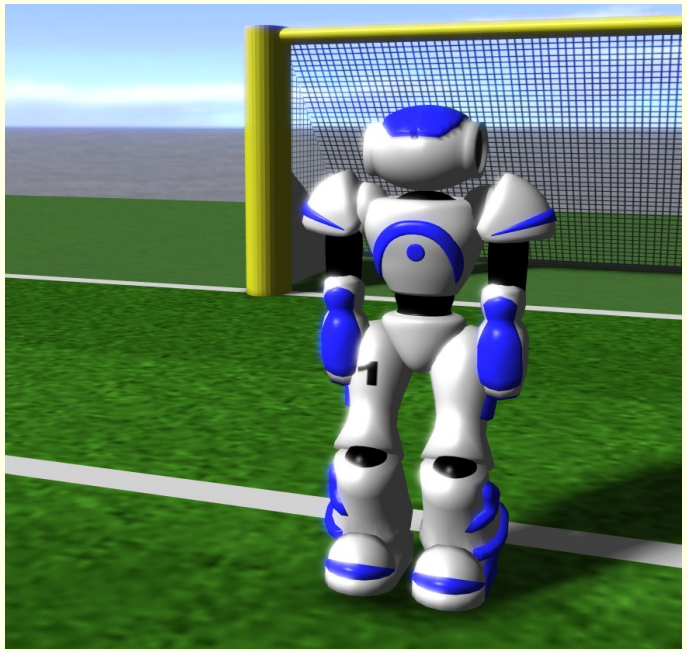
Omnidirectional Walk Engine

- Expensive to design and build new physical robot body prototypes
- Simulation allows us to quickly and easily test out new body morphologies



HARD

EASYier

Tasks

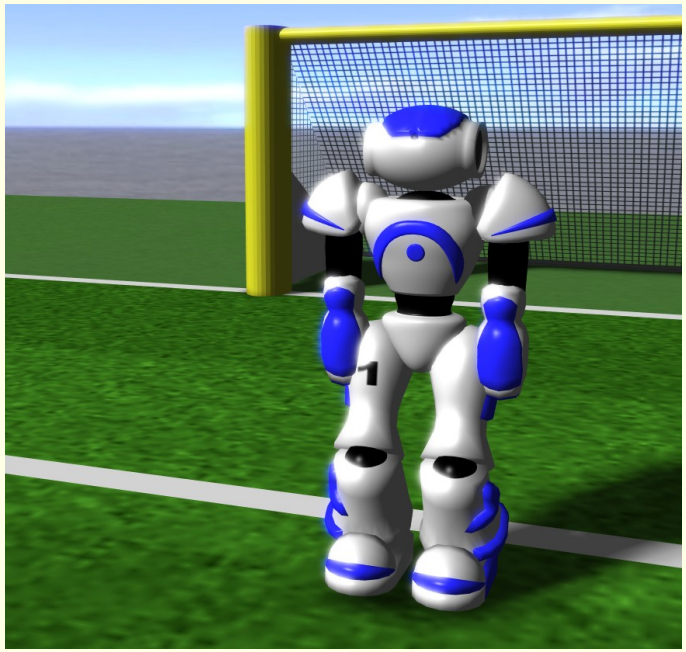
- Running = Distance traveled forward in ten seconds + percentage of time both feet off ground

- Kicking = maximum distance ball kicked in forward direction

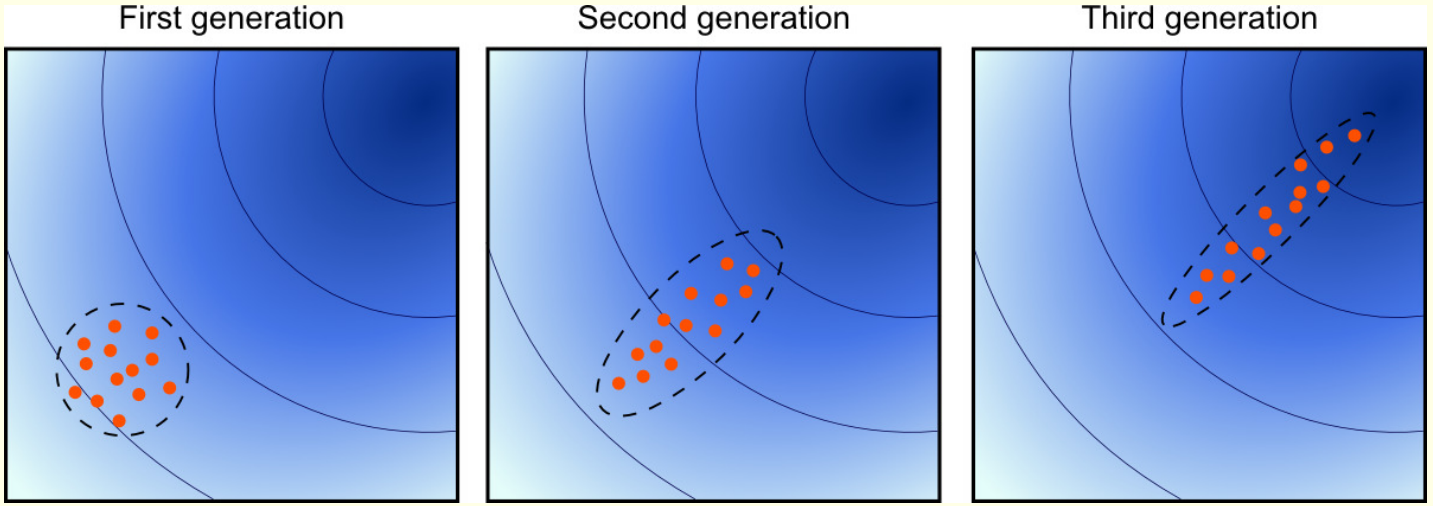
Performance and Potential

- Not changing any power or mass variables

- Only changing x, y, z postitions of six leg joint anchor positions: torso->hip1, hip1->hip2, hip2->thigh, thigh->shank, skank->foot



CMA-ES (Covariance Matrix Adaptation Evolutionary Strategy)



- Evolutionary numerical optimization method
- Candidates sampled from multidimensional Gaussian and evaluated for their fitness
- Weighted average of members with highest fitness used to update mean of distribution
- Covariance update using evolution paths controls search step sizes

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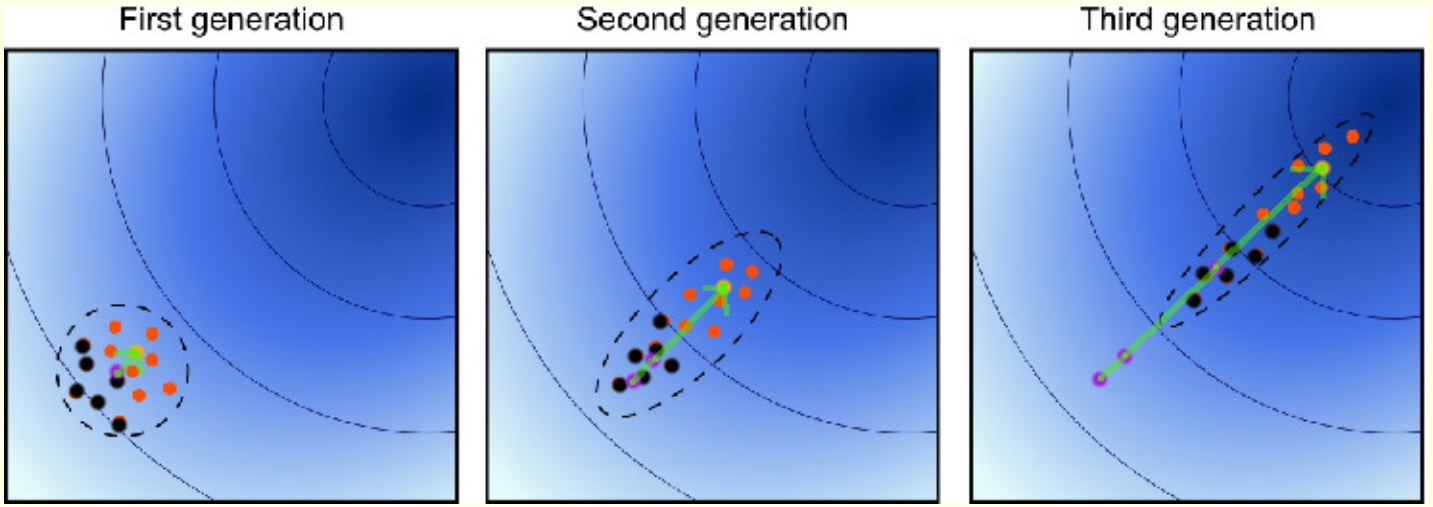

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