McMaster University | Engineering Computing & Software

Evolving Robot Controllers with Emergent Tangled Program Graphs

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SFWRENG 4G06: Software Design IV Capstone Design Project

Project Goals

We present both software engineering and research contributions in this project:

1. Align TPG with standard software engineering practices, including continuous integration and comprehensive testing.
2. Develop an interface between TPG and MuJoCo (Multi-Joint dynamics with Contact), to generate experiments for selected environments to test TPG's capabilities

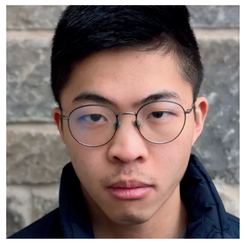
Our Team

Team Tangle consists of these members:

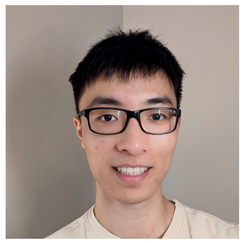
Cyruss Allen Amante
Software Engineering

Richard Li
Software Engineering

Mark Angelo Cruz
Software Engineering



Calvyn Siong
Software Engineering



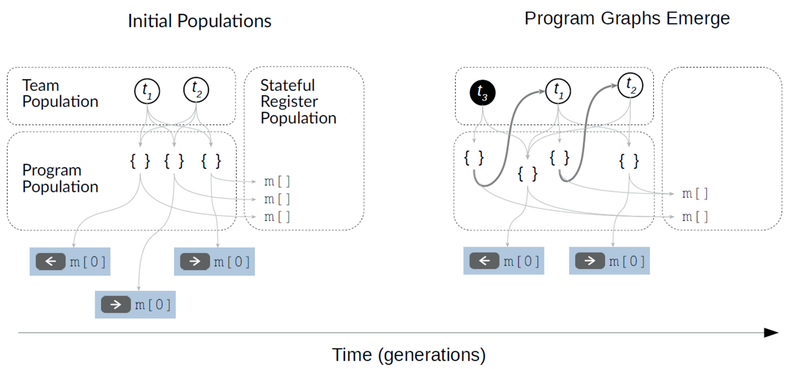
Edward Gao
Software Engineering

Acknowledgment

Our team would like to acknowledge Dr. Stephen Kelly (Project Supervisor) for his immense support and guidance throughout the duration of the Capstone project.

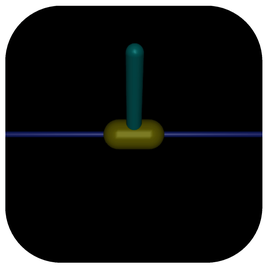
Context

Tangled Program Graphs (TPG) is a reinforcement learning framework based on genetic programming, which evolves agents composed of interconnected programs.



MuJoCo Environments

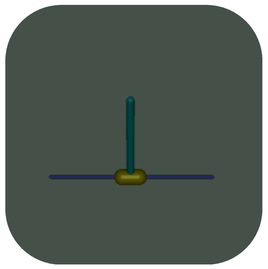
The following MuJoCo environments have been integrated into Tangled Program Graphs:



Inverted Pendulum

Humanoid Standup

Half Cheetah



Inverted Double Pendulum

Hopper

Ant

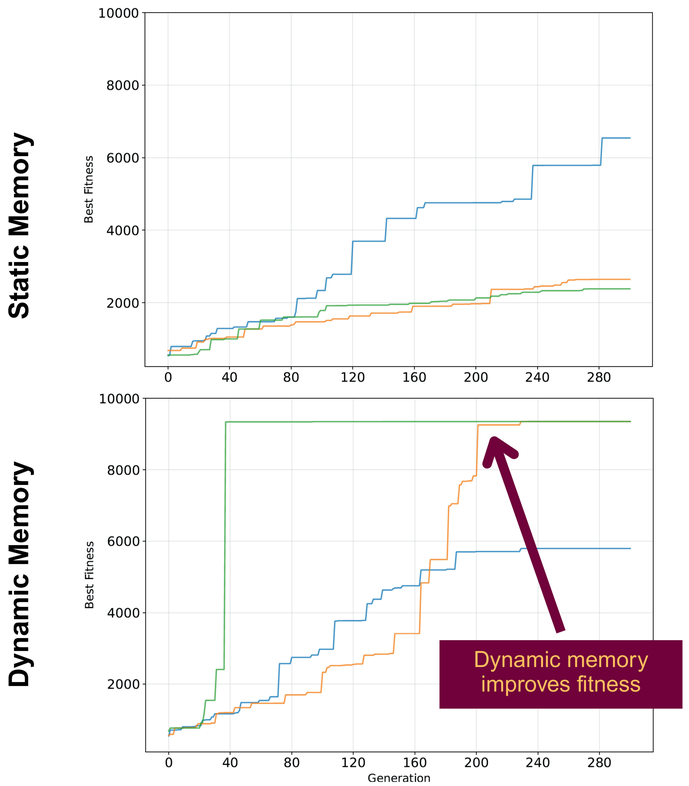
Notable Enhancements

Containerization for Reproducibility: We ensure that experiments can be replicated across different computing environments

CLI for Reinforcement Learning Experimentation: We simplify the process of launching and managing RL experiments

Enhanced Logging and Configuration System: Providing more comprehensive and accessible experiment data

CI/Test Cases: Execute automated unit testing and project building to ensure code reliability

Dynamic Memory Research

Goal: Determine whether dynamic memory can enhance learning performance compared to fixed-memory approaches. Below shows the fitness levels for inverted double pendulum.