Research Plan

Dezshaun Meeks

HRBB 407

Mentor: Dr. Nancy Amato

Supervisor: Sam Ade Jacobs

Department: Computer Science and Engineering

Program: REU
Research Title

Region Connection in Parallel Sampling-Based Motion Planning

Purpose

The current implementation of the region connection in parallel sampling-based, motion planning; is naive and has some impact on the scalability results especially at higher processor counts and sample sizes. The purpose is to design and implement a better region connection method(s).

Project Goals and Implications

This project is apart of the parallel motion planning research and its primary goal is to develop scalable parallel algorithms and methods for motion planning algorithms. It is expected that these methods and algorithms will scale well on massively parallel machines. My contributions will be part of achieving the overall objectives.

Personal Goals

My personal goals for this research are to increase my programming skills as well as my ability to problem solve. I also want to enhance my abilities on tackling huge projects, and working together with groups of people on team based algorithms. But above all, my main goal is to learn as much as I can so that I can develop a better region connection in parallel sampling-based motion planning.

Methods

The methods used for this research are parallel programming in the computer language C++, and the used of the framework, Standard Template Adaptive Parallel Library (STAPL). Methods also include, becoming knowledgeable of generating motion paths, and how machines (like robots) use these paths to advance its way from a given point to a destination so that we can build a foundation of what we need to accomplish, which will result in better implementation of code.
Work Schedule

The common work schedule is M-F 9:00 am to 5:00 pm. However, some days may be from 10:00 am to 6:00 pm.

Deliverables and Dates

June 8th – Initial website emailed

June 9th – Research Plan

July 6th – Midterm Evaluation

July 28th – Research abstract

August 1st & 2nd – Student presentations

August 3rd – Final Research paper

August 4th – Final Website & Final Evaluation

August 5th – Final Research poster

Mentor’s Project Goals

The overall objective of our research is to develop a scalable framework for parallelizing sampling-based motion planning algorithms. We target massively parallel machines but without sacrificing the quality of solutions. Currently, our existing framework, as a prototype, works well if the environment is uniformly cluttered. We will like to generalize the approach such that it also work well in a more difficult environment. We will also explore other region connection methods so as to enhance the scalability and performance of our framework.

Mentor’s Student Mentee Goals

Our current implementation of region connection in parallel sampling based motion planning is naive and has some impact on the scalability results especially at higher processors counts and sample sizes. Student mentee (Dezshaun) is expected to design and implement better region connection method(s). Dezshaun is expected to work independently but cooperatively with Sam on this task.

During the course of the summer research, each student mentees will be required to read relevant papers assigned by the mentor (especially in the first two weeks). Papers deal with motion planning for all students, multi-robot systems and computer vision techniques specially for students working in group behavior research and parallel sampling-based motion planning and
feature-sensitive motion planning papers for students working in parallel motion planning research. These papers will be discussed at regular intervals. The student mentees will also be required to submit weekly reports to the faculty mentor detailing their progress and describing any difficulties. In addition, they will interact with the student mentor daily and work on sub-goals.