April 24 (BERT 012)

9:30 am: Dan Dillon

The Effect of Shock Waves on a Freeway Link with Constant Speed Limits

This paper uses the METANET macroscopic traffic model to simulate traffic flow of a single two-lane highway. To study the impact of a sudden increase in traffic density on the dynamics of traffic, this paper examines the total time spent (TTS) of vehicles in the system under different constant speed limits. The density increase causes a traffic jam known as a shock wave. Under validated METANET parameters and a shock wave introduced in the final segment of the freeway link, a speed limit of 39 km/h minimizes TTS in the system. At speed limits of 70 km/h and above, TTS reaches a steady state level 30.8 percent higher than the value for 39 km/h. Without a shock wave, TTS decreases with increasing speed limits. The complex pattern of TTS as a function of constant speed limits during a shock wave underscores the importance of previous work on dynamic speed limits to control a system in which shock waves occur.

9:50 am: Will Kanegis

Iterative Prisoner's Dilemma and the Genetic Algorithm

In this paper we simulate Iterated Prisoner's Dilemma, a model for cooperation and conflicts of interest. The genetic algorithm was employed to determine optimal Iterated Prisoner's Dilemma strategies. Fitness of strategies was measured by performance against other strategies in the population, and cooperation was found to be the best strategy after sufficiently many iterations. Uncooperative strategies prevailed in the earlier generations of the simulation, but the final resulting strategies cooperated with one another almost exclusively.

May 1 (BERT 012)

10:10 am: Meghan Frate

Escaping the Earth

Using Molecular Dynamics simulations we study the three body problem of the Sun, Earth, and a projectile of mass on the order of the Moon. The projectile is launched at the surface of the Earth from different launch angles from a stationary launch point and will be launched with various velocities above and below the escape velocity of the Earth to determine whether the projectile escapes the force of gravity of the Earth and the Sun, or whether it gets bound in orbit around the Earth or Sun. We then compare our simulated results of the escape velocity with the predicted escape velocity and show preliminary work on the Projectiles motion.

10:30 am: Sowande Parkinson

Self-Organized Criticality in a Sandpile Model

A simple model of Self-Organized Criticality is the sandpile model. The Bak, Tang, Wiesenfeld sandpile model is simulated and we determine the distribution of avalanche sizes $P(s)$. We use as a lithmus test for the presence of Self-Organized Criticality that $P(s)$ follows a power law. We determine the exponent of this power law for various scenarios of adding grains to the sand pile.