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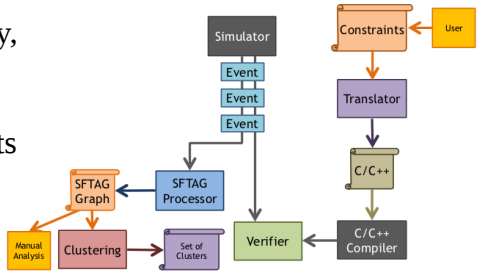
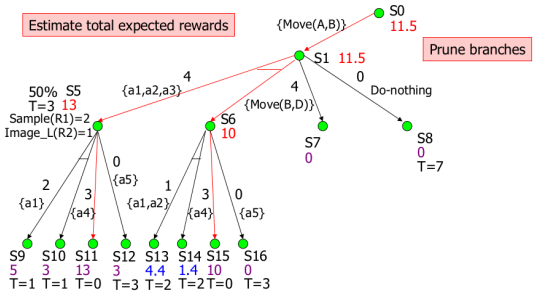
DECISION MAKING UNDER UNCERTAINTY

Did you notice that the road above has no forks and it's not covered with fog, but you still don't know what lies ahead? Many people think that decision making under uncertainty is the problem of being presented with multiple options and choosing the best option. In reality, the problem is much more complex because the forks and options are not readily seen. My research spans a range of interdisciplinary areas where uncertainty is prevalent.

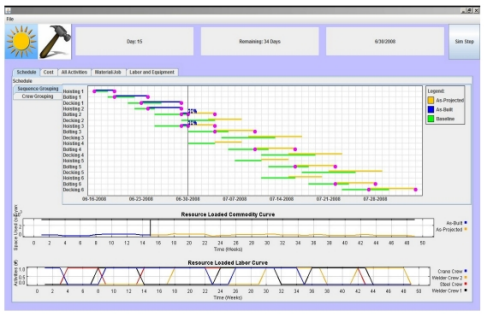
Simulator Verification: Simulators are large, complex software which are continually under development and thus need to be continually verified. Recently, we developed a graphical structure that enables us to automatically derive verification constraints from simulator traces. SFTAGs (State Flow Temporal Analysis Graphs) take into account stochastic paths and durations taken by events that are being simulated. These graphs facilitate the comparison of temporal results obtained with different simulation parameters.





Constructing Parallel Plans: Automatic generation of robust plans that will operate in realistic domains involves reasoning under uncertainty, operating under time and resource constraints, and finding the optimal set of goals to work on. Creating plans that consider all of these features is a computationally complex problem that we address with our planner CPOAO* (Concurrent Probabilistic Oversubscribed Planning using AO*). CPOAO* includes novel domain independent heuristics and pruning techniques to reduce the search space.

Risk Informed Project Management: The construction industry is the largest single production activity in the U.S economy – accounting for almost 10% of the gross national product. As with other projects, contingencies commonly cause delays and added costs in construction projects. Our work involves providing automated techniques to avoid and respond to contingencies. We developed ICDMA (Interactive Construction Decision Making Aid) which uses AI planning technology to predict the paths a project can take.



Student Persistence in Engineering and Computer Science: Careers in engineering and computer science usually promise a job well-respected by the society and one with a good salary. However, approximately 55% of the US students leave these fields within 6 years, either switching to a non-STEM field or leaving higher education altogether. Our group investigates the complex issues surrounding student persistence, including who influences students' career choices, what factors affect students' deliberations about changing majors, and what are the gender differences in the reasons for staying in a major.
P.S. The road above leads to beautiful Lake Superior from McLain State Park, Michigan.