Honors Research Presentation
Visualized Decision Making and Planning

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The Team

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Motivation

- How can we use computers to help humans make complex decisions?

- Components of computer aided decision making:
  1. algorithms (this has been done)
  2. visualizing/presenting to the user (this is where we come in)
Example of Planning - Student Advising

- Students **decide** each quarter what classes to take
- Students receive grades each quarter as **outcomes** of classes
Survey Time!

Students only. (Sorry Professors.)
Example of Planning - Student Advising

- Current advice is usually of the form "Take this, this, this, this, and that" such as on flow charts.

- Could we give better advice by considering which classes a student has taken and what grade they received in each?
Example of Planning - Student Advising

<table>
<thead>
<tr>
<th></th>
<th>Calculus I</th>
<th>Intro to Computer Science</th>
<th>Computer Networks</th>
<th>Intro to Databases</th>
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<tr>
<td>Brian</td>
<td>A</td>
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<tr>
<td>Jen</td>
<td>B+</td>
<td>A-</td>
<td>C</td>
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<td>Shannon</td>
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<td>Alex</td>
<td>B</td>
<td>A</td>
<td>B-</td>
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</tbody>
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Developing Advice

How do humans decide what advice to give? We use:

- **desirability of outcome** - how desirable (or undesirable) is it to be in a given situation; based on user preferences and goals
- **likelihood of outcome** - the likelihood that taking a given action will lead to a given outcome

In our system:

likelihood = probability; desirability = utility
Definitions - Plans and Policies

- **plan** - a linear sequence of actions to take

- **policy** - a description of the actions you should take in each possible situation
Take Artificial Intelligence. If you do well, take data mining, otherwise, take the SE sequence.
Example of Planning - Student Advising

How many possibilities do we need to account for?

**Conservative Estimate**
4 classes/quarter * 3 quarters/year * 4 years = 48 classes

Possibilities Class Outcomes (13 of them):
Not Taken, A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F

So, \[ \frac{13^{48}}{13} \] is a lower bound for the number of possible situations!

Humans can't handle that many possibilities, but computers can!
The Million Dollar Question

How do we visually and interactively present information about *plans* and *policies* to users?
Project Workflow/Status

- Develop Goals/Cognitive Model
- Critique Old System
- Brainstorm for new System
- Design Backend API
- Implement Backend API
- Test and Fix Backend API

- Design New Interfaces
- Implement New Interfaces
- Test and Fix Interfaces
- Perform Experiments
- Analyze Results

We are Here
Cognitive Model

How do humans think about planning?

- **State** - What is my situation?
  - What should I do from here?
    - What **should** I do from here?

- **Actions** - What can I do from here?

- **Results** - How will my situation change if I take a certain action?
  - likelihood
  - desirability
Old Interface
New "Traditional" Interface
New "Explosion" Interface
New "Time Machine" Interface
Evaluating our Work

We want to know, objectively and subjectively:

- what is (not) useful
- what does (not) match user's cognitive model
- what is (not) improved in the newer interfaces from the original interface
More Information

Visit our project wiki at
http://wiki.csc.calpoly.edu/planit
Questions?
Anybody Interested?