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)
- What's out there is inflexible and not adaptive.
Example of Planning - Student Advising

- Students decide each quarter what to take
- Current advice is usually of the form "Take this, 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>
</tr>
</thead>
<tbody>
<tr>
<td>Brian</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Jen</td>
<td>B+</td>
<td>A-</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>Shannon</td>
<td>C</td>
<td>C-</td>
<td>F</td>
<td>D+</td>
</tr>
<tr>
<td>Alex</td>
<td>B</td>
<td>A</td>
<td>B-</td>
<td>C</td>
</tr>
</tbody>
</table>
Developing Advice

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

- **likelihood of outcome** - the likelihood that taking a given action will lead to a given outcome

- **desirability of outcome** - how desirable (or undesirable) is it to be in a given situation; based on user preferences and goals

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.
How many possibilities do we need to account for?

**Conservative Estimate**

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

Possibilities for each class:
Not Taken, A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F
(13 of them)

So, \(13^{48}\) 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

1. Develop Goals/ Cognitive Model
2. Critique Old System
3. Brainstorm for new System
4. Design Backend API
5. Implement Backend API
6. Test and Fix Backend API

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

We are Here
Old Interface

PlanIt: The Interactive Planner

Current State

- Slightly wet recently
- I am having a good time
- I am a teenager
- I am not thirsty
- I am not tired
- Slightly thrilled recently
- I am hungry
- Lots of shows recently

Possible Result States

- Fairly wet recently
- I am having a good time
- I am a teenager
- I am not thirsty
- I am not tired
- Fairly thrilled recently
- I am hungry
- Some shows recently

4.3% 0.5% 17.3% 1.9% 6.5% 2.9% 0.7% 0.3% 26.9% 11.5%

Result State

Ride a water-drop ride (Suggested)

Suggested Action

- Ride a water-drop ride

Alternate Actions

- Have a drink
New Baseline Interface
New "State-Action" Interface Concept
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
Experimental Design

- Experiment group: A computer science lab class
- Objective measures
- Subjective measures
- Same domain, different interfaces
Sound Interesting?

If this sounds interesting to you, we want your help!

Please contact us at boppenhe@calpoly.edu and/or dekhtyar@calpoly.edu
More Information

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