A Mixed-Initiative System for Building Mixed-Initiative Systems

Craig A. Knoblock, Pedro Szekely, and Rattapoom Tuchinda
Information Science Institute
University of Southern California
| WASHINGTON DC AREA HOTELS LIST | 0 | 10/14/05 4:34 pm | Jenniann *
| Bid Assistance DT-WH, Dupont-Woodley 4* 11/9-11/11 | 0 | 10/17/05 12:20 am | whidbeyone *
| Bidding assistance 11/17-11/20 Dupont Circle | 6 | 10/16/05 9:58 pm | CreamandCrimson *
| 4* J.W. Marriot WH-DT 10/9-10/11 $112 | 3 | 10/15/05 3:00 pm | nancyrea *
| Bidding assistance -Washington DT/WH Feb 18,2006 | 5 | 10/14/05 3:11 pm | poulie45 *

[Map]

[BiddingForTravel.com]

[Priceline]

[Orbitz]
alcmenetest

address  2799 Jefferson Davis Highway

city     Crystal City

state    Virginia

zipcode  22202

checkin  11/04/05

checkout 11/06/05

BiddingForTravel
BiddingForTravel

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<th>area</th>
<th>star</th>
<th>hotelname</th>
<th>biddingForTravel_price</th>
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</thead>
<tbody>
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<tr>
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<tr>
<td>Crystal City</td>
<td>3</td>
<td>Crown Plaza</td>
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<tr>
<td>Crystal City</td>
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<td>Double tree Crystal City</td>
<td>$60</td>
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</tbody>
</table>
Heracles (Hair·a·cles)

- Designed for implementing mixed-initiative, multi-source information assistants
- Break down tasks into hierarchy (templates)
- Use constraint propagation networks.

Diagram:
```
  Variables
    ∋ Constraints         GUI
```

Heracles Constraint Structure
We want to provide a system that allows end users to build a new application without having to program.

Alcmene is built as an application in Heracles.

A mixed-initiative system for building mixed initiative systems
Geocode the address.

Input: 1. wholeaddress: such as 3767 clarington ave, Los Angeles
Output: 1. wholeaddress
2. lat
3. lon
Geocode the address.

Input: 1. wholeaddress: such as 3767 clarington ave, Los Angeles
Output: 1. wholeaddress
       2. lat
       3. lon
### alcmene

#### Save Template
- **myprogram**
- **debug**
- **save**

#### wholeaddress
- **3767 Clarington Ave, Los Angeles, CA 90034**

#### result
- **3767 Clarington Ave, Los Angeles, CA 90034**
  - **lat**: 34.023086
  - **lon**: -118.401261

#### Add Variable
- **name**
- **Create**

<table>
<thead>
<tr>
<th>wholeaddress</th>
<th>lat</th>
<th>lon</th>
</tr>
</thead>
<tbody>
<tr>
<td>3767 Clarington Ave</td>
<td>34.023086</td>
<td>-118.401261</td>
</tr>
</tbody>
</table>
Automating the linking of sources

- Search to suggest possible plan paths
  - Users might have some ideas of the goal but don’t always know how to get there.

- Partial Plan Execution
  - User don’t always know what to expect for the output
  - Data sources are dynamic
Search Steps

- Defining source domain model and type
  - Orbitz($indate, $outdate, $city, hotelname, price, address)
  - Geocoder($address, lat, lon)
  - SatelliteMap($lat, $lon, $*, image)

- Searching through the domain model space
  - Suggest the possible paths to users.

- Show the intermediate results (Partial Plan Execution)
Searching through the domain model space

{address, indate, outdate, city}

- **Orbitz**($indate, $outdate, $city, hotelname, price, address)
- **Geocoder**($address, lat, lon)
- **SatelliteMap**($lat, $lon, $*, image)
Searching through the domain model space II (Bound search)

- Metadata description and Data Indexing of sources
- Locating possible goal by keyword search

{Address, City, State, Zip} → “Map”

Map

SatelliteMap($lat, $lon, $*, image)
Cycles and Binding sources

\{Address, City, State, Zip\}

\{Address, City, State, Zip, $password, lat, lon\}

\textbf{Geocoder}

\textbf{SatelliteMap($lat, $lon, $data, image$)}

\textbf{Map}
Multiple candidate paths available

- The number of candidate plan paths can be very large
- Execute all of them
  - Many of them are not useful or correct.
  - Reduce the result spaces
Dealing with path explosion

- Problem: A source might return 100,000 tuples.
- Sampling the result and continue expanding
  - Segmenting the result using some attributes (i.e. Gender – M/F) and map selected attribute as a binding to existing variables.
  - Randomly
- Cap the source that generates too many results
Other technical issues

- Constraint Specification
  - Basic operations depending on the variable type with Excel like expression

- Record Linkage
  - Integrating existing record linkage system into Alcmene

- Semantic Mapping between variables
  - Inducing source descriptions for automated web service composition.
Related Work

- **Heracles**

- **Wrappers**

- **Dynamic Webpages**

- **Mixed-initiative Planning Application**
Conclusion & Future work

- A mixed-initiative system for building mix-initiative systems.

- Status
  - Initial prototype allows the definition of simple types of variables and constraints

- Next step
  - Automatic linking of sources