Object Services and Consulting, Inc.

LingoLogic

Menu-based Natural Language Interfaces

what an end user sees when using LingoLogic

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The Basic Idea

Natural language seems like a great idea for communicating with computers. Indeed, computers are able to process natural language in several areas: text to speech, speech to text, text translation, and keyword-based retrieval. But the area of natural language interfaces (NLI), where the computer processes complex queries or commands, has enjoyed very limited success, so much so that natural language is not much used in user interface development.

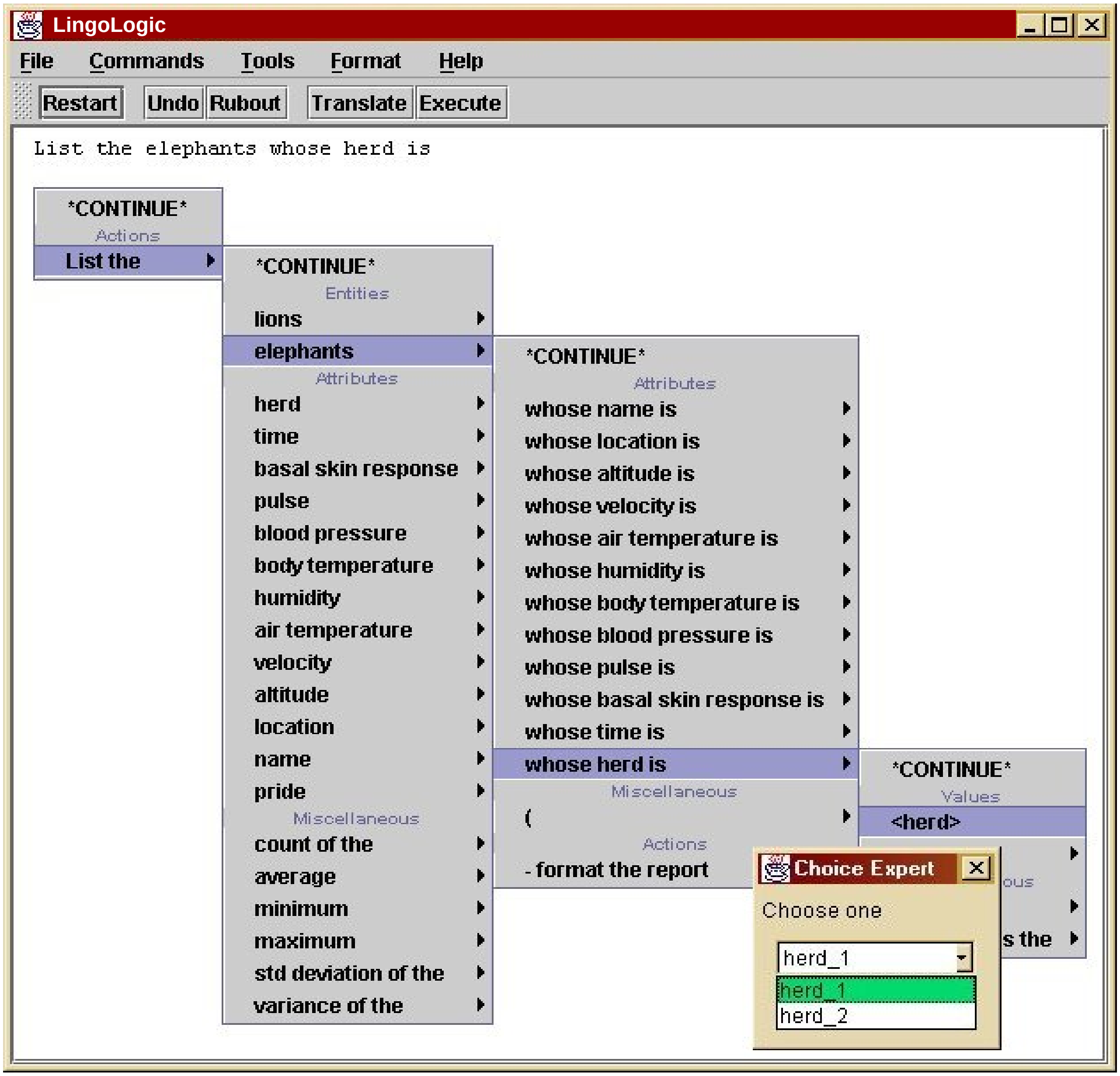
To understand why, try typing or speaking to a system that has a NLI – most of your questions and commands will not be understood because they overshoot the capabilities of the NLI system or the underlying application it interfaces to. In addition, you won’t really know about some things you could ask about (does the system handle map or statistical queries?) so your questions and commands will also undershoot the capabilities of the NLI system. This mismatch between user expectations and NLI system capabilities is called the *habitability* problem.

LingoLogic technology uses standard NLI technology but in a menu-driven, completion-based way to restrict the language and guide the user to just the capabilities of the NLI and underlying system. The technology targets a large unfilled niche in user interface design enabling unskilled users to make complex queries and commands. Interface development is much easier and has been automated in the case of LingoLogic interfaces to relational DBMS systems.

OBJS has developed the LingoLogic Toolkit containing tools for creating and delivering NLI interfaces. The core technology is attribute grammars and a predictive parser. The system runs on Windows 95/98/NT/2000/XP.

Cascading Popup Menus

The user composes a sentence either by typing it in or selecting items from a cascade of menus driven by the grammar and predictive parser. Other supported LingoLogic user interfaces provide speech and a space efficient sentence-completion menu configuration.



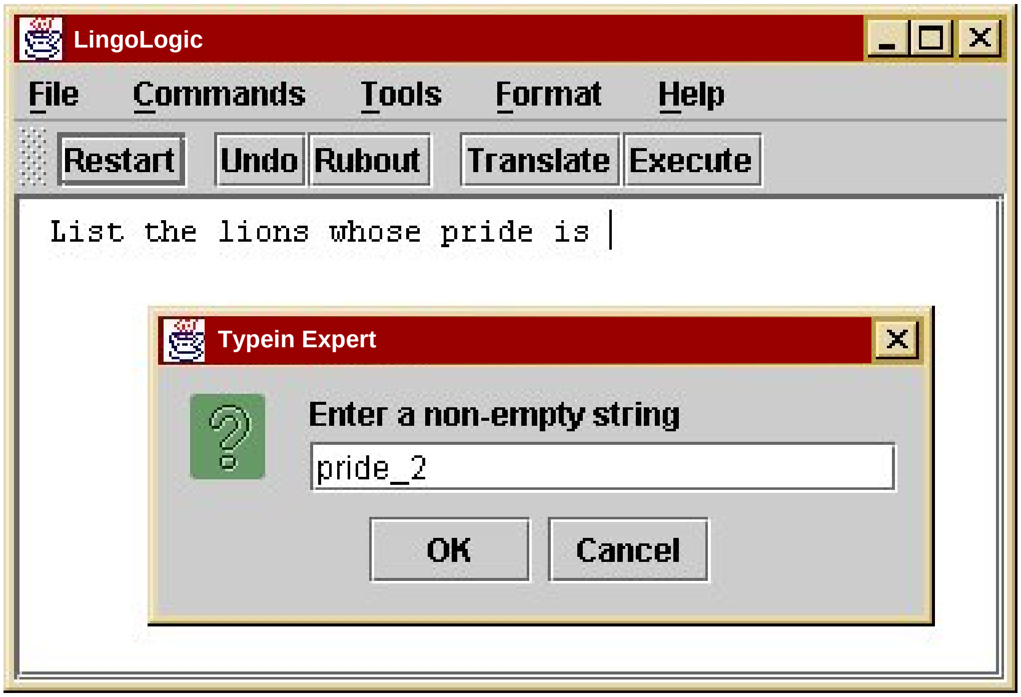
```
List the elephants whose herd is
```

The buttons and their functionality are:

- **Restart** - erases the entire sentence and reinitializes the parser to begin again.
- **Undo** - erases the last phrase selected or character of the phrase being typed in.
- **Rubout** - erases the last phrase selected
- **Translate** - translate the sentence to SQL and display it in a separate window.
- **Execute** - translate the sentence to SQL, send the query to a database, and display the result in a separate window.

Domain Experts

Domain experts provide domain-specific support for specifying values. If an expert is selected, a menu supports the user in specifying a value. For instance, a DBMS choice expert is shown on the previous page and a type-in expert is shown below. LingoLogic design supports an extensible library of experts (e.g., date, map).



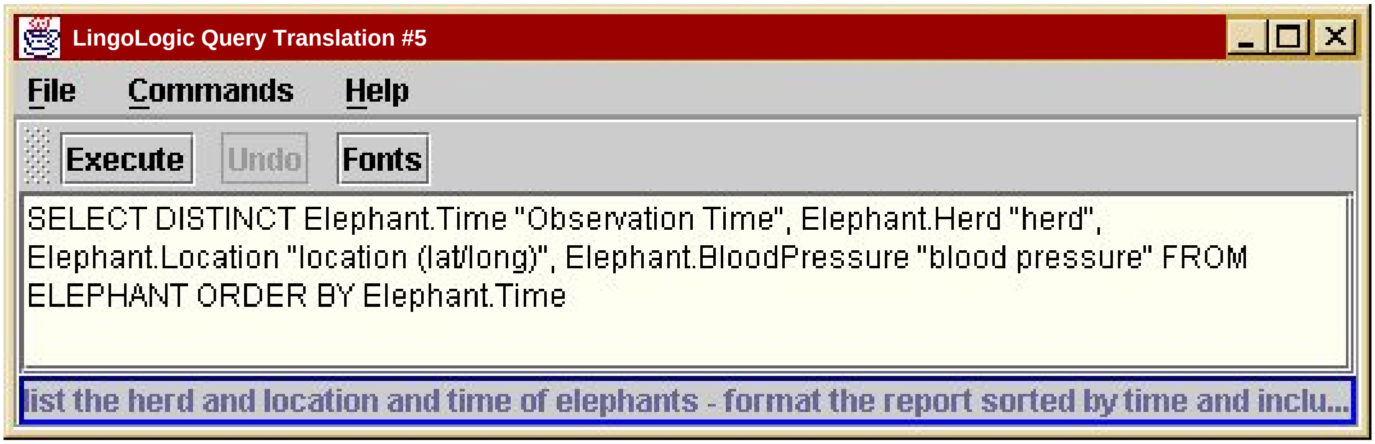
List the lions whose pride is

Enter a non-empty string

pride_2

Query Translation

In the widely useful case of relational databases, default standard grammars and translations are provided and can be combined with DBMS schemas at run time to automate the generation of LingoLogic interfaces to DBMS systems that use SQL. To view the SQL for a composed sentence, the user clicks on the **Translate** button. The sentence and SQL are displayed in a TextArea that can be edited:

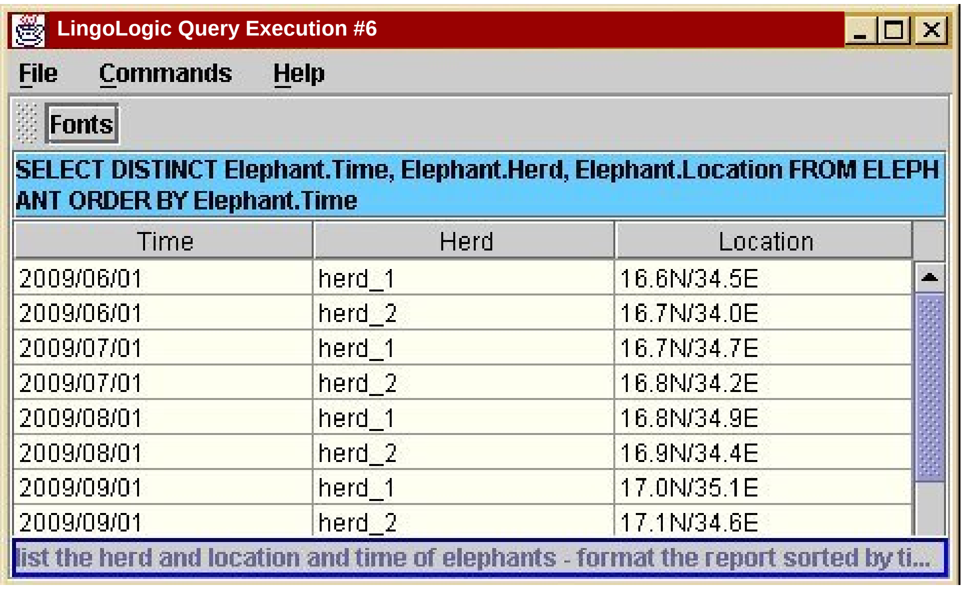


```
SELECT DISTINCT Elephant.Time "Observation Time", Elephant.Herd "herd",
Elephant.Location "location (lat/long)", Elephant.BloodPressure "blood pressure" FROM
ELEPHANT ORDER BY Elephant.Time
```

list the herd and location and time of elephants - format the report sorted by time and inclu...

Query Execution

To execute the query and view the query result, one clicks on the **Execute** button in either the main NLI window or the translate window:



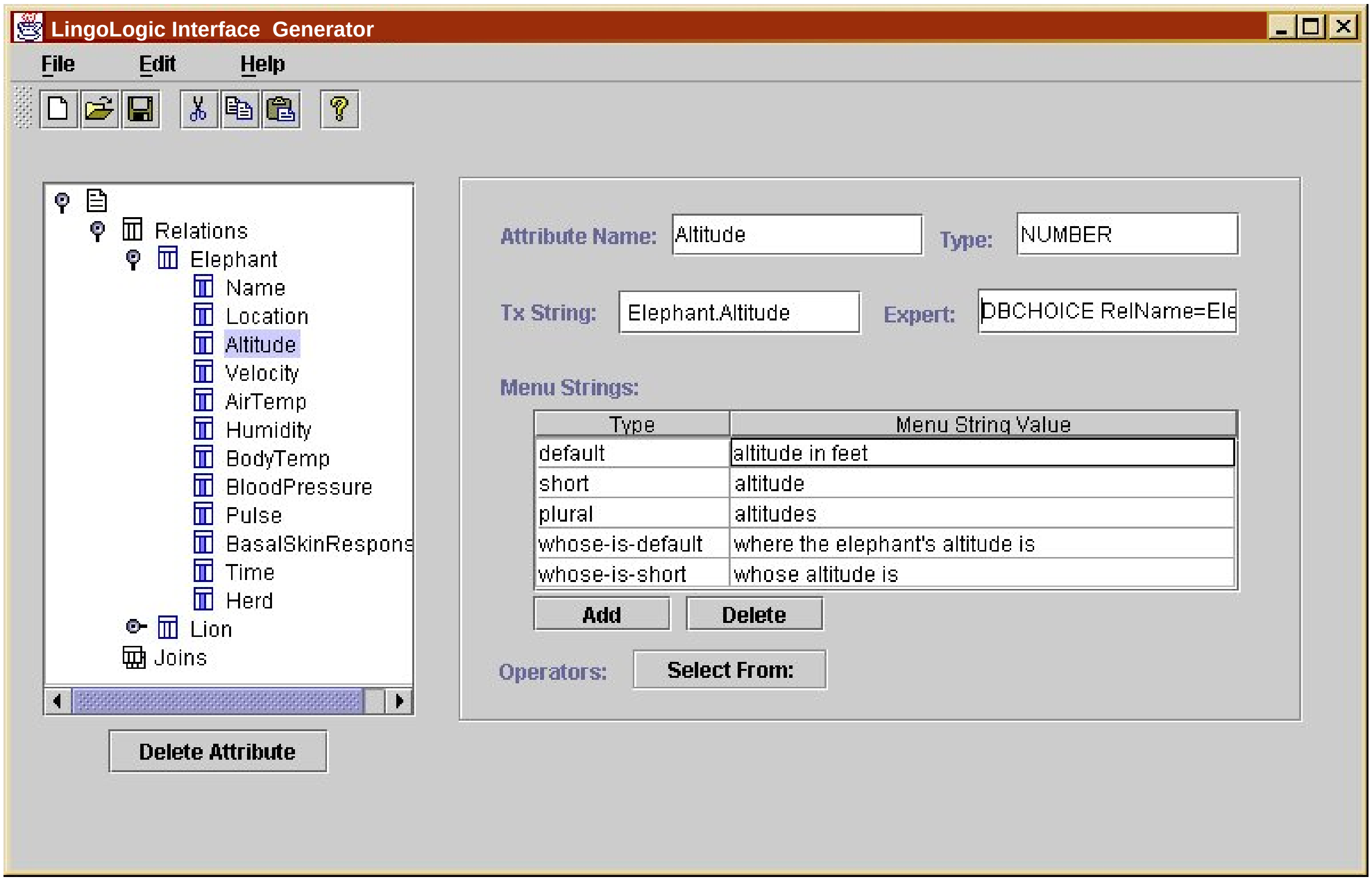
```
SELECT DISTINCT Elephant.Time, Elephant.Herd, Elephant.Location FROM ELEPH
ANT ORDER BY Elephant.Time
```

Time	Herd	Location
2009/06/01	herd_1	16.6N/34.5E
2009/06/01	herd_2	16.7N/34.0E
2009/07/01	herd_1	16.7N/34.7E
2009/07/01	herd_2	16.8N/34.2E
2009/08/01	herd_1	16.8N/34.9E
2009/08/01	herd_2	16.9N/34.4E
2009/09/01	herd_1	17.0N/35.1E
2009/09/01	herd_2	17.1N/34.6E

list the herd and location and time of elephants - format the report sorted by ti...

Generating New Interfaces

An interface generator called the Portable Specification Editor (PSE) is used to generate new interfaces to relational DBMS databases. It attaches to any ODBC database, extracts schema and other information, and that information parameterizes a grammar and lexicon so with the push of a button an interface is generated. The interface developer can be an end user or someone who builds interfaces for end users.



Attribute Name: Altitude

Type: NUMBER

Tx String: Elephant.Altitude

Expert: DBCHOICE RelName=Ele

Menu Strings:

Type	Menu String Value
default	altitude in feet
short	altitude
plural	altitudes
whose-is-default	where the elephant's altitude is
whose-is-short	whose altitude is

Operators: