

NATURAL LANGUAGE INTERFACES

powered by
Large
Language
Models

Hands-on workshop

CASCON 2024

- Ruby Bagga (ruby.bagga@ibm.com)
- Sara Elsharawy (saraelsh@ibm.com)
- Sarah Packowski (spackows@ca.ibm.com)
- Kelly Xiang (Kelly.Xiang@ibm.com)
- Ashley Zhao (Ashley.Zhao@ibm.com)

ibm.biz/NL-interfaces

Introduction to Natural Language Interfaces

Agenda

1. Definition
2. Motivation
3. History

1. Definition

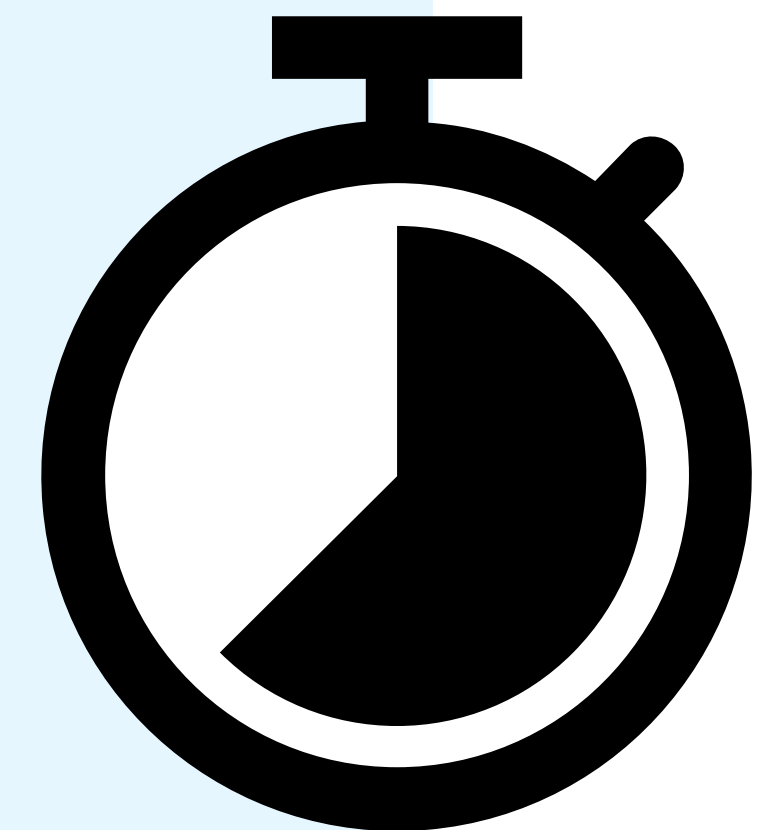
What is a natural language interface?

Activity

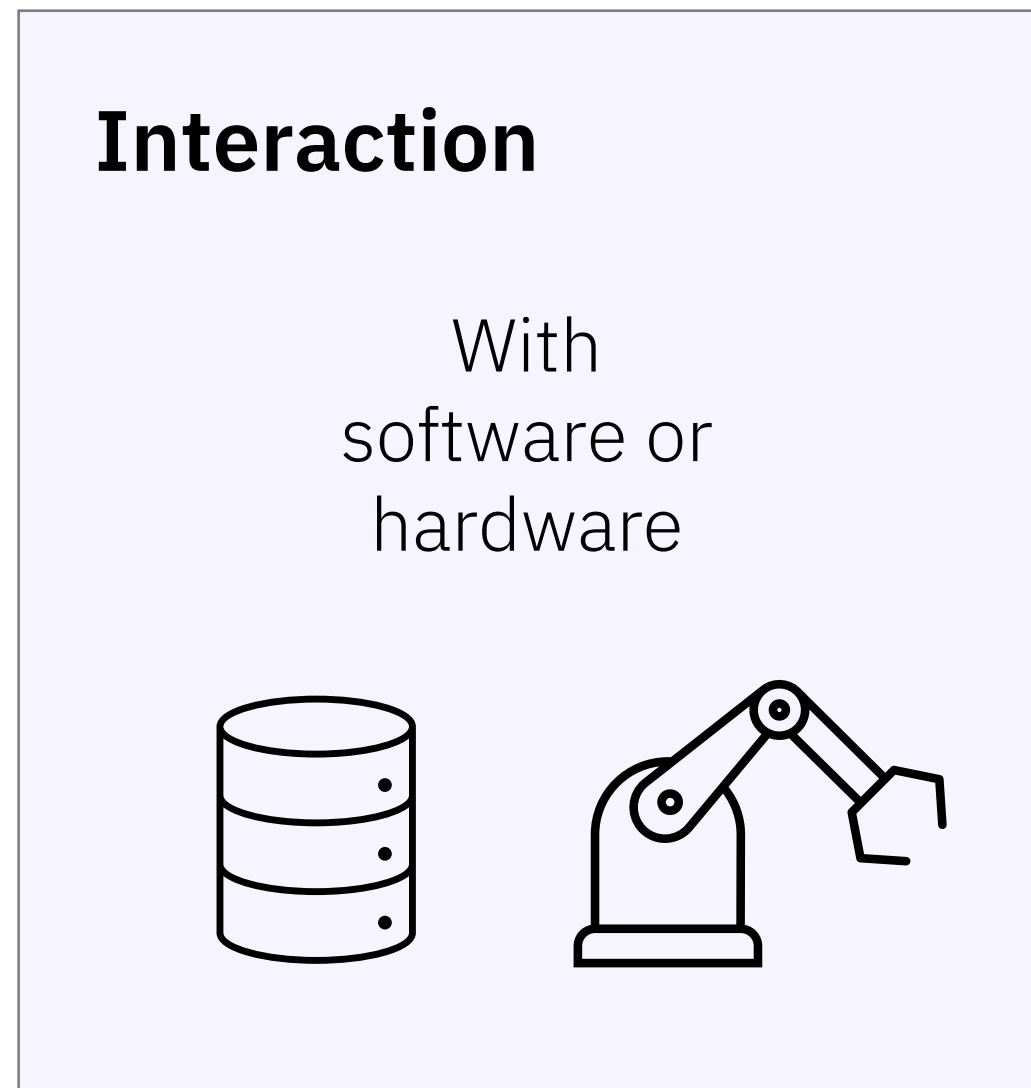
Take **3 minutes** to think about what an NL interface is.

Jot down terms, use cases, key features, characteristics, etc.

After the 3 minutes is up, we'll share ideas as a group.



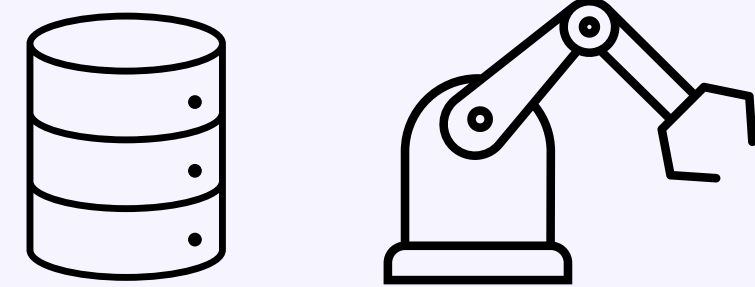
Natural language interface



Natural language interface

Interaction

With
software or
hardware

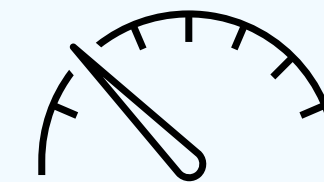


Language

Sublanguage

Controlled

Restricted



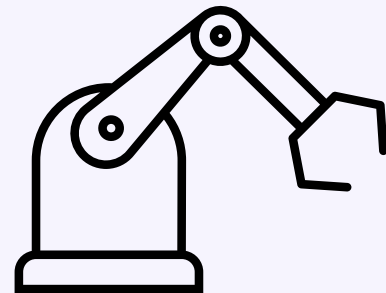
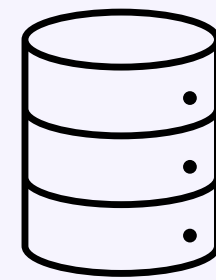
Natural
language

Structured,
commands

Natural language interface

Interaction

With
software or
hardware

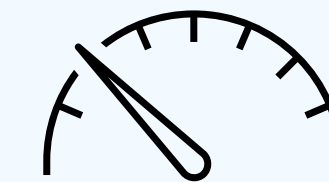


Language

Sublanguage

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Restricted

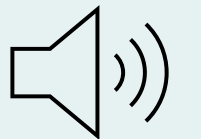
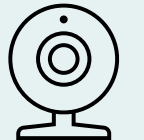
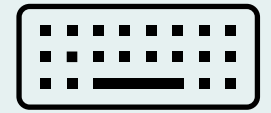


Natural
language

Structured,
commands

Format

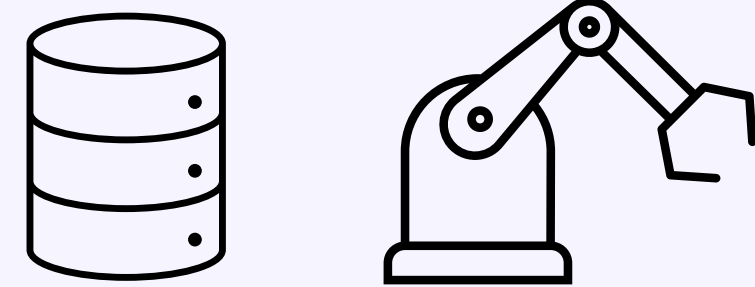
- Audio
- Text
- Tab-complete
- Menu select
- Node assembly
- Sign language
- Body language



Natural language interface

Interaction

With
software or
hardware

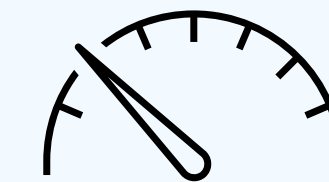


Language

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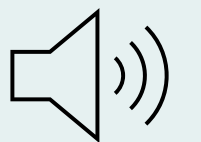
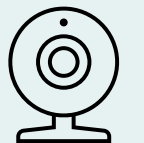
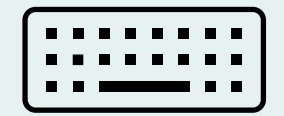


Natural
language

Structured,
commands

Format

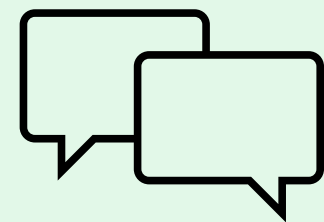
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Direction

Input
only

Output
only



Dialog

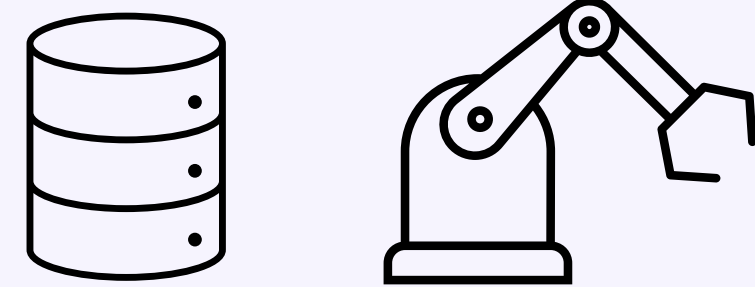
Single
turn

Multi-
turn

Natural language interface

Interaction

With
software or
hardware

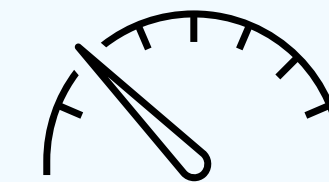


Language

Sublanguage

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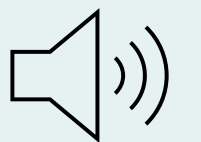
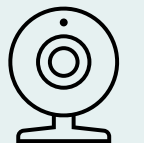
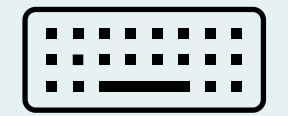


Natural
language

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commands

Format

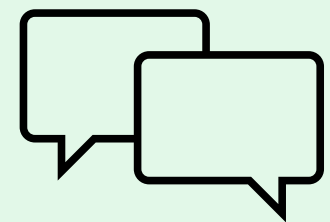
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Direction

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Output
only



Dialog

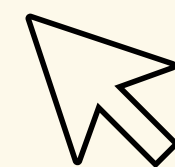
Single
turn

Multi-
turn

Control

User
initiated

Agent
initiated

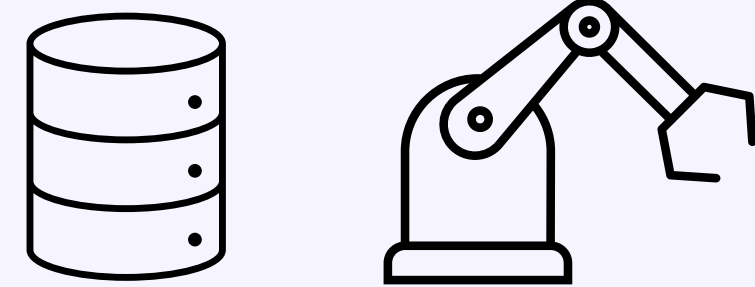


Share
control

Natural language interface

Interaction

With
software or
hardware

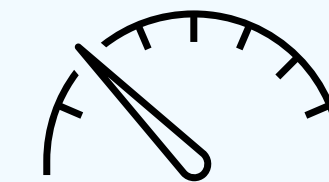


Language

Sublanguage

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Restricted

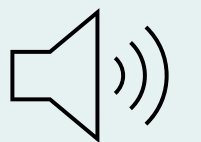
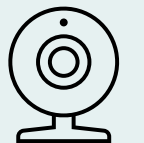
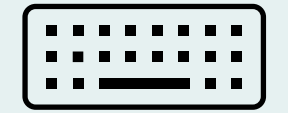


Natural
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Format

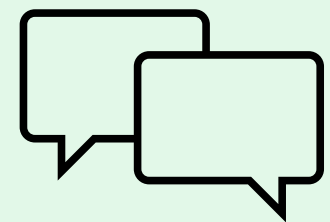
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Direction

Input
only

Output
only



Dialog

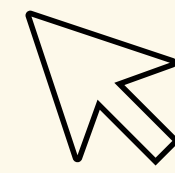
Single
turn

Multi-
turn

Control

User
initiated

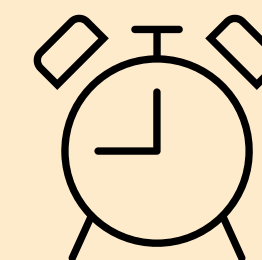
Agent
initiated



Share
control

Timing

Synchronous

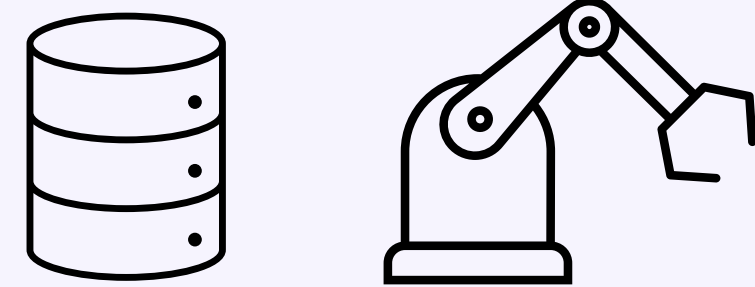


Asynchronous

Natural language interface

Interaction

With
software or
hardware

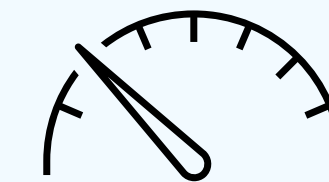


Language

Sublanguage

Controlled

Restricted

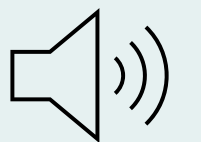
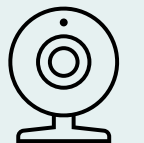
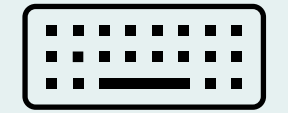


Natural
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Format

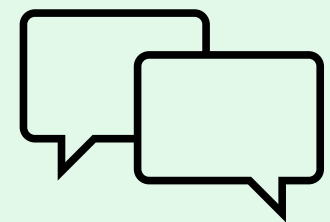
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Direction

Input
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Output
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Dialog

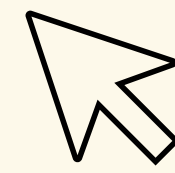
Single
turn

Multi-
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Control

User
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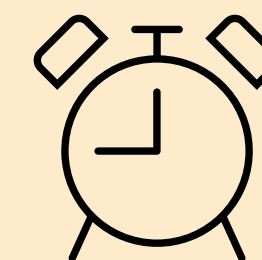
Agent
initiated



Share
control

Timing

Synchronous



Asynchronous

Purpose

- Command
- Instruct
- Direct
- Guide
- Explain
- Explore
- Answer questions
- Entertain

1. Definition

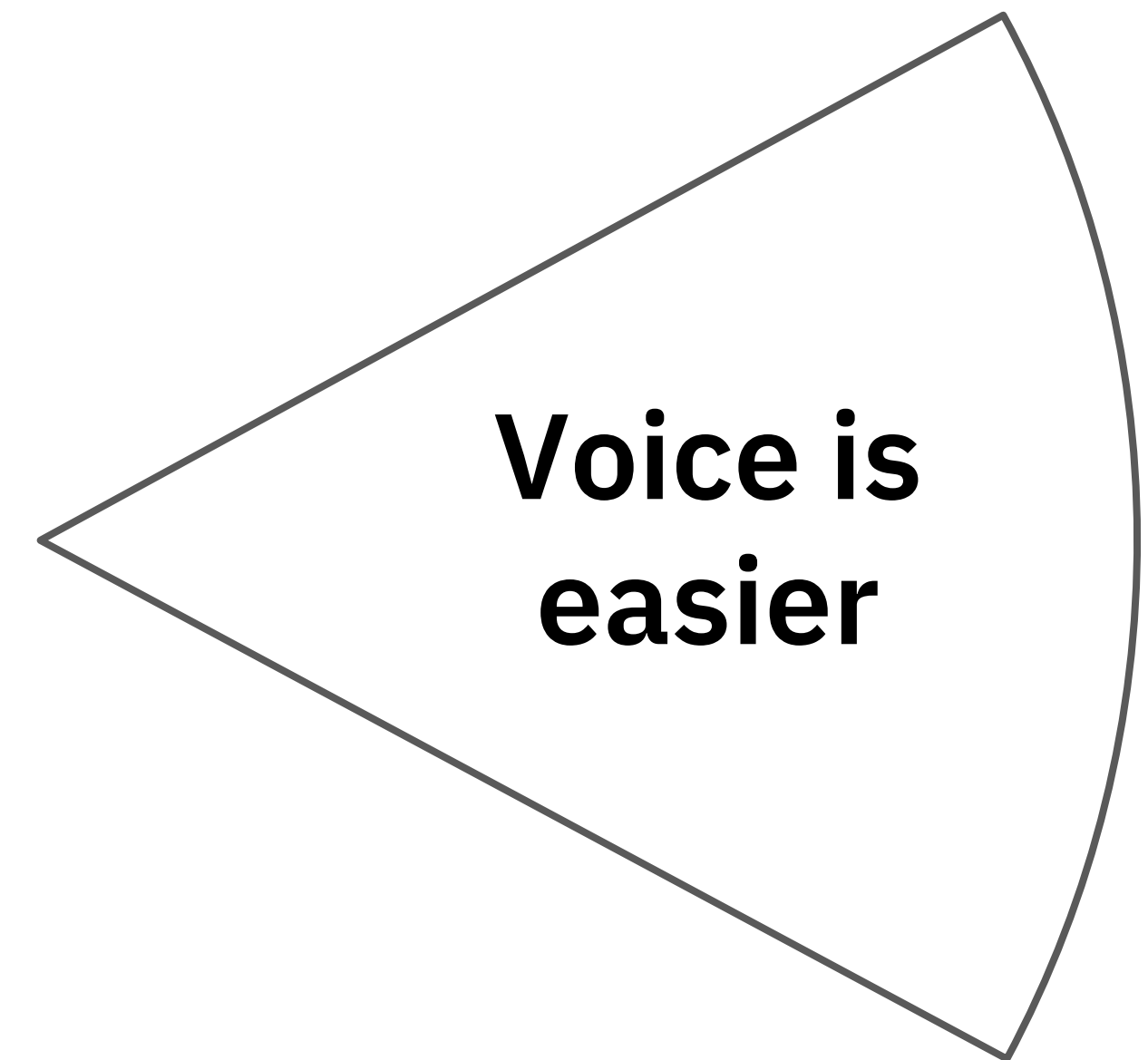
A natural language (NL) interface enables a user to achieve a goal by interacting with systems - using natural language, in a variety of formats.

An NL interaction might be initiated by the user or the system; and the interaction can flow like a conversation or be simple input or output, in real time or delayed.

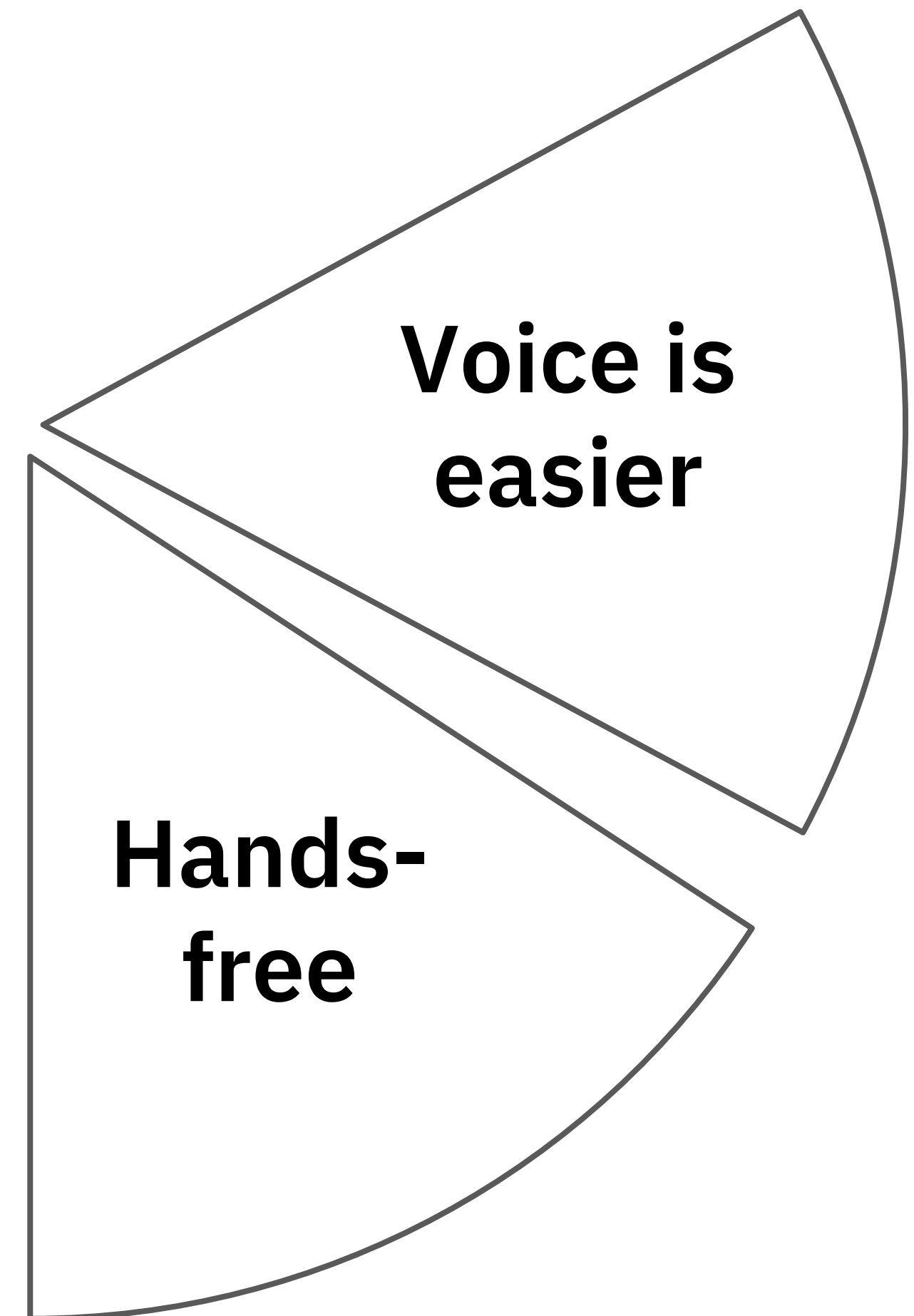
2. Motivation

Why natural language
interfaces?

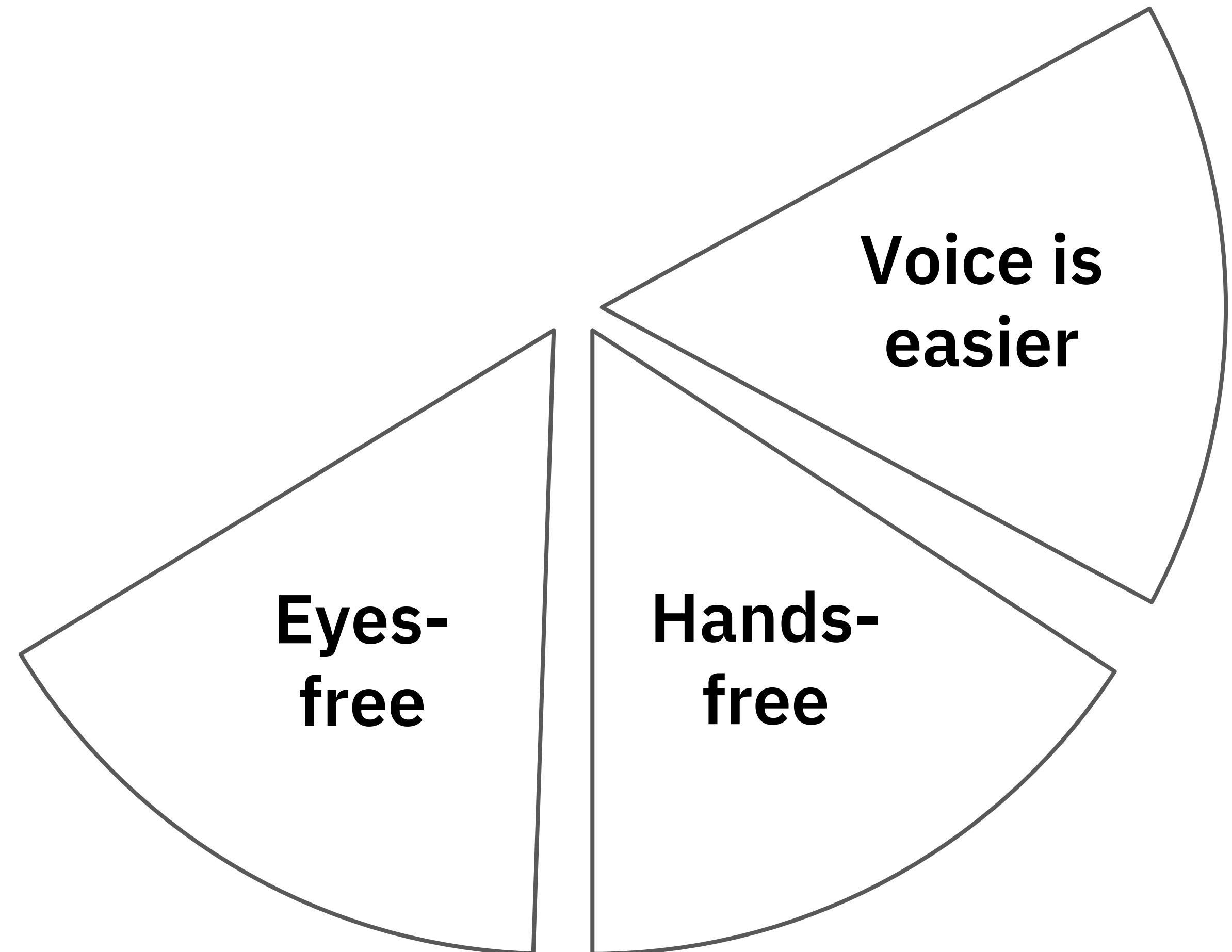
Why
Natural
language
interface?



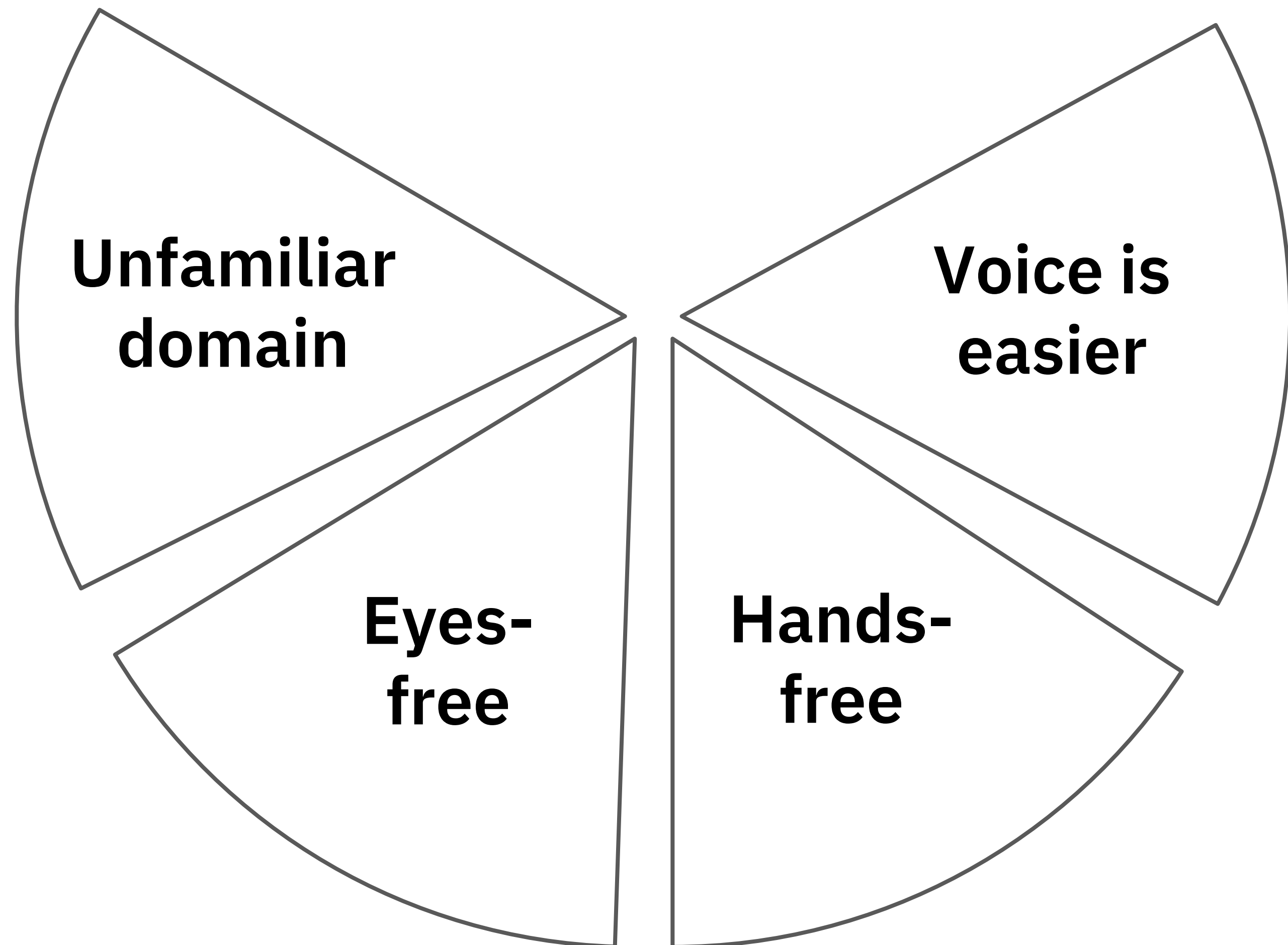
Why
Natural
language
interface?



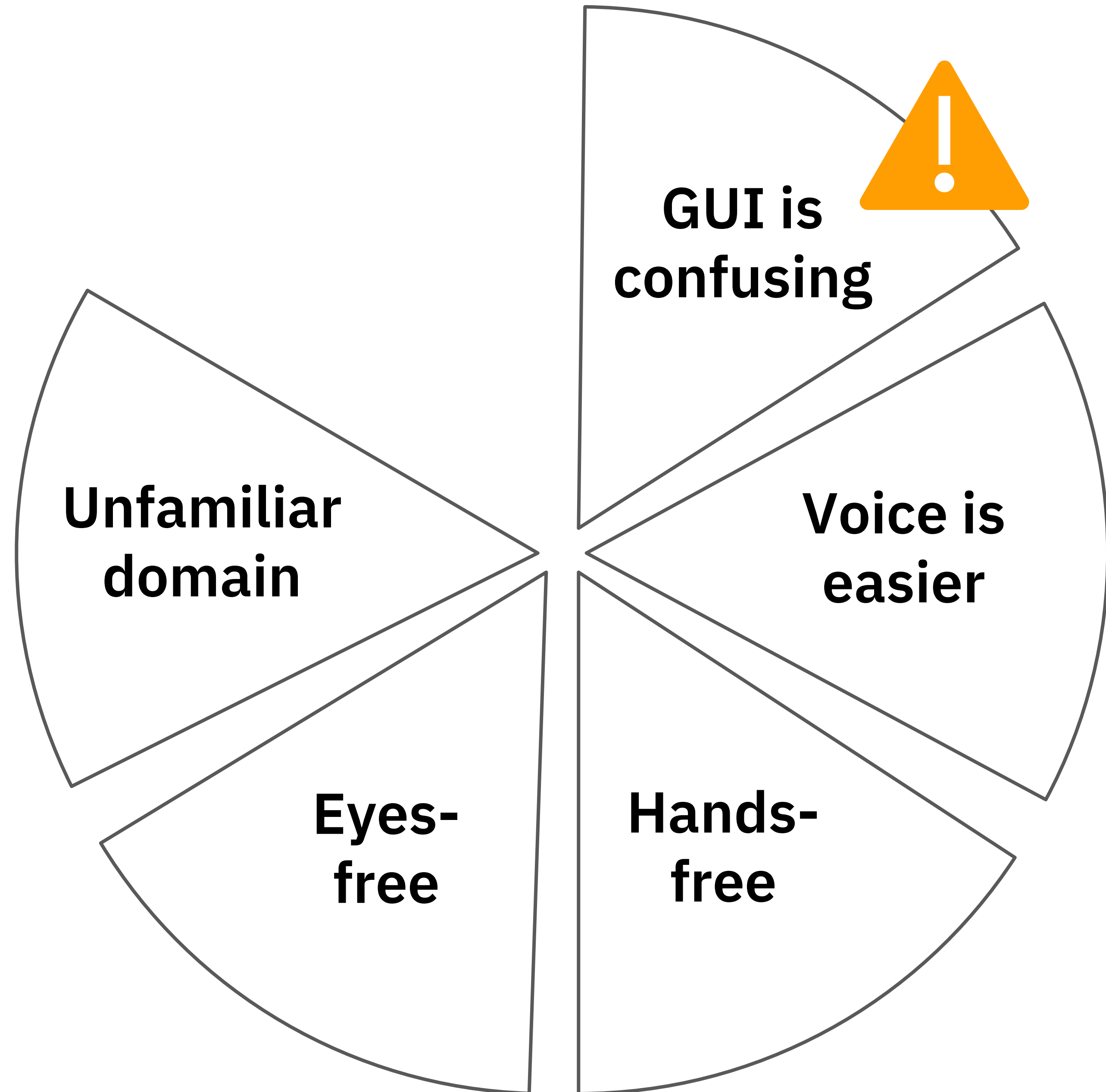
Why
Natural
language
interface?



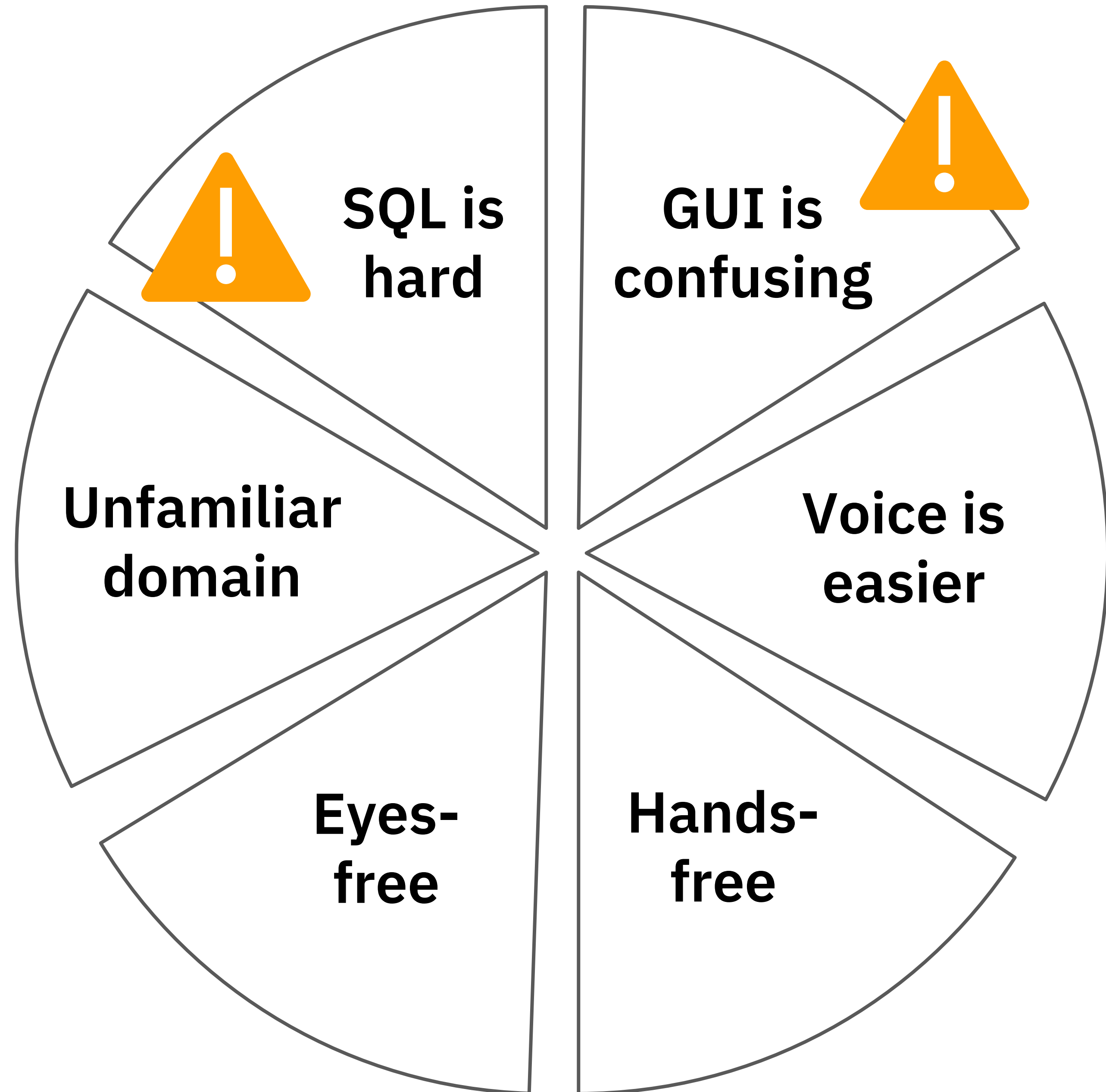
Why
Natural
language
interface?



Why
Natural
language
interface?



Why Natural language interface?



3. History

What do we already know?

How did we get here?

Over the last decade, several computer systems have been developed that support natural-language interaction ...

Advantages of NL interfaces

- NL is flexible
- Users need less training with NL vs commands or SQL
- NL can be faster than using menus or GUIs
- NL enables clarifying and follow-up questions

Disadvantages of NL interfaces

- Flexibility at the cost of verbosity
- Lack of cues about capability
- People overestimate capability (eg. expect common sense)

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Natural-language interface

Panel discussion, 1982

Natural-Language Interface
Gary G. Hendrix, Chairperson
SRI International
Menlo Park, CA 94025
American Journal of Computational Linguistics, Volume 8, Number 2, April-June 1982

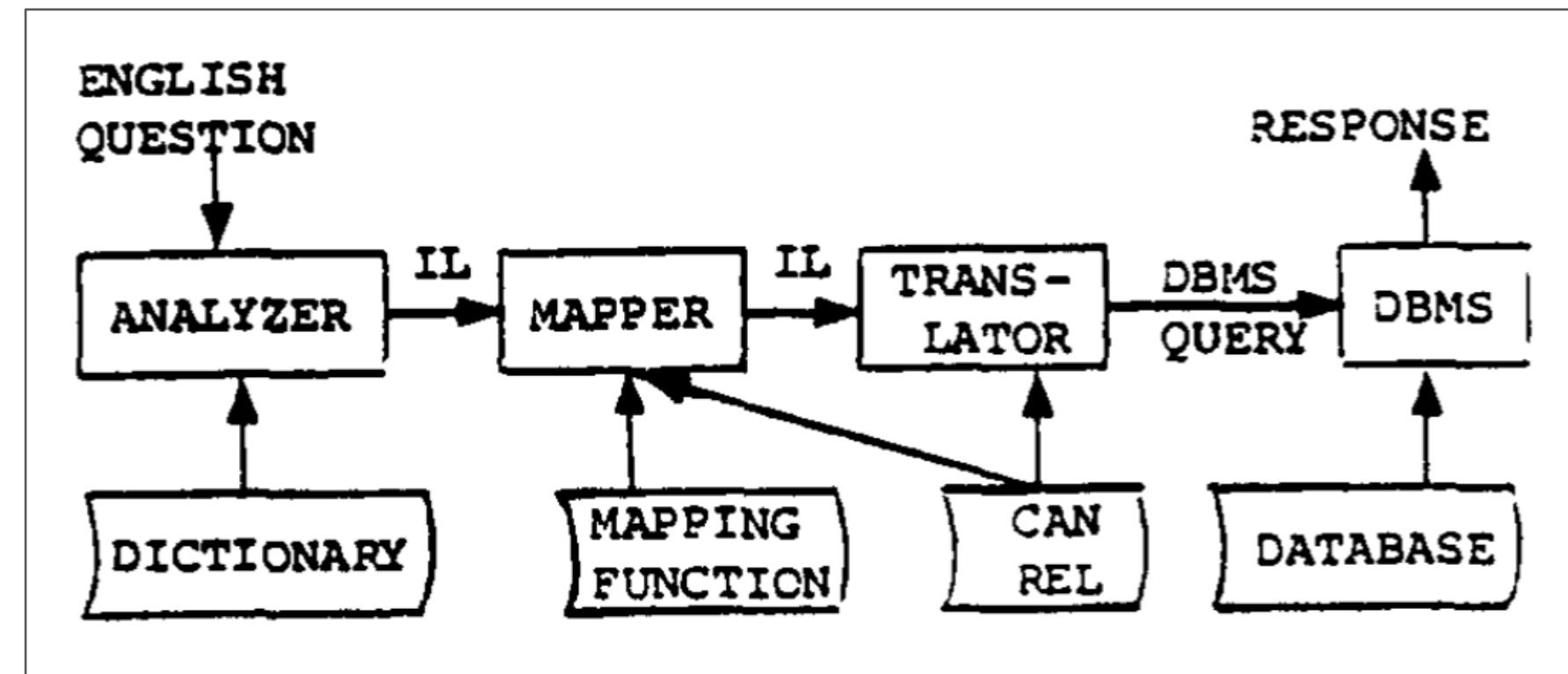
1977 - 1999

THE REPRESENTATION AND USE OF FOCUS IN DIALOGUE UNDERSTANDING

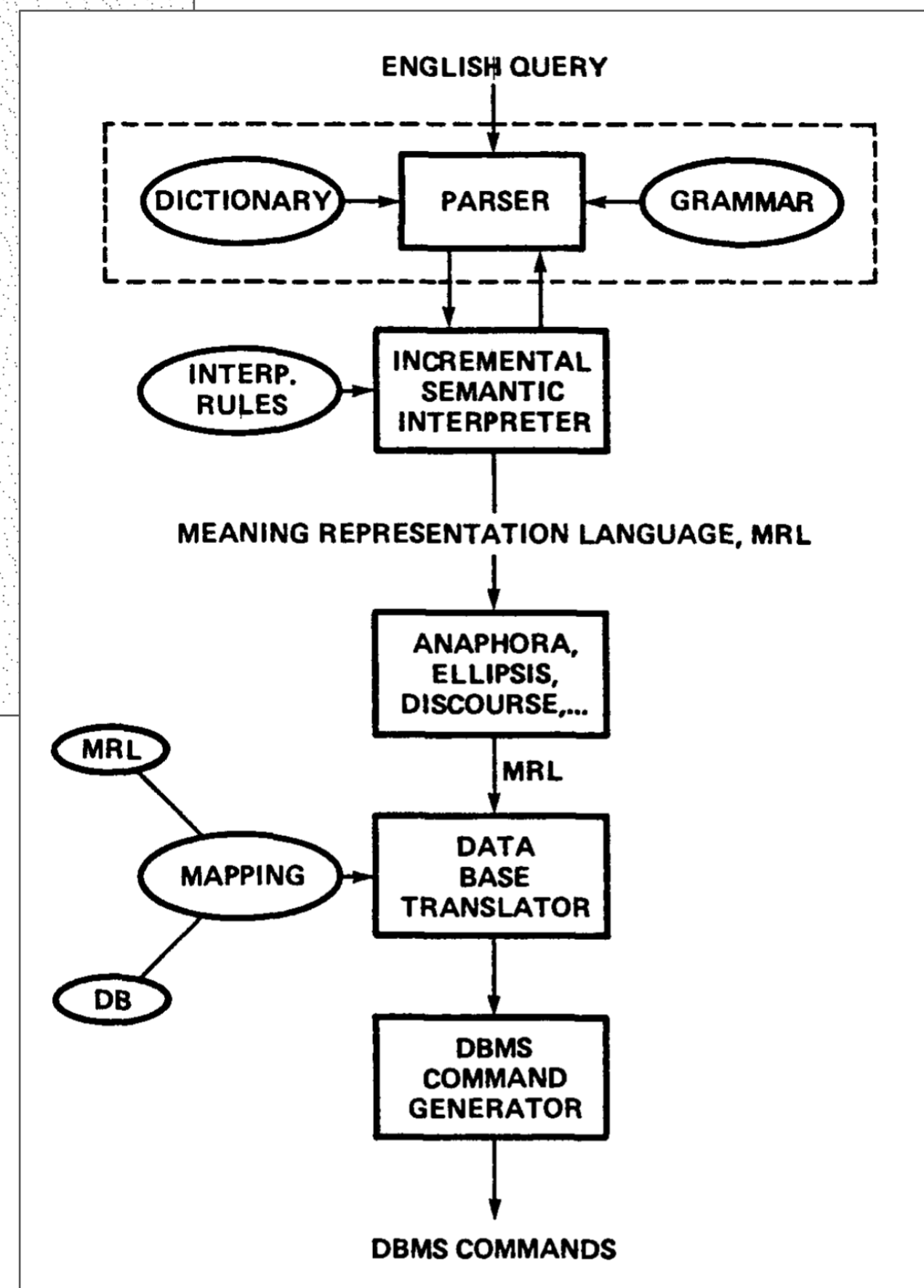
Technical Note 151

July 1977

By: Barbara J. Grosz
Artificial Intelligence Center



USING A MENU-BASED NATURAL LANGUAGE INTERFACETO
ASK MAP- AND GRAPH-VALUED DATABASE QUERIES
Craig W. Thompson
Steve Martin*
Texas Instruments Incorporated
P. O. Box 226015,
MS 238Dallas, Texas
75266I
*MIT Coop Program at TI

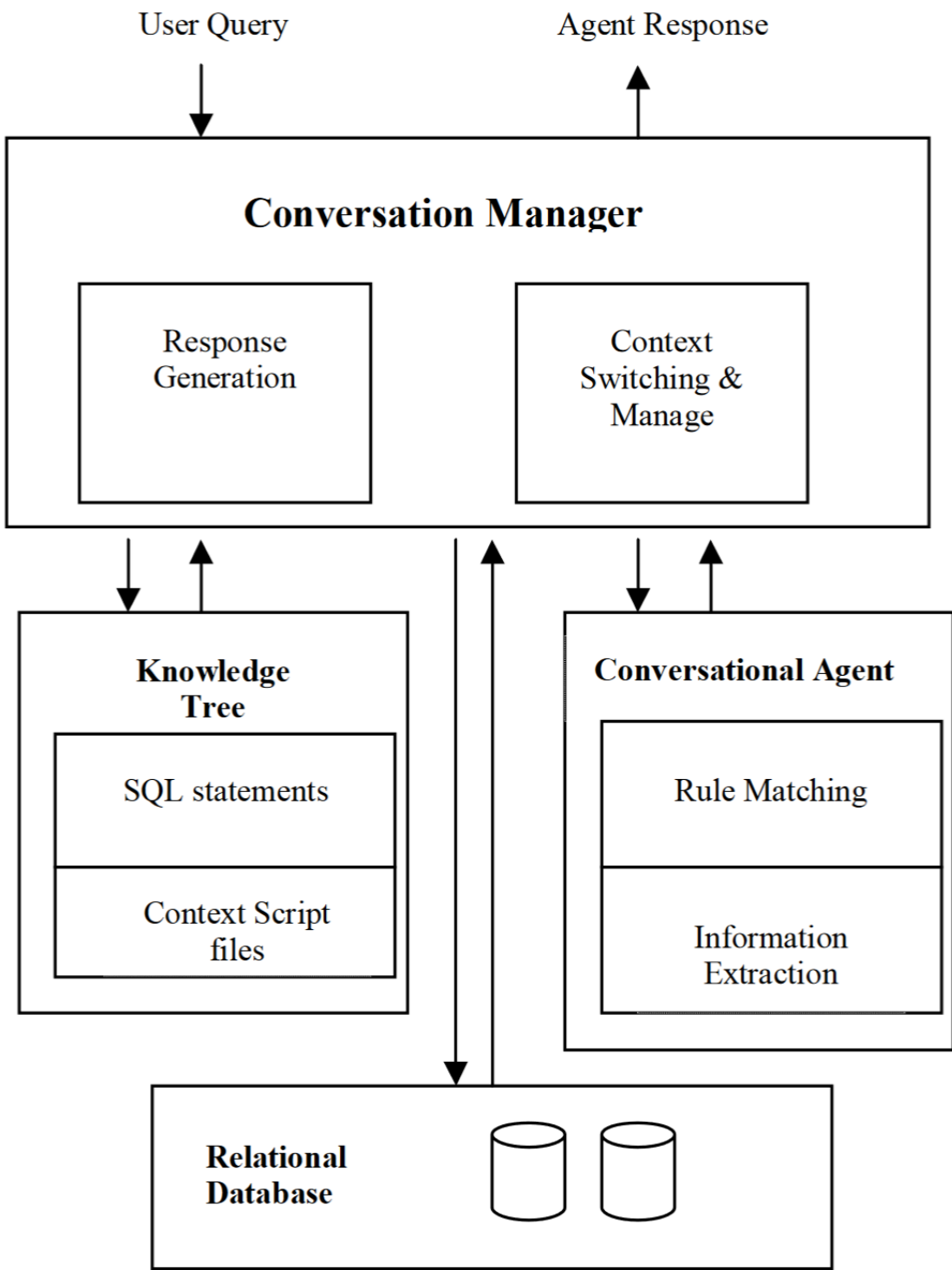


NLMENU Interface Austin Restaurants			
Commands		Nouns	Experts
Find	Draw	restaurants	<specific map locations>
Delete	Insert	<a new restaurant>	<specific restaurant names>
Attributes		a bar chart	<specific addressses>
distance from ut in		a line graph	<specific telephone numbers>
name		a pie chart	<specific kinds of food>
address		a histogram	<specific reviews>
telephone		a scatter plot	<specific qualities of foods>
kind of food		a surface graph	<specific prices>
review			<specific credit cardss>
quality of food			<specific number>
price			
credit cards			
		Comparisons	
		between	
		greater than	
		less than	
		greater than or equal to	
		less than or equal to	
		equal to	
			Connectors
			and draw a map of them
			and
			or
System Commands			
Restart		Refresh	Rubout
Save Input		Retrieve Input	Exit System
Show Input		Show Parse Tree	Play Input
			Save Output

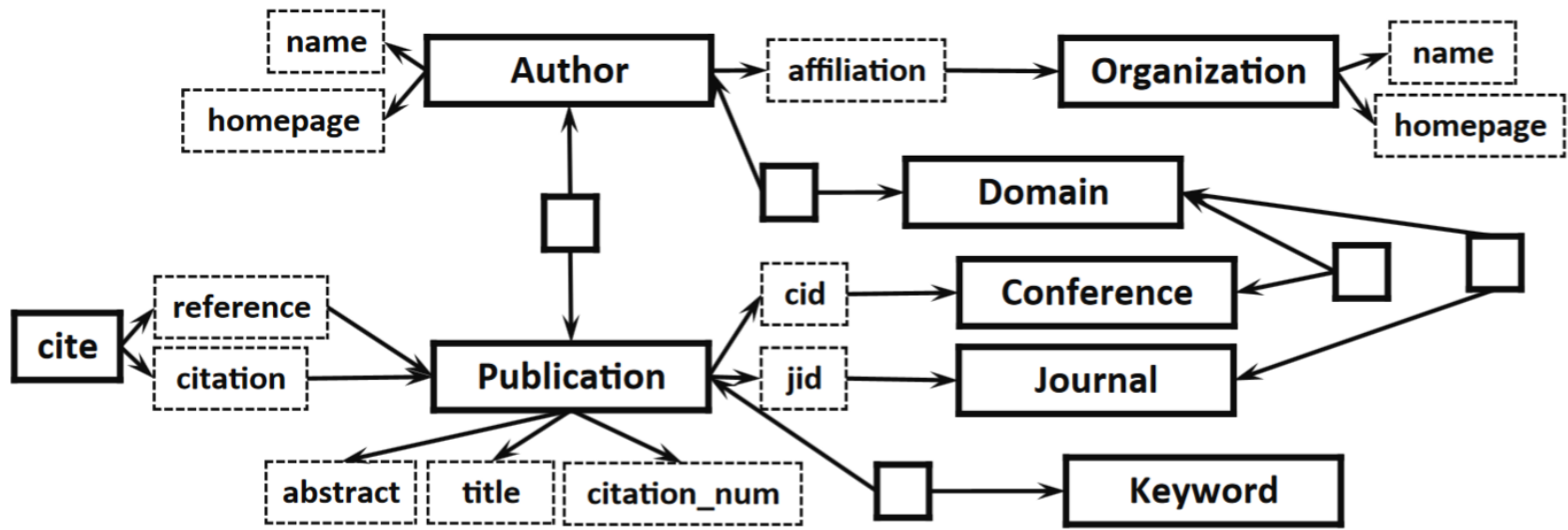
Information Retrieval Using a Transportable Natural Language Interface
Hadeleine Bates and Robert J. Bobrow
Bolt Beranek and Newman Inc,
10 Moulton Street Cambridge,
MA 02238

2000 – 2020

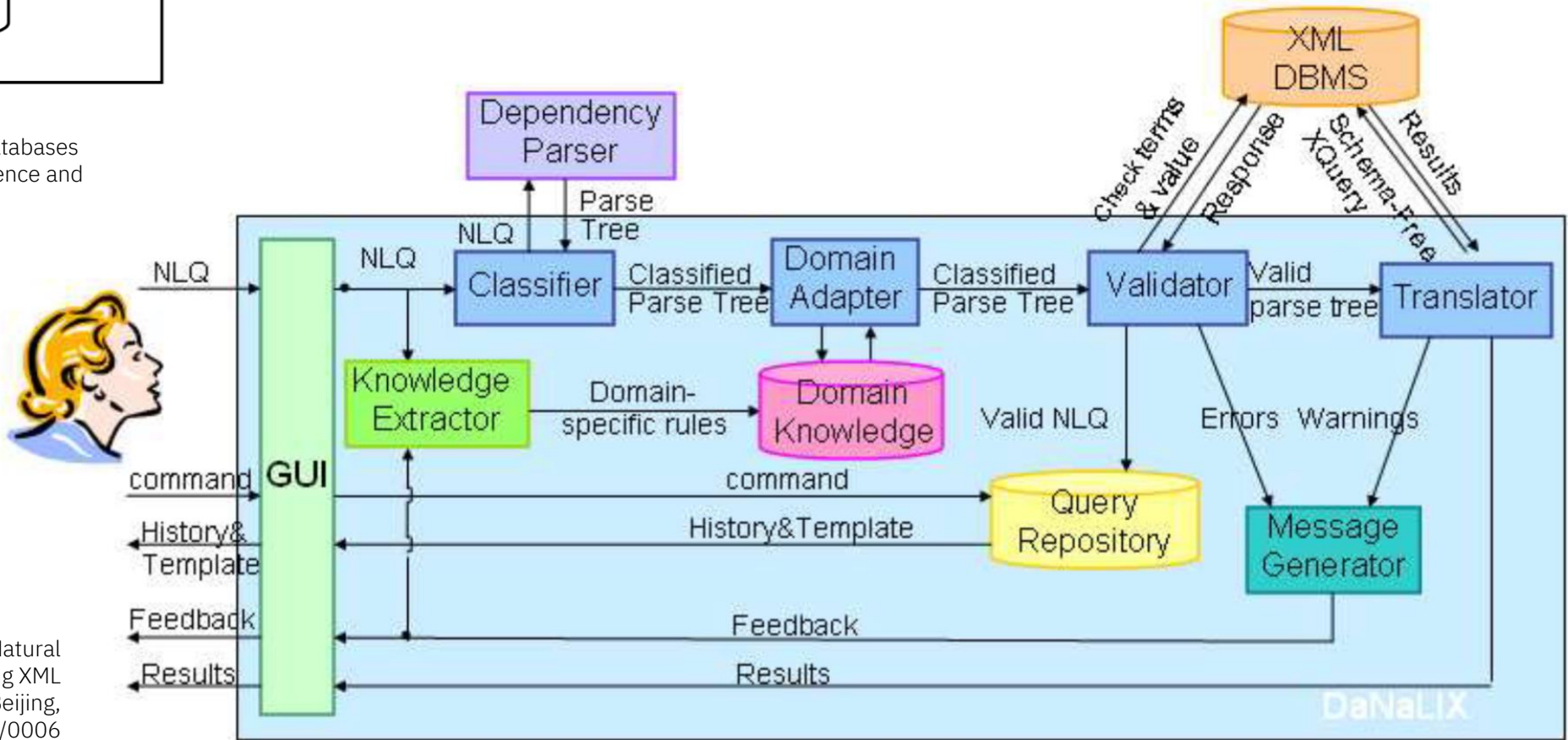
Constructing an Interactive Natural Language Interface
for Relational Databases*
Proceedings of the VLDB Endowment, Vol. 8, No. 1
Copyright 2014 VLDB Endowment 2150-8097/14/09



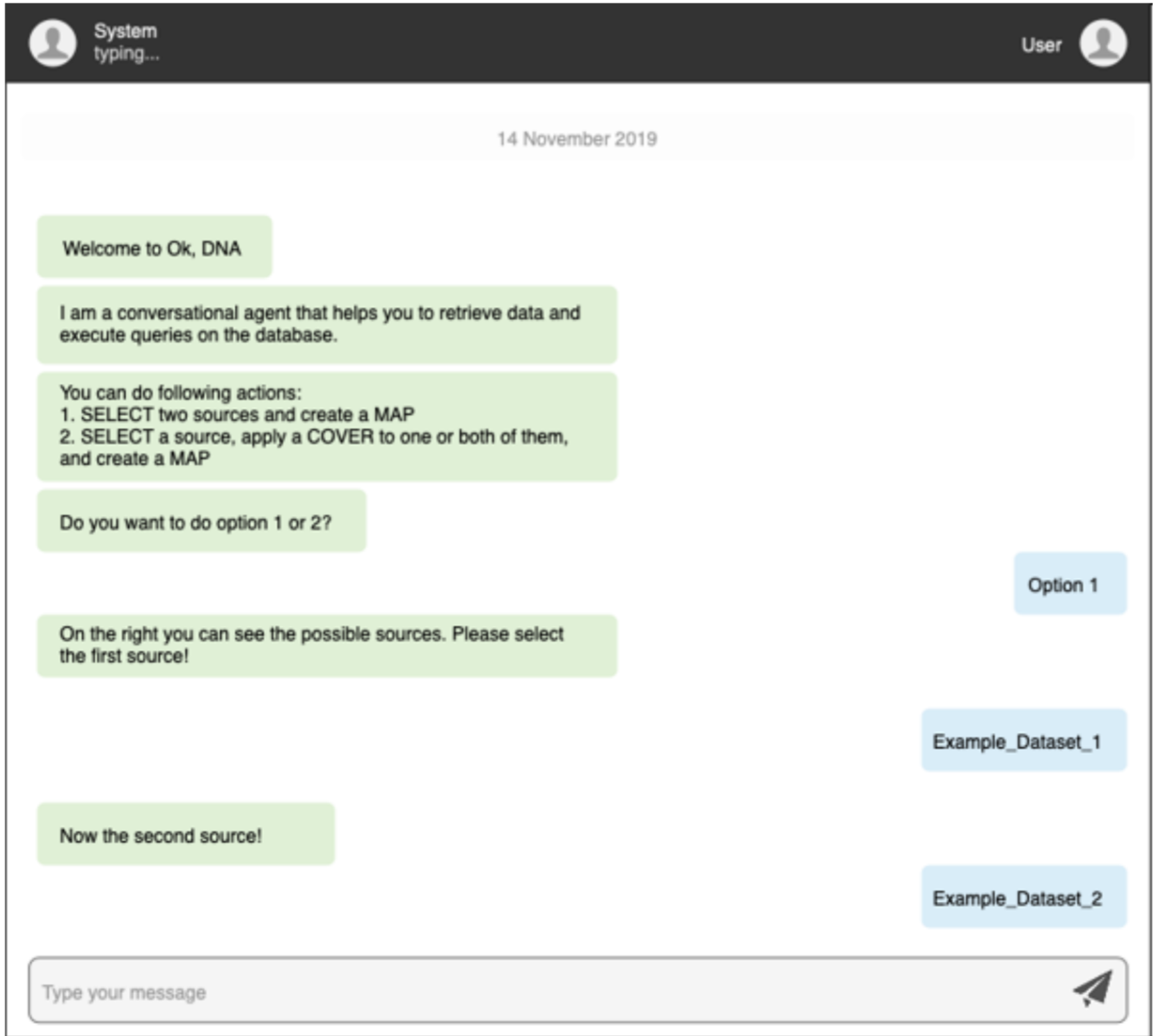
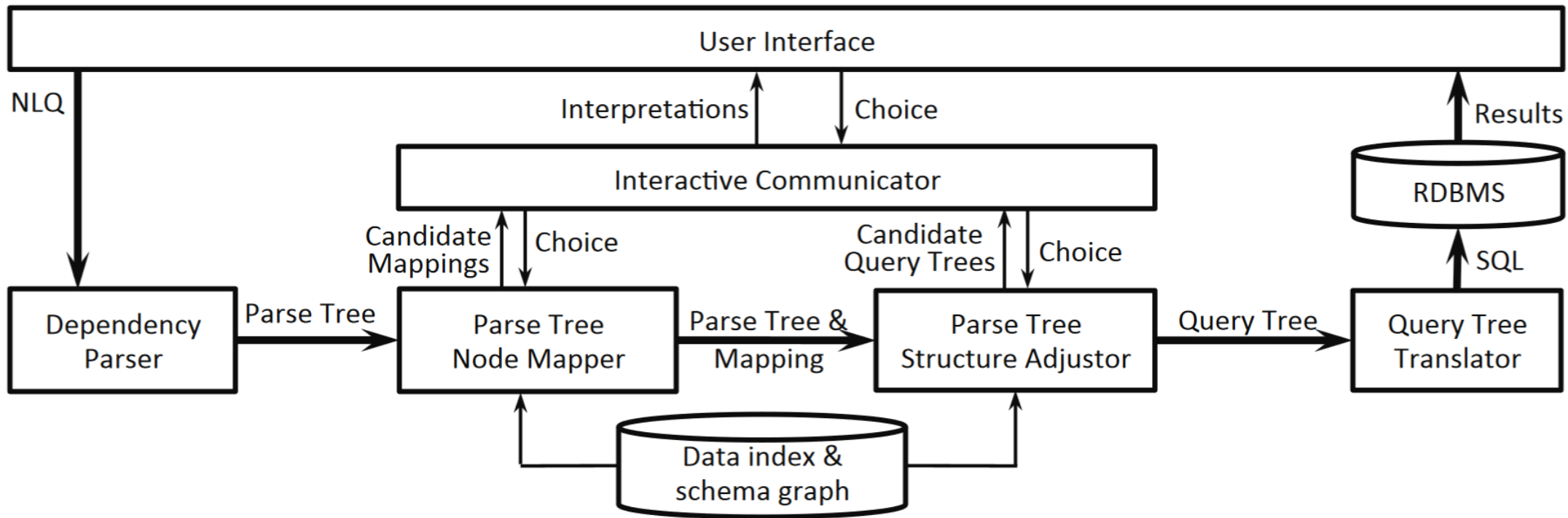
Conversation-Based Natural Language Interface to Relational Databases
2007 IEEE/WIC/ACM International Conferences on Web Intelligence and
Intelligent Agent Technology - Workshops



Query 1: Return the average number of publications by Bob in each year.
Query 2: Return authors who have more papers than Bob in VLDB after 2000.
Query 3: Return the conference in each area whose papers have the most total citations.



DaNaLIX: a Domain-adaptive Natural
Language Interface for Querying XML
SIGMOD '07, June 12-14, 2007, Beijing,
China. ACM 978-1-59593-686-8/07/0006



OK, DNA!: A Conversational Interface to Explore Genomic Data
In 2nd Conference on Conversational User Interfaces (CUI '20), July 22-24, 2020

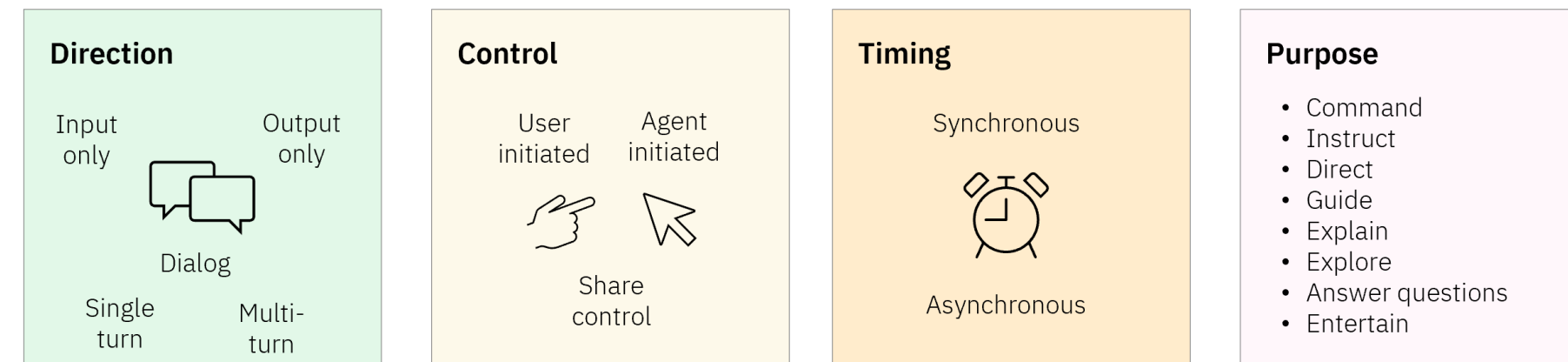
Review

1. Definition
2. Motivation
3. History

Review

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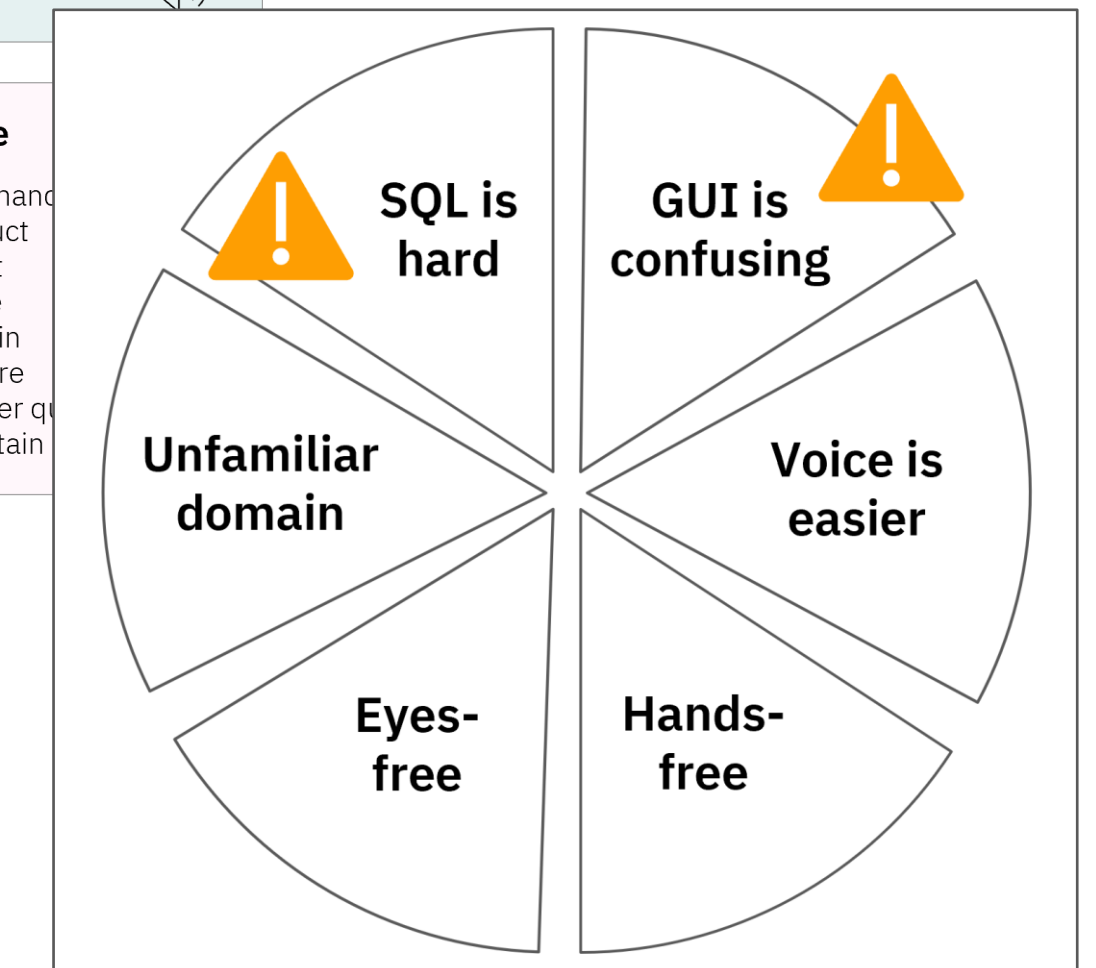
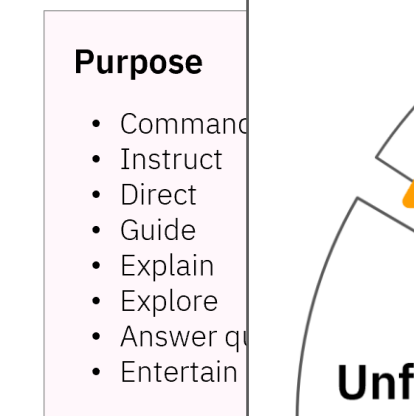
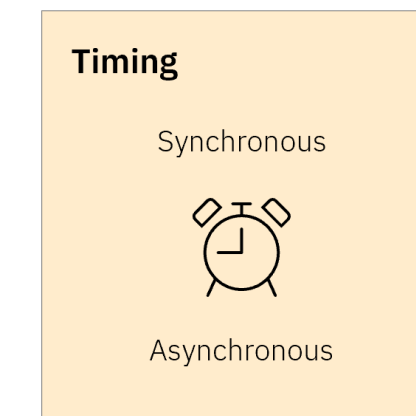
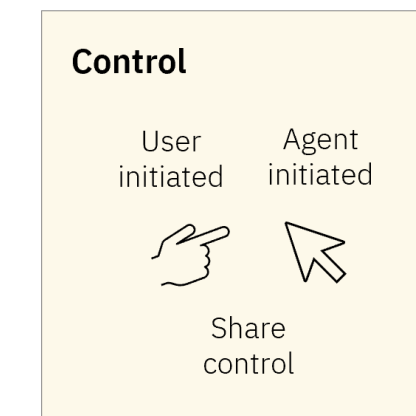
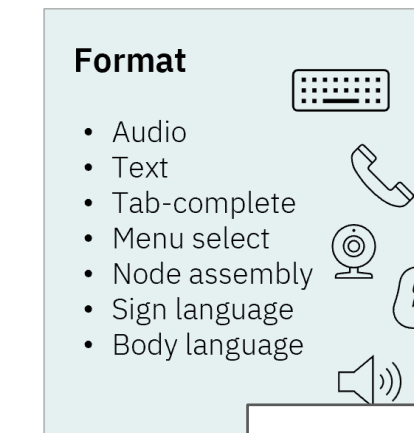
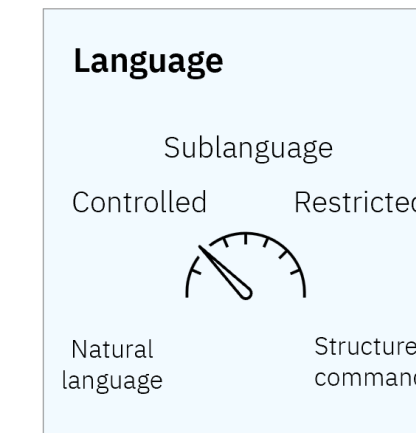
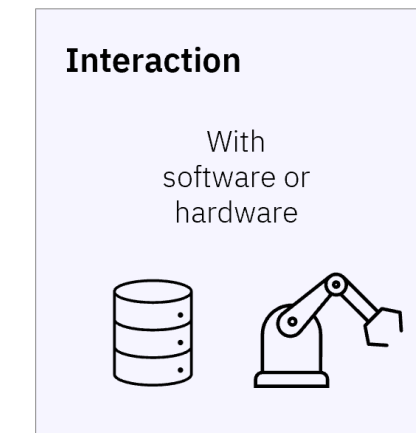
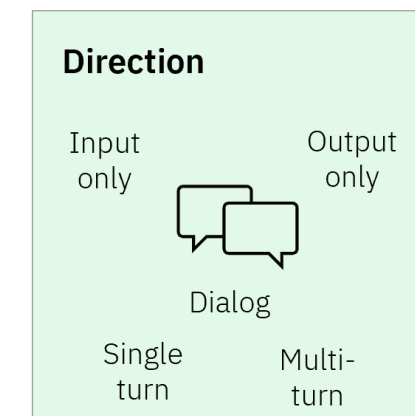
Natural
language
interface



Review

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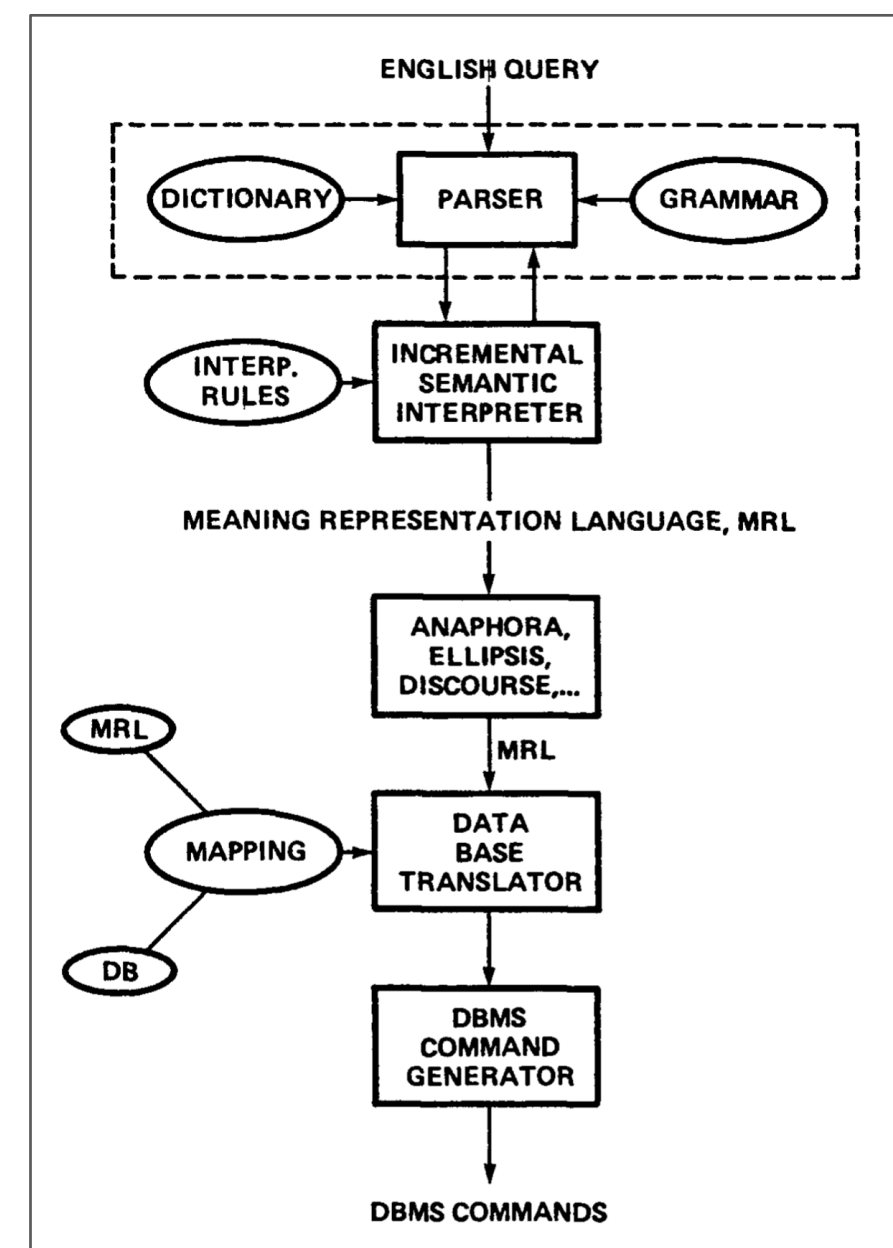
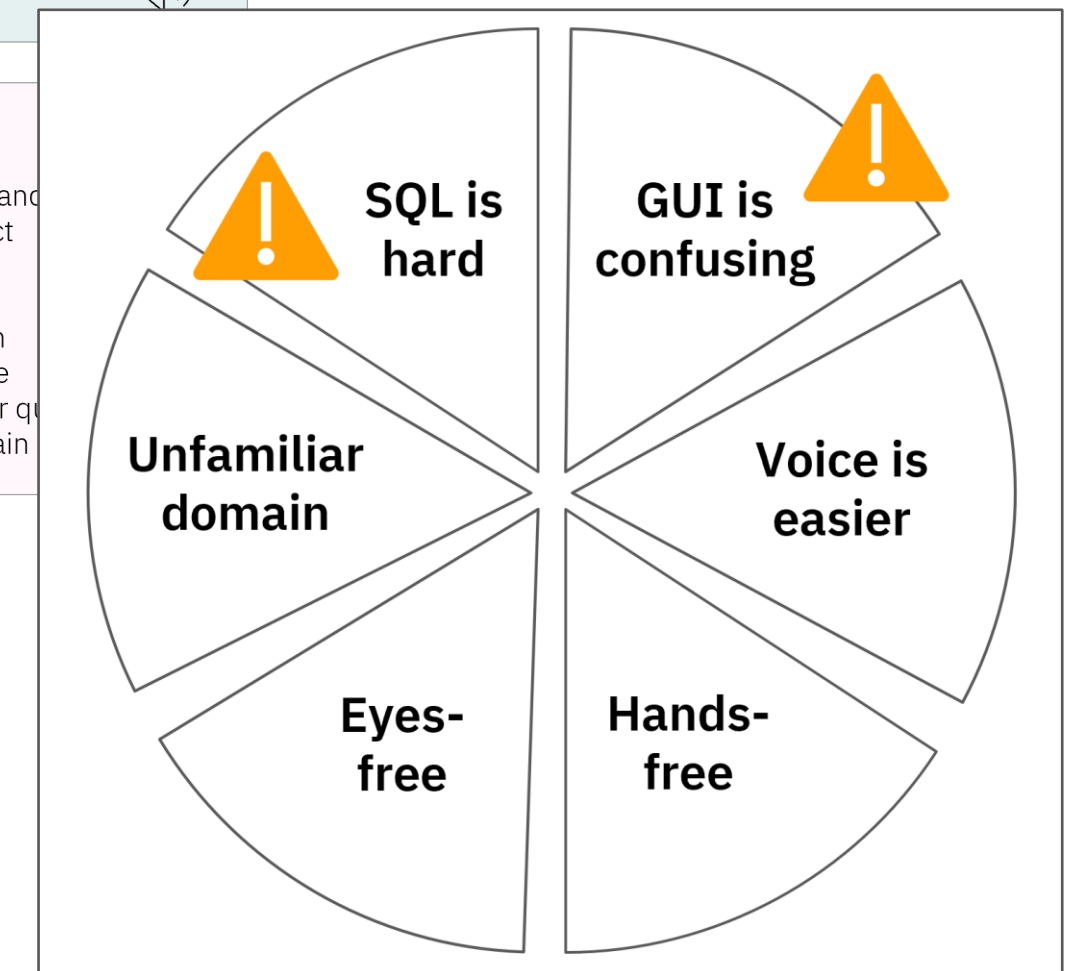
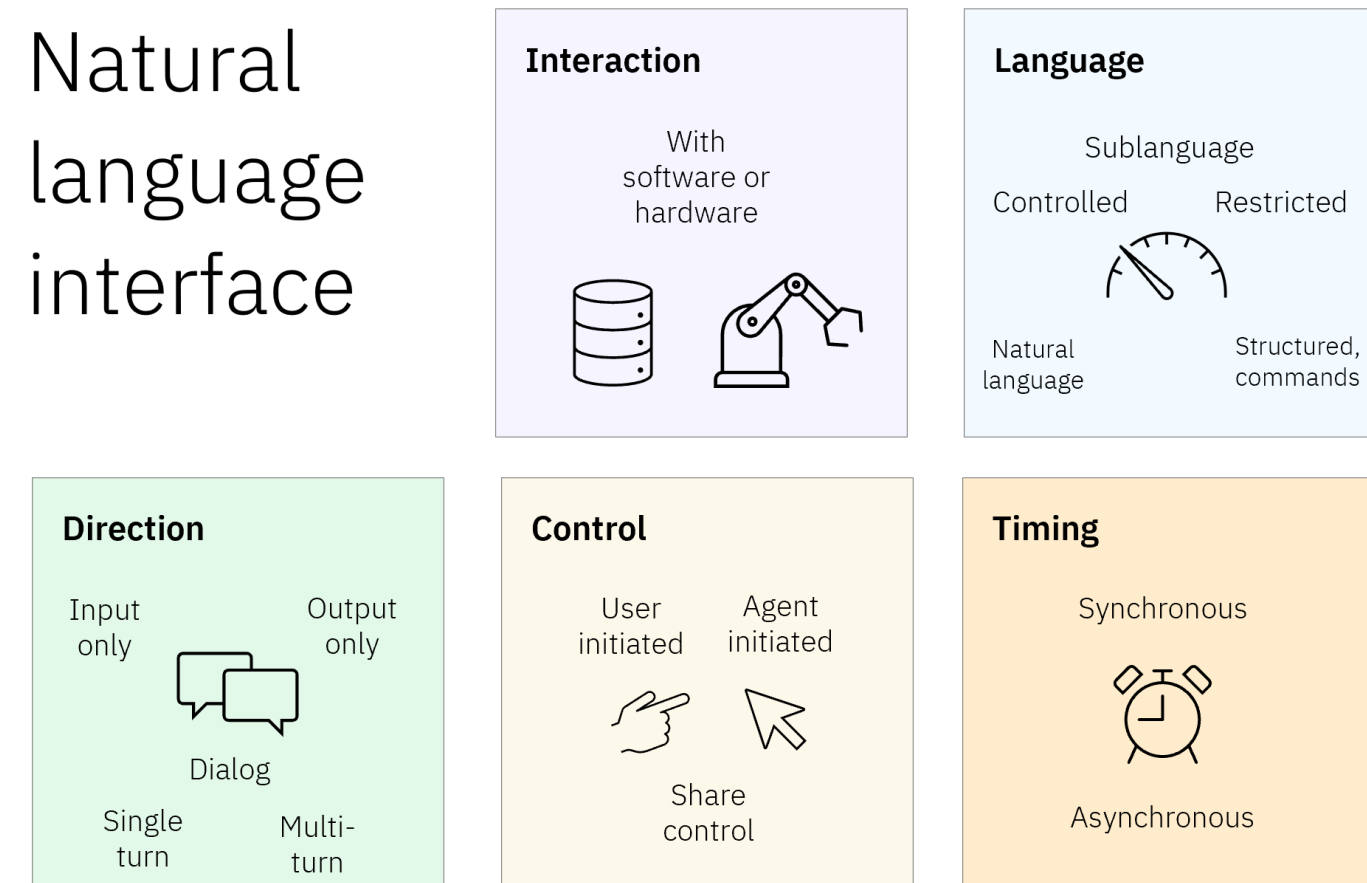
Natural
language
interface



Review

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Natural
language
interface



Review

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Natural language interface

