

I Can Parse You: Grammars for Dialogs

Martin Hirzel, Louis Mandel, Avraham Shinnar, Jérôme Siméon, Mandana Vaziri
IBM Research, Yorktown Heights, NY, USA

9 May 2017, SNAPL 2017 Conference

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Circular Bot, Hello!



Hello, Human! I am a chat-bot that talks about chat-bots. What can I do for you?

Grammars for Dialogs

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Circular Bot, that's great!


Can you just give my talk for me?





I am sorry, I don't understand.
Please rephrase.

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 Circular Bot, what can you do?

 I can:

- Answer common questions about chat bots
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Circular Bot, what's a chat bot?



We chat bots are computer programs that can have a natural-language dialog with a human. We're also known as conversational agents.



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We have lots of use-cases, including question answering, controlling devices, customer service, and ordering pizzas.

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Would you like a pizza now, human?



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I suppose.




Toppings?

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 Toppings?

 A small chicken and mushrooms pizza on a thin crust.

 Chicken and mushrooms. What kind of crust?

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Toppings?



A small chicken and mushrooms pizza on a thin crust.



Chicken and mushrooms. What kind of crust?



I just told you, a small pizza with a thin crust.



Thin crust. What size?



I am sorry, I don't understand.
Would you like a pizza now, human?



I suppose.



Toppings?



A small chicken and mushrooms pizza
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Chicken and mushrooms. What kind of crust?



I just told you, a small pizza with a thin crust.



Thin crust. What size?



Small size.



I am sorry, I don't understand.
Choices are individual-size, medium, or large.
What size?



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Individual-size.



So that's an individual-size chicken and mushrooms pizza on a thin crust, correct?



Chicken and mushrooms. What kind of crust?



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So that's an individual-size chicken and mushrooms pizza on a thin crust, correct?



Yes.



Would you like to add some blue cheese at no additional cost?



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Small size.



I am sorry, I don't understand.

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What size?



Individual-size.



So that's an individual-size chicken and mushrooms pizza on a thin crust, correct?



Yes.



Would you like to add some blue cheese at no additional cost?



No! I don't like blue cheese.



Okay, adding blue cheese.



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Individual-size.



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Okay, adding blue cheese.



No, you idiot!



No insults please. I'm limited to my programming.


 No! I don't like blue cheese.

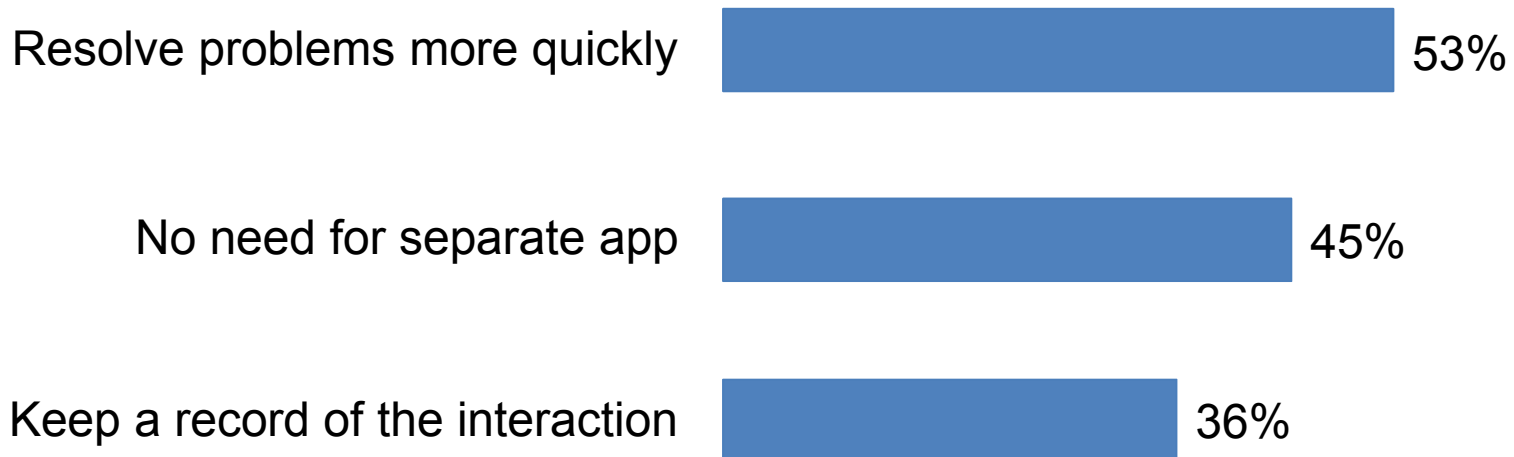
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 Circular bot, why do consumers want chat-bots?

 Consumers who said “yes” to being contacted via a chat-bot gave the following reasons:

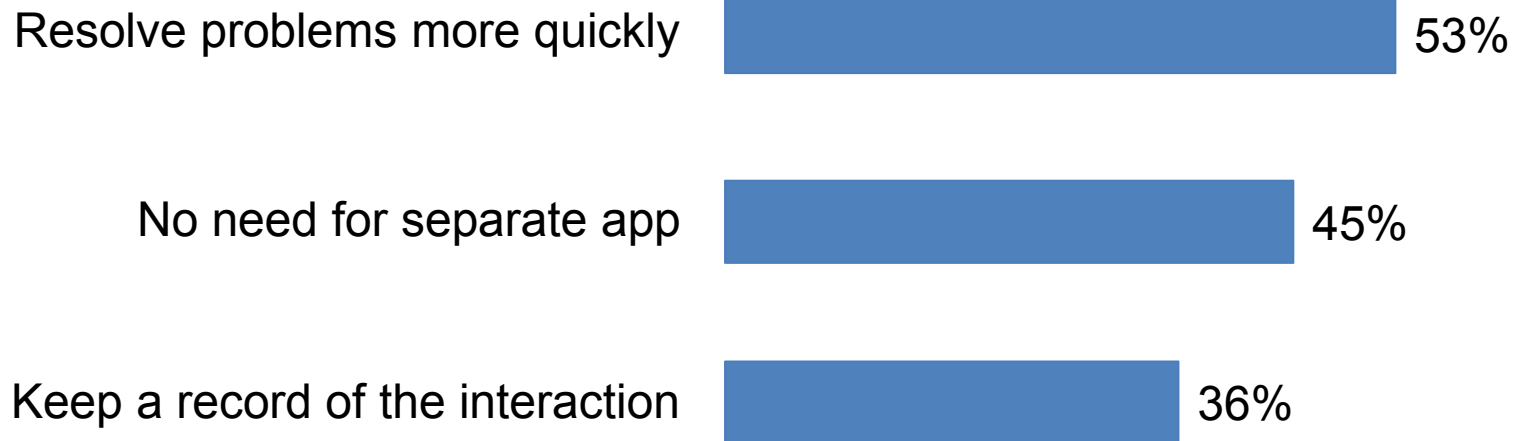


(Source: <http://www.businessinsider.com/amazon-joins-the-chatbot-conversation-2016-12>)

7H) Circular bot, why do consumers want chat-bots :



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Circular bot, why do service providers want chat bots?



Service providers use chat bots to:

- Increase customer satisfaction
- Reduce the need for live agents
- Be flexible about features




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 Circular bot, do chat bots really increase customer satisfaction?



I refuse to incriminate myself.

How about you give a normal talk for a bit?



- Increase customer satisfaction
- Reduce the need for live agents
- Be flexible about features



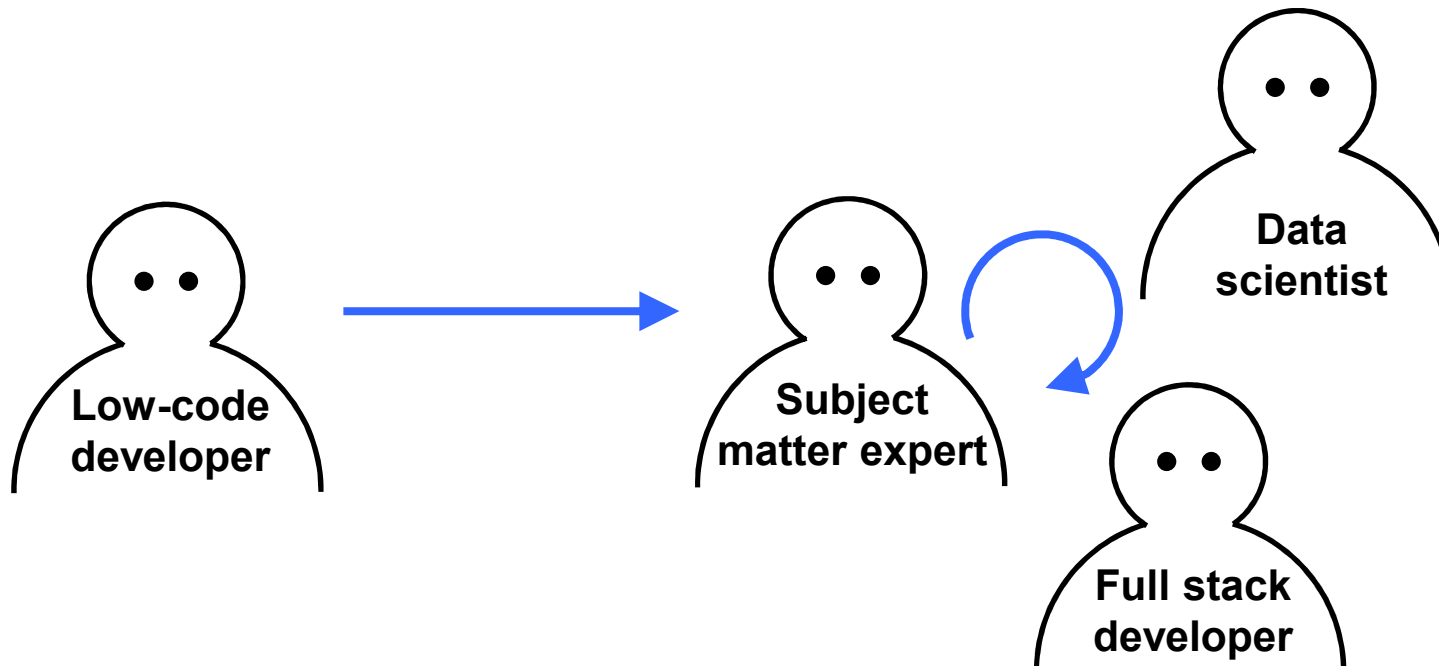
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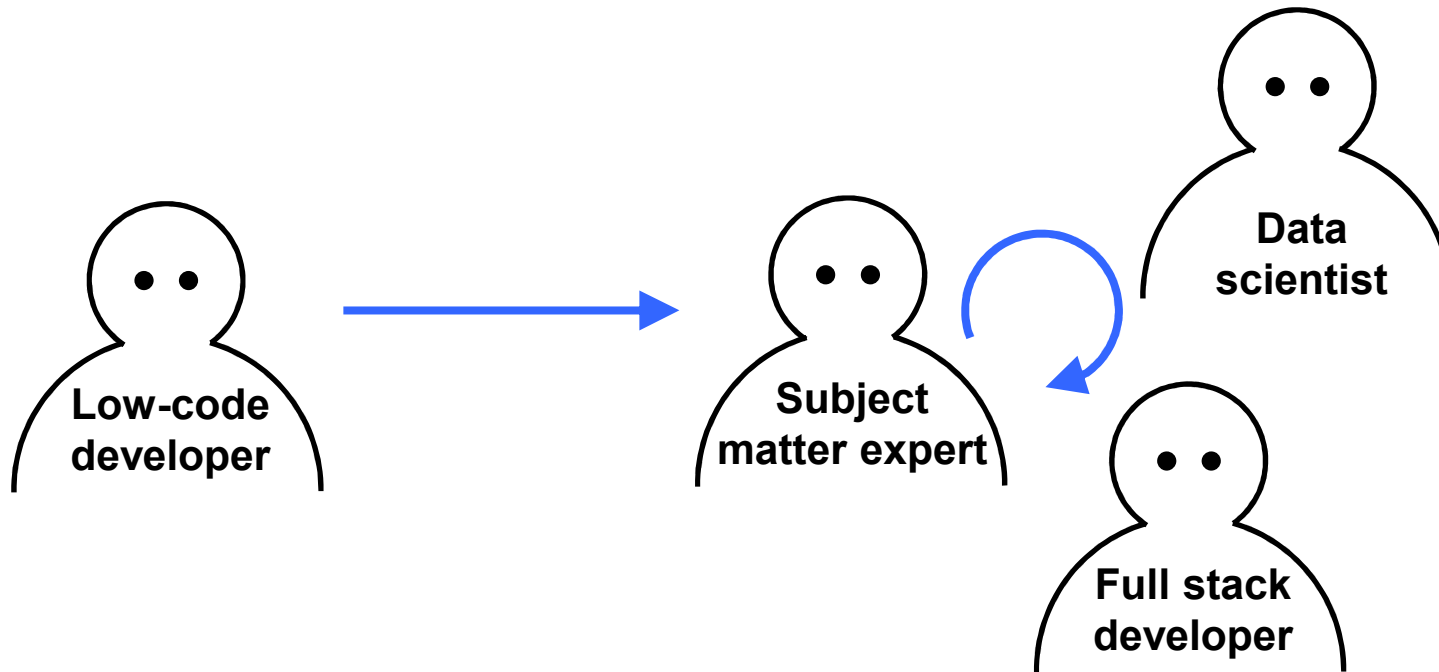


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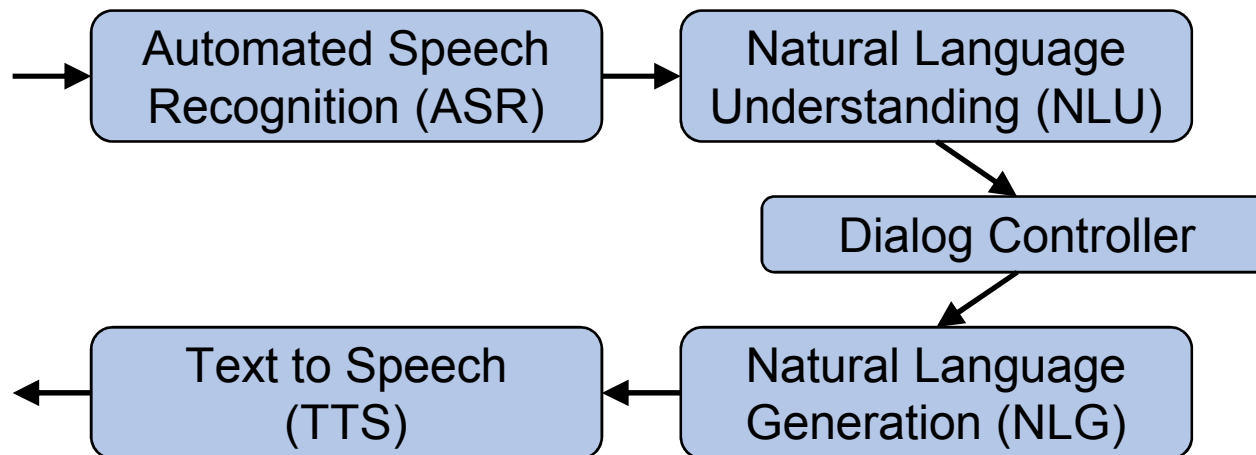


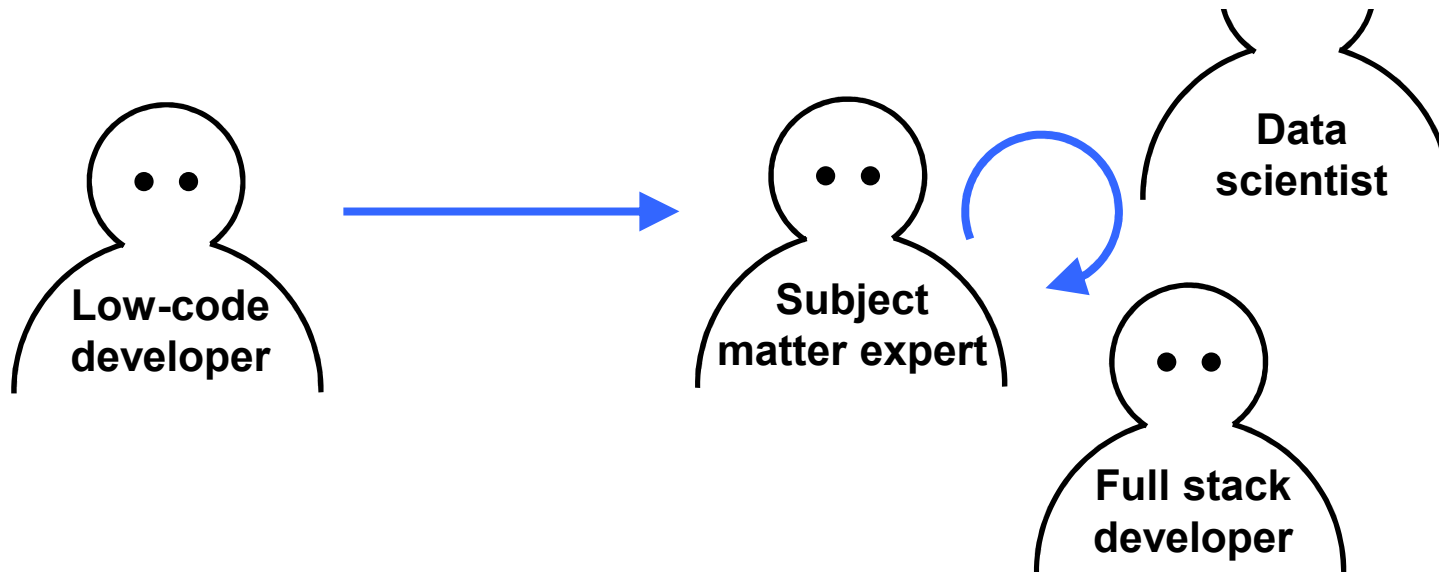
Who creates chat bots?



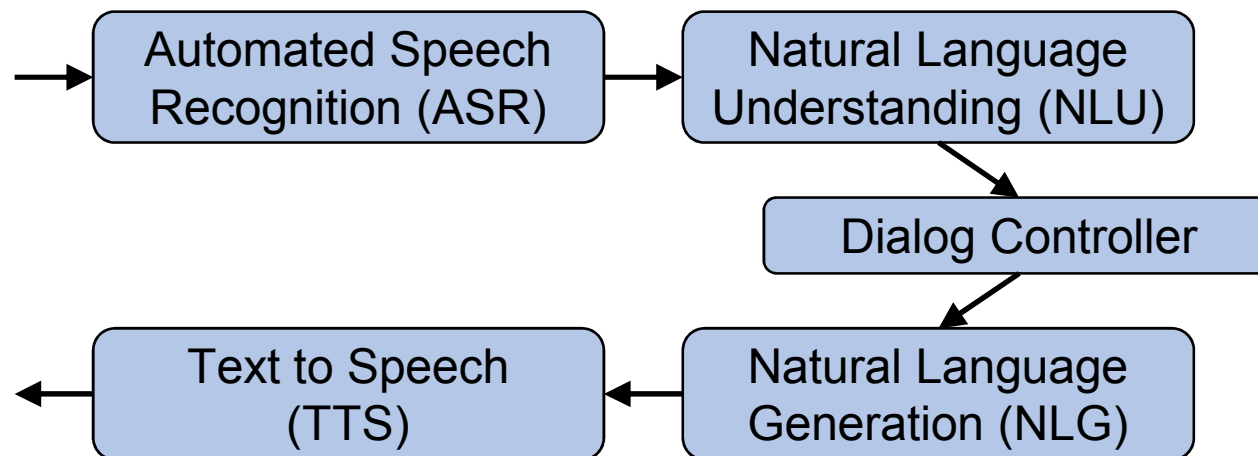


Typical chat bot architecture



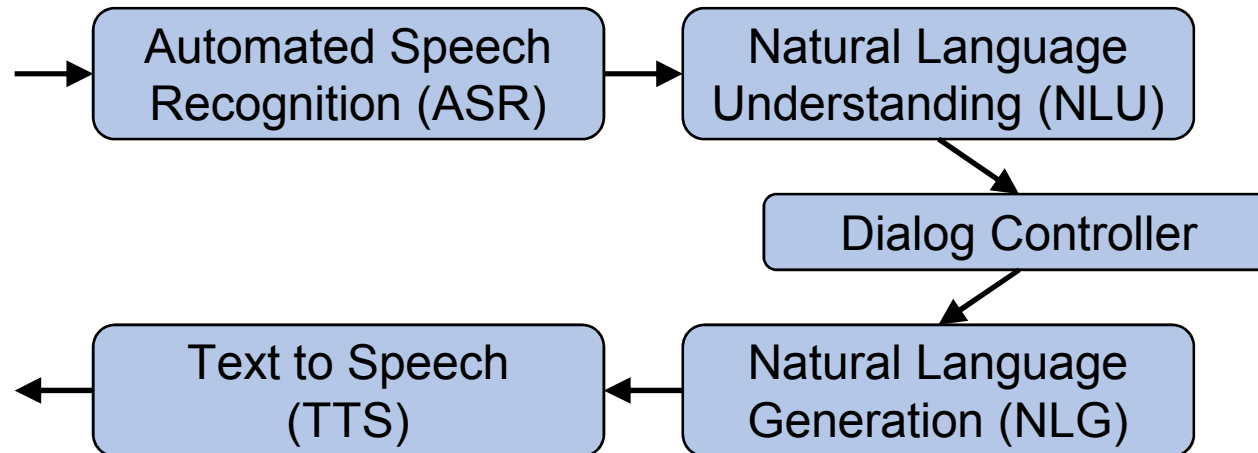


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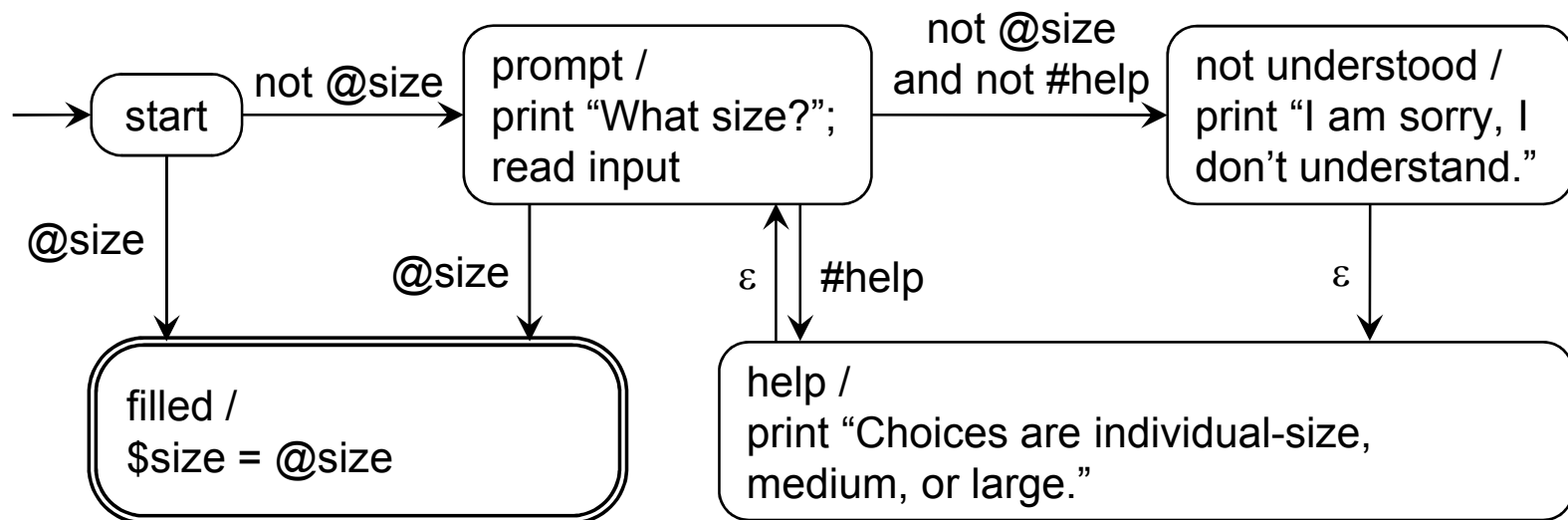
Programming languages for the dialog controller

🤖 Typical chat bot architecture

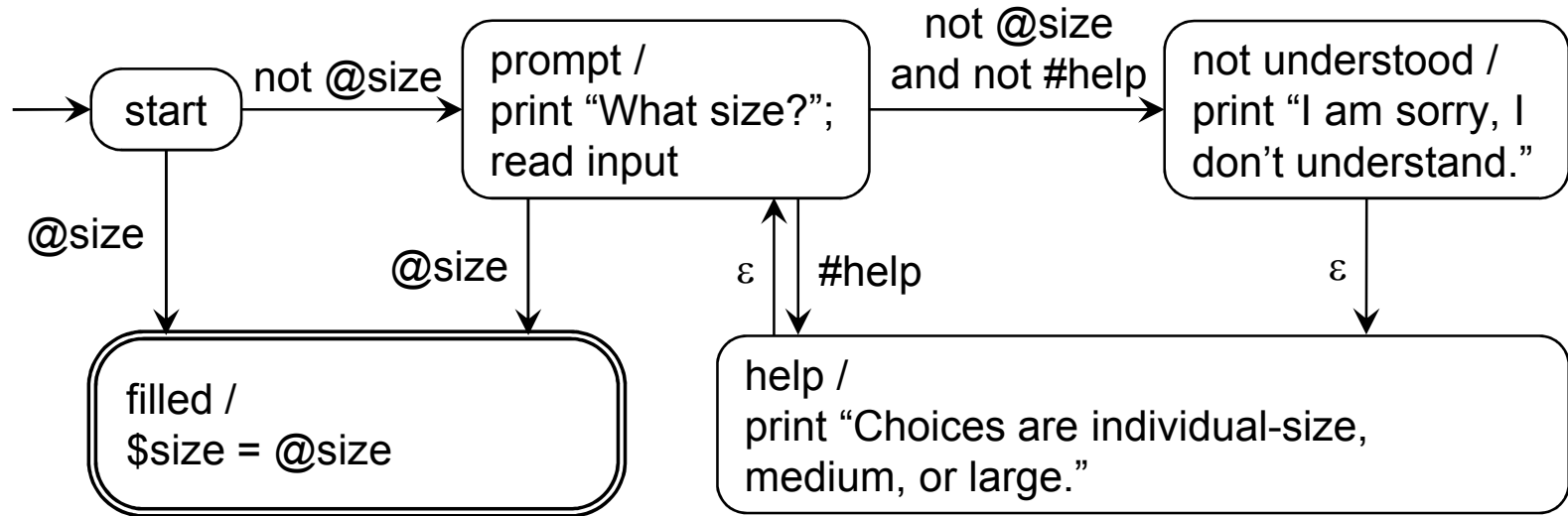


🤖 Programming languages for the dialog controller

Finite automata, e.g.:



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Frames, e.g.:

Slot	Input	Prompt	Help text
\$size	@size = enum { individual size, medium, large }	What size?	Choices are individual-size, medium, or large.
\$crust	@crust = enum { thin / New York style, thick / Chicago style }	What crust?	Choices are thin or thick.
\$toppings	Need a sub-dialog for collecting list here ...	What toppings?	You can pick zero or more of ...


```
filled /
$size = @size
```

```
help /
print "Choices are individual-size,
medium, or large."
```

Frames, e.g.:

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Chat bots should be coherent.

Work towards a goal, e.g.:

- Question answering
- Command-and-control
- Form filling
- Diagnosis, problem resolution
- Query formulation

} Goal-driven patterns, see paper

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Chat bots should be flexible.

Handle deviations from the goal, e.g.:

- Anaphora and ellipsis
- Repair
- Disambiguation
- Elaboration
- Stopping a discussion
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Add-on patterns,
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Coherence-flexibility dilemma

Techniques that improve coherence
reduce flexibility and vice versa.

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Idea: grammars as DSL for chat bots

Specify linear sequence of interactions,
concise, flexible, with error correction.

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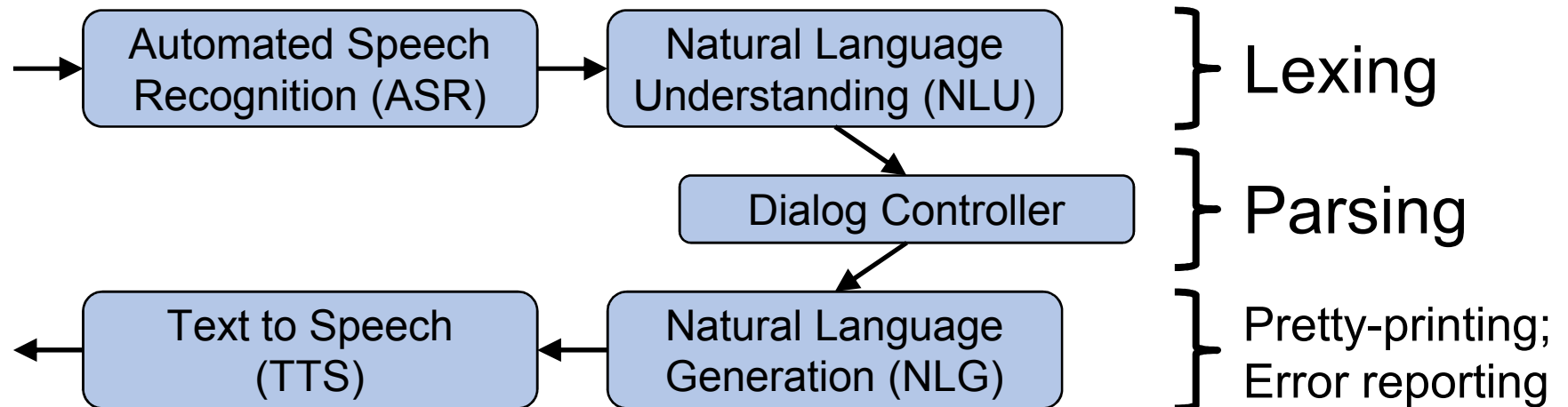
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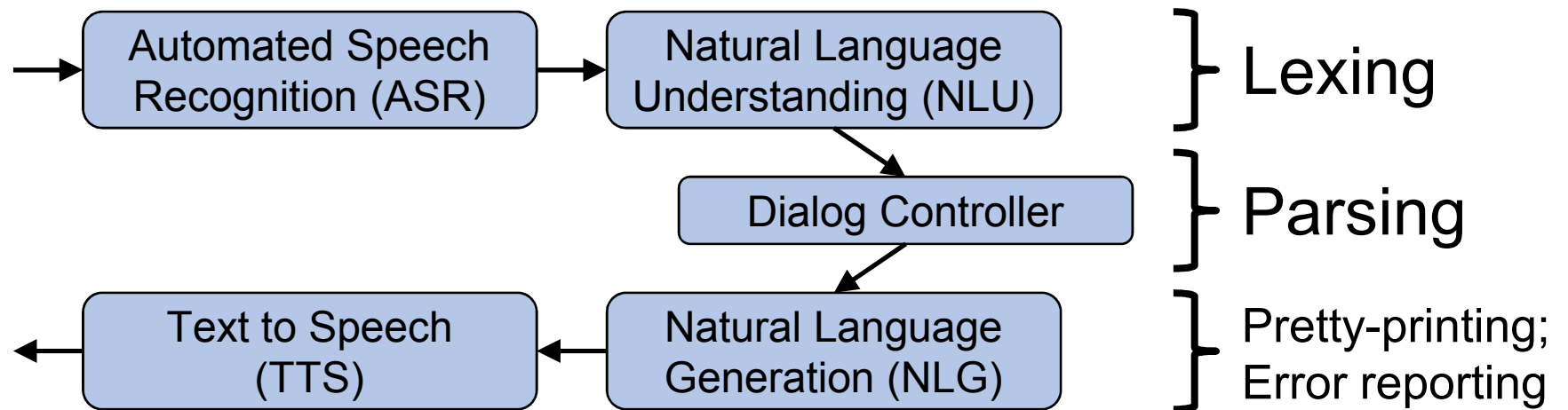
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Chat-bot / parser analogy



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Grammar example

pizza ::= topping crust size*

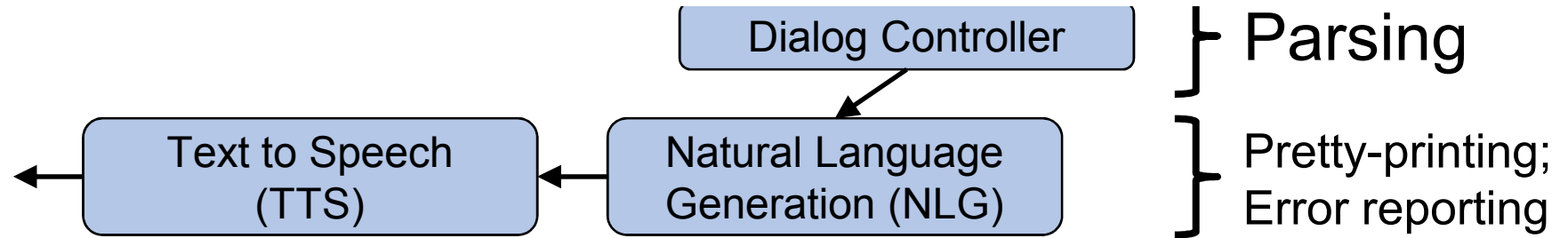
topping ::= 'chicken' | 'mushrooms' | 'blue cheese'

crust ::=

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size ::= 'individual-size' | 'medium' | 'large'



Grammar example

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Broader issues with Cognitive Systems

- Safety and trust
- Modularity and reuse
- Lifecycle management
- Boot-strapping

7.11 Grammatical Example

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 Thank you all for your attention, and thank you Circular Bot for your help!

 Your blue-cheese pizza is ready now.

PIZZA .. *topping* *crust* *size*

topping ::= 'chicken' | 'mushrooms' | 'blue cheese'

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Just kidding.