

Compound Dialog Adaptation: Emergent Conversational Behavior

Presented:

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Who Am I?

- Emmett Coin
 - Speech Scientist
 - Advanced conversational (dialog) systems
 - Technology Expertise:
 - Embedded/wearable/harsh-environment
 - Multimodal Dialog engine architecture and design
 - Industrial Poet
 - Rugged solutions
 - Compact and elegant methodology
 - The power of the spoken word
 - The naturalness of human-computer interaction

What Is “” Talk

- Developer of conversation engines
 - Building a better conversation engine
 - Charting a course to the next level
- “Think Tank” for conversation
 - Dialog/conversation technology
 - Advanced development methods
 - Embed sophisticated new components

Ideas this talk should **provoke**...

- How can we think about a conversation that ...
 - **Tracks and matches** the user's experience
 - Does the Gricean thing
- Cooperation & Variation
 - **What** would a human do?
 - **Why** do they do it?
- Unnoticed (auto-magical) adaptation
 - The **connotative** effects of longer conversations with the machine

A Quick Concept Review

- Domain space distance
 - “Are we talking about groceries now”
- Temporal distance
 - “Before the interruption what were we doing?”
- Shared experience
 - between conversational partners
 - We’ve done this a lot (or this is new let’s do this more carefully)
- Dimensions of “register” (politeness is a simple one)
 - When I added carrots to the list did you say thank you?
 - Did you use my name in an utterance?
- Wordless communications (prosody, nods, smiles, etc)

In and Out: Domain Interaction

- **In** domain utterances:
 - “Change that to macaroni”
 - “Make it 2 pounds”
 - Appropriate because:
 - You are in the process of updating the shopping list
 - Eliminates redundancy -- context is understood (Gricean)
- **Out** of domain utterances:
 - “Add three pounds of roast beef to my shopping list”
 - “Do I have butter on the grocery list?”
 - Appropriate because:
 - Redundancy makes the context switch unambiguous (Gricean)
 - Misunderstanding can be costly and is annoying

Strategies: IN vs. OUT

	Relative Domain Location	
	IN	OUT
IN Domain Utterance	Act on it	Ignore
OUT of Domain Utterance	Act on it Educate by example	Act on it

Near and Far: Temporal Interaction

- **Near** (recent) utterances:
 - “I want mustard”
 - Appropriate because:
 - 5 **seconds** ago you added salt to your shopping list
 - Eliminates redundancy -- context is understood
- **Far** (larger domain time interval) utterances:
 - “Put mustard on the grocery list”
 - Appropriate because:
 - 2 **minutes** passed since you said anything
 - Conversation partners may not agree on the domain they were last in.

Strategies: Recent vs. Later

Relative Domain Time Interval

Recent

Later

Recent Domain Utt

Act on it

Ignore

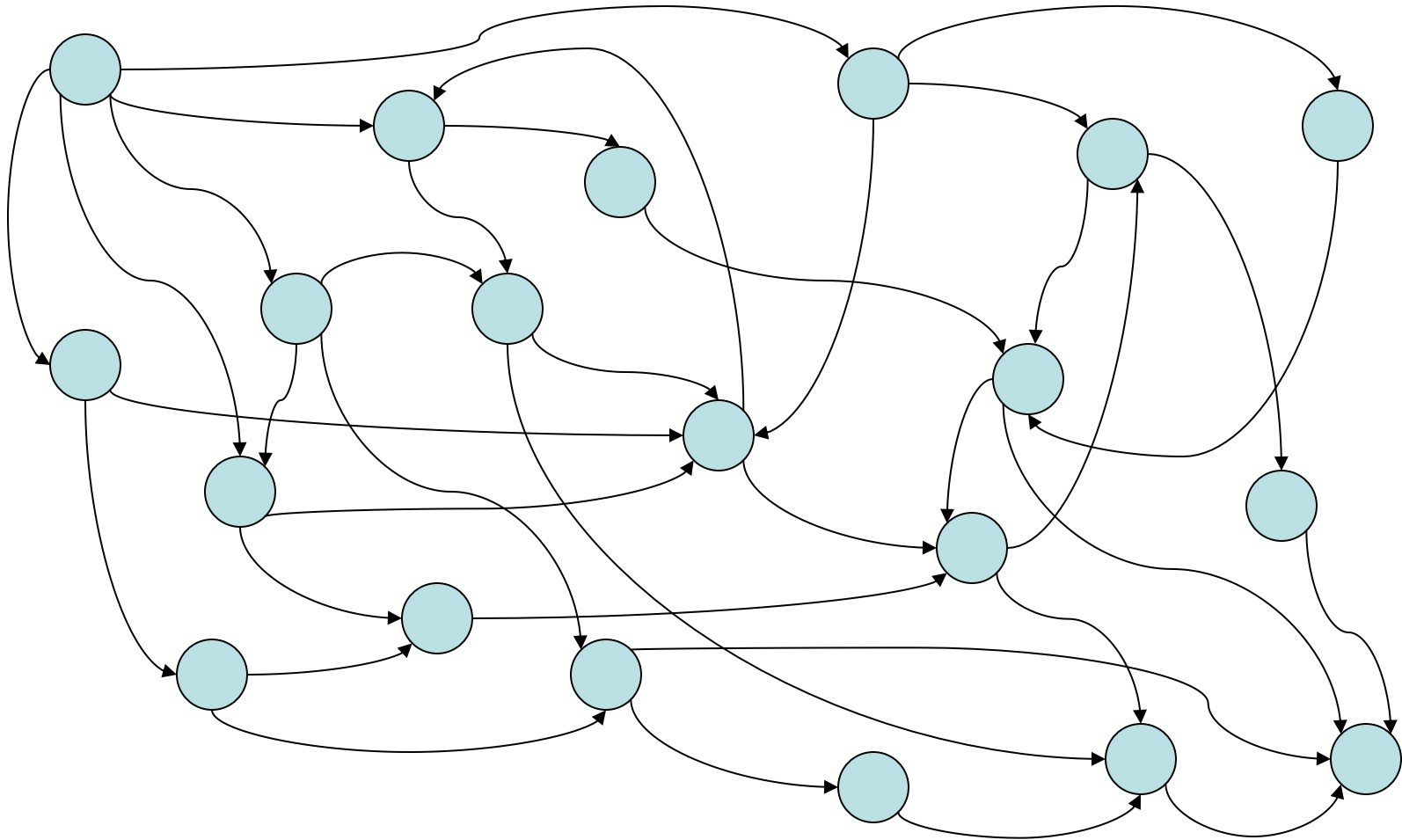
Later Domain Utt

Act on it
Educate by example

Act on it

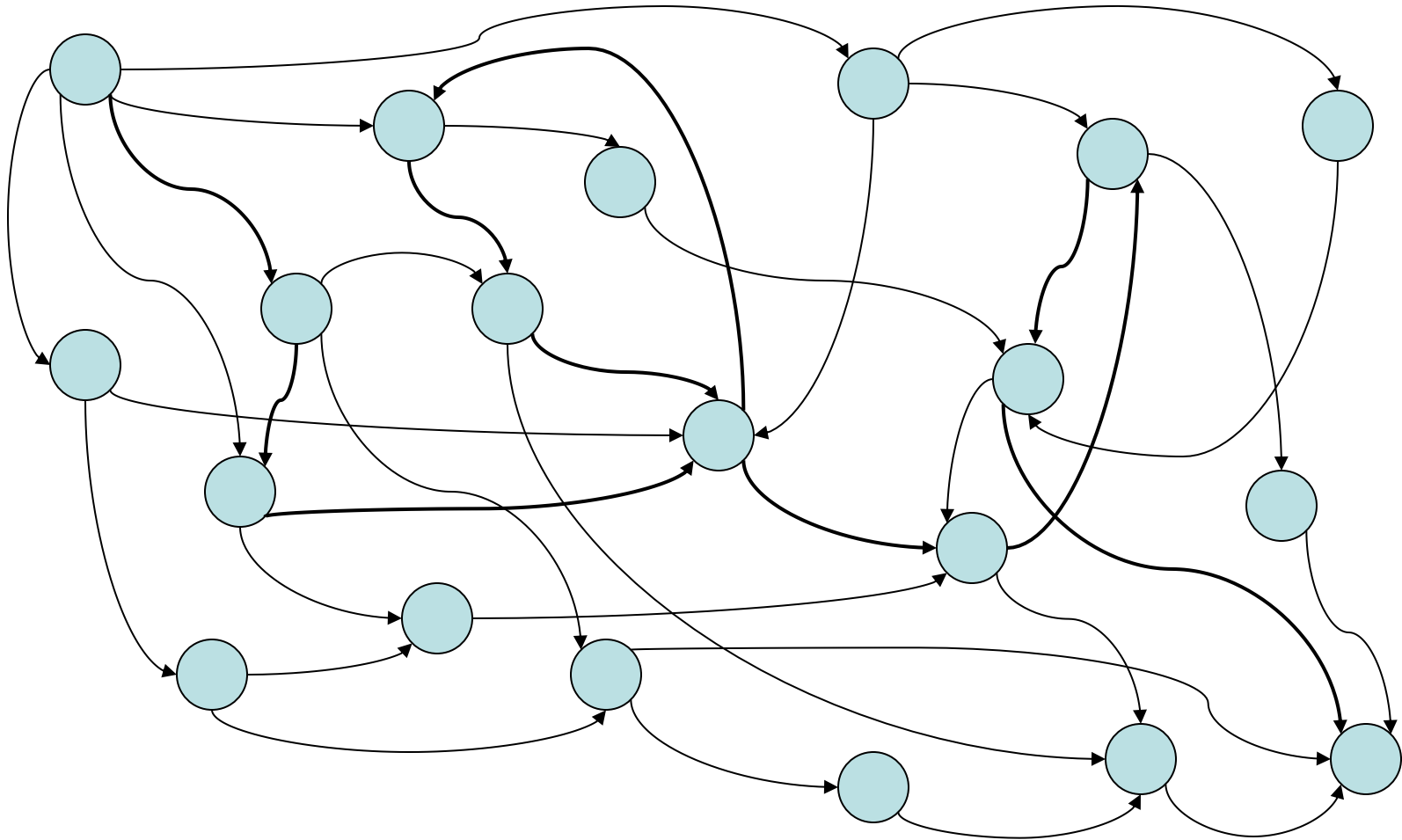
Conversation Experience

Meta Memory



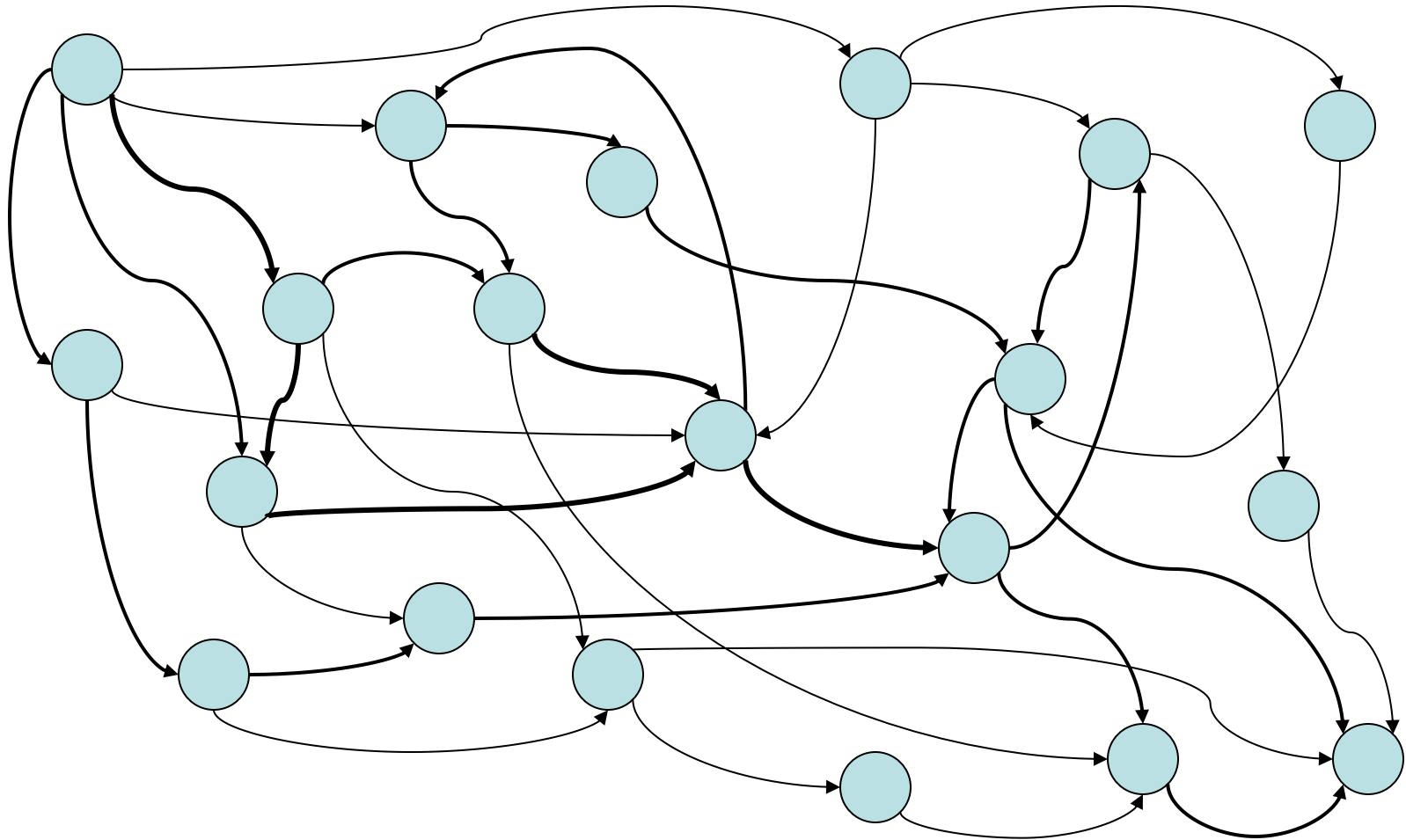
Conversation Experience

Meta Memory



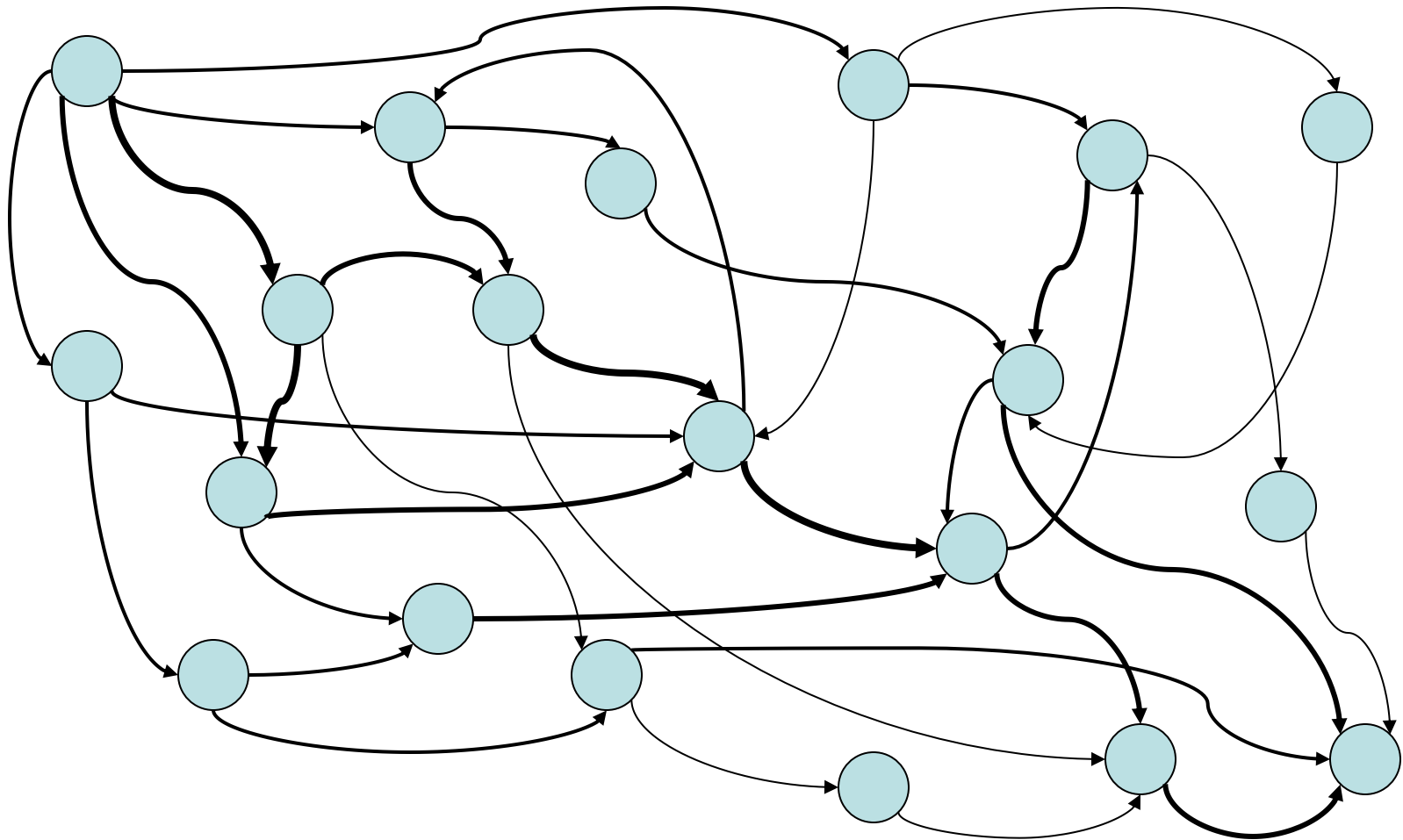
Conversation Experience

Meta Memory



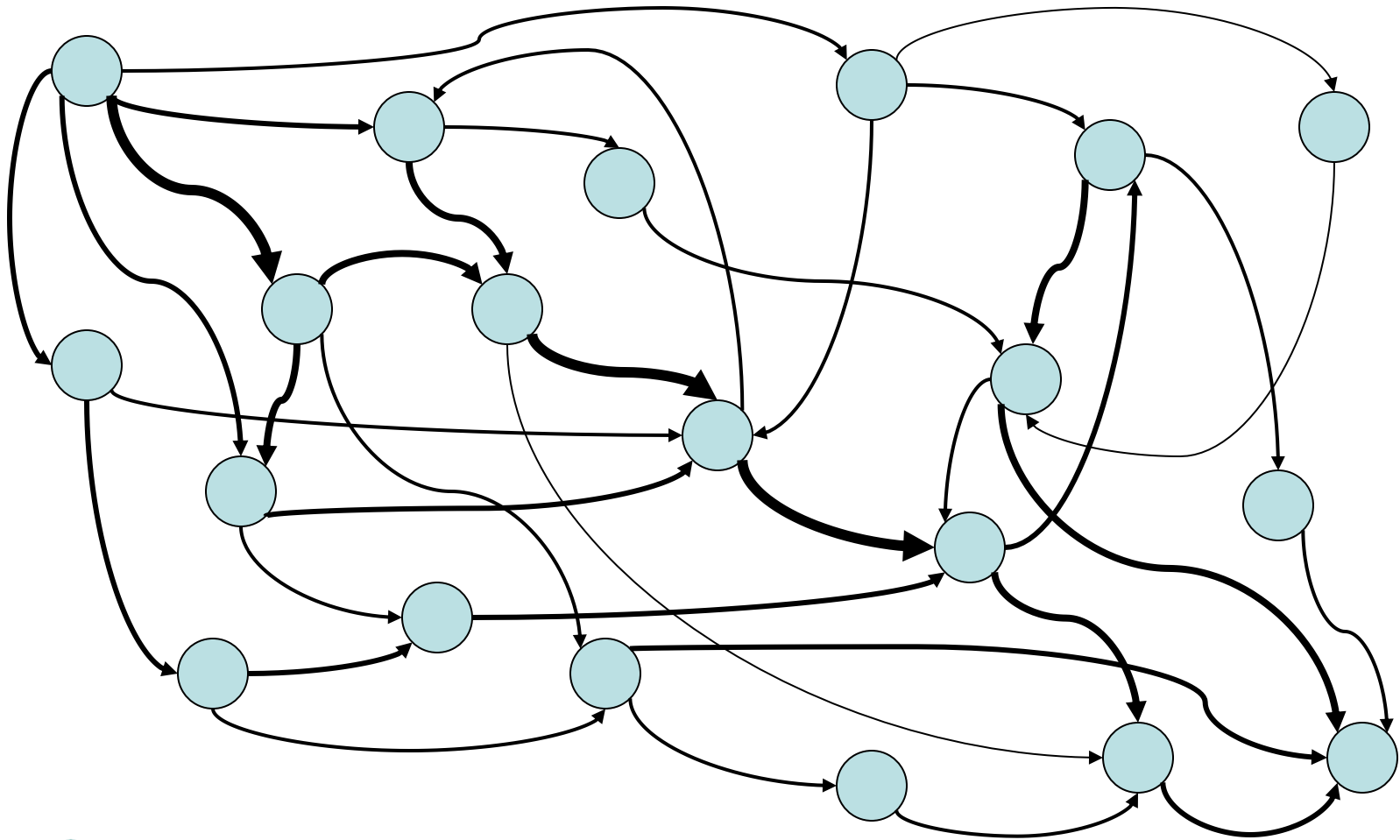
Conversation Experience

Meta Memory



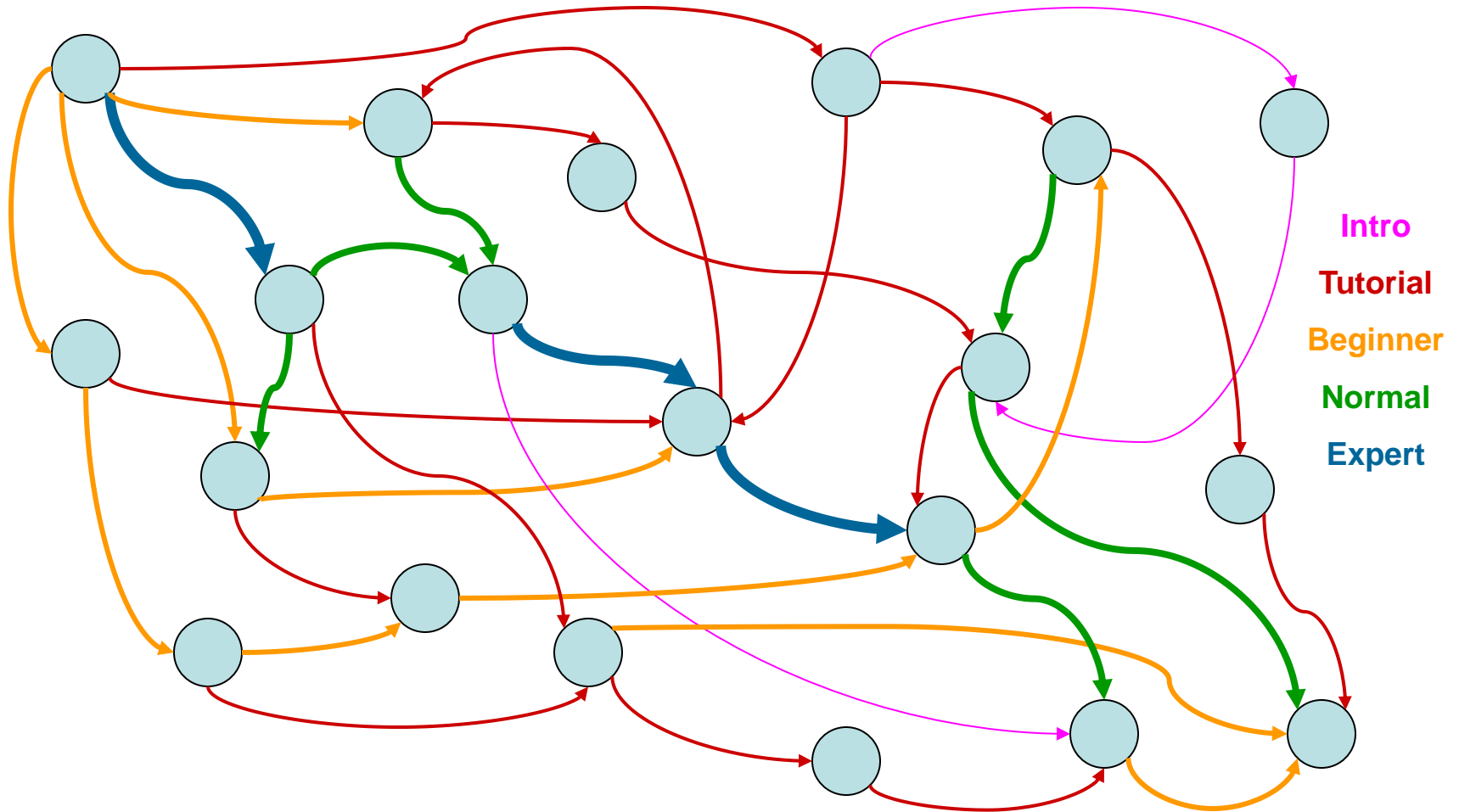
Conversation Experience

Meta Memory



Conversation Experience

Meta Memory



What is Meta Made Of?

[or Prompting Some Antics?]

Cassandra says: {M:ejGenericList.xml/here_is_the_X_List:}.

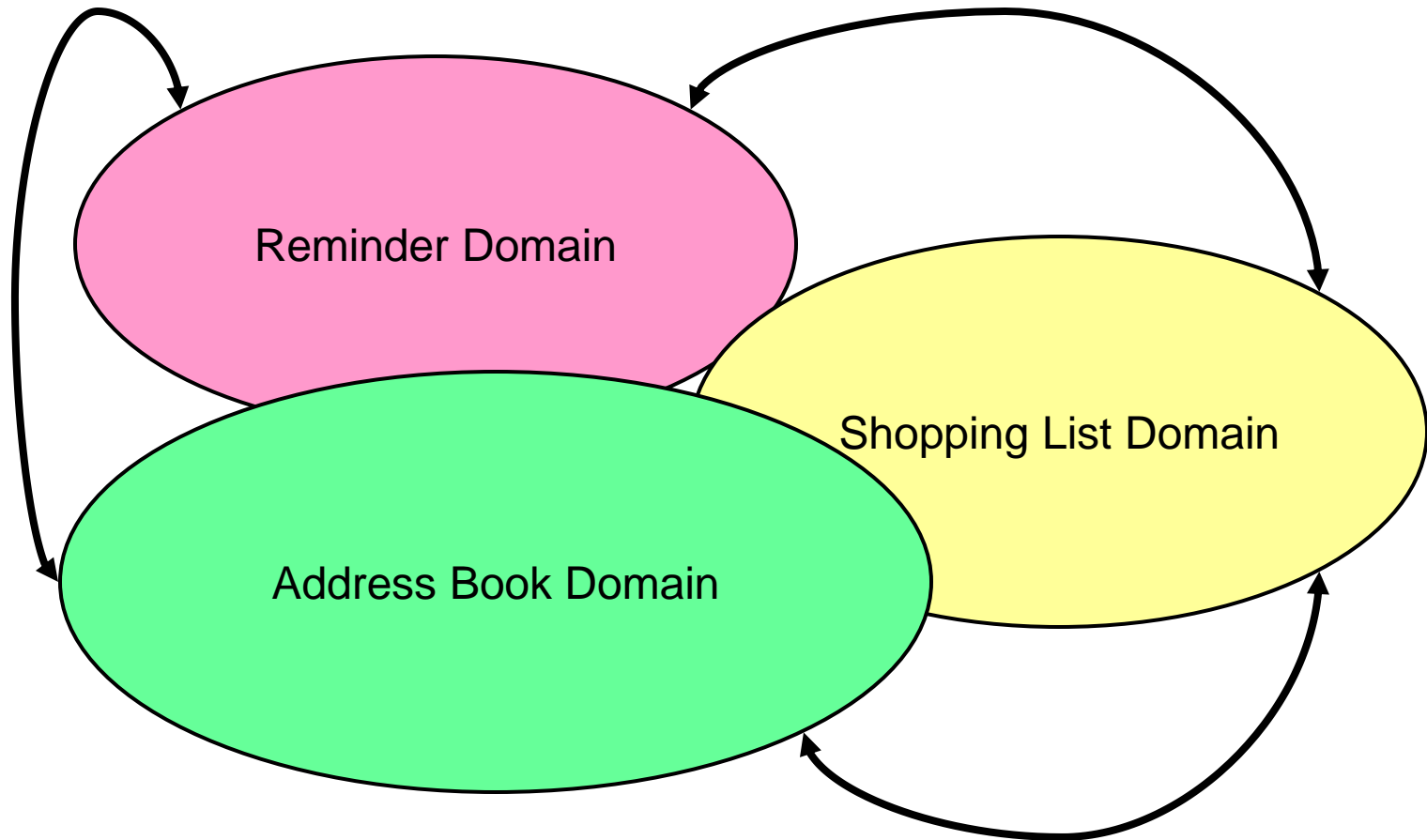
She uses the following specification:

```
<here_is_the_X_List>
  <val>Here's the {V:genericList/name:} list.</val>
  <int>
    <val>{G:pGram_Core.xml/yes:}, displaying the {V:genericList/name:} list</val>
  </int>
  <tut>
    <val>{G:pGram_Core.xml/yes:}, here's the {V:genericList/name:} list</val>
  </tut>
  <beg>
    <val>Here's the {V:genericList/name:} list</val>
  </beg>
  <nor>
    <val>{V:genericList/name:} list</val>
  </nor>
  <exp>
    <val>Here</val>
  </exp>
</here_is_the_X_List>
```


Between Domain Interaction

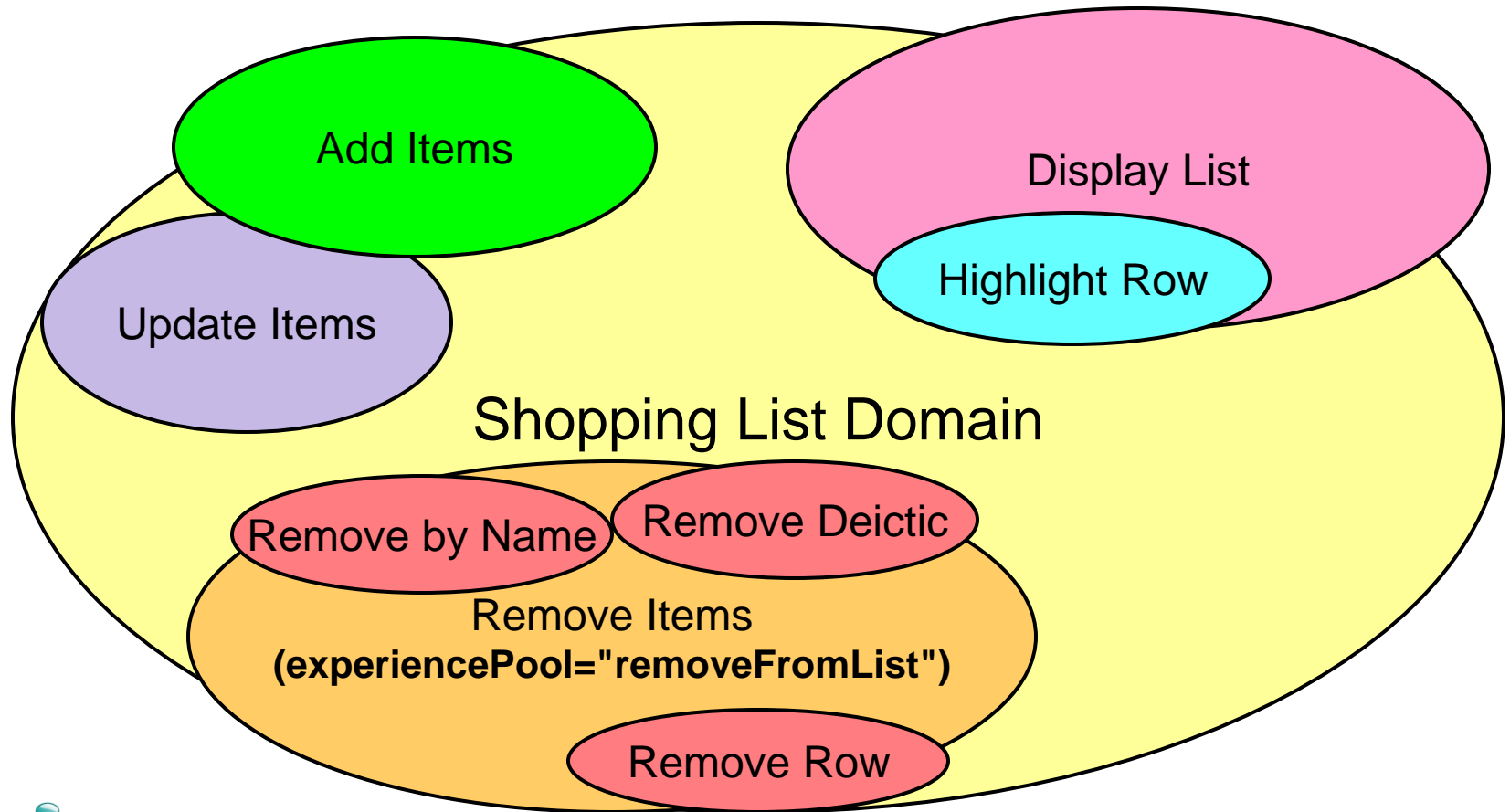
an example of an Experience Pool

(experiencePool="listDisplay")



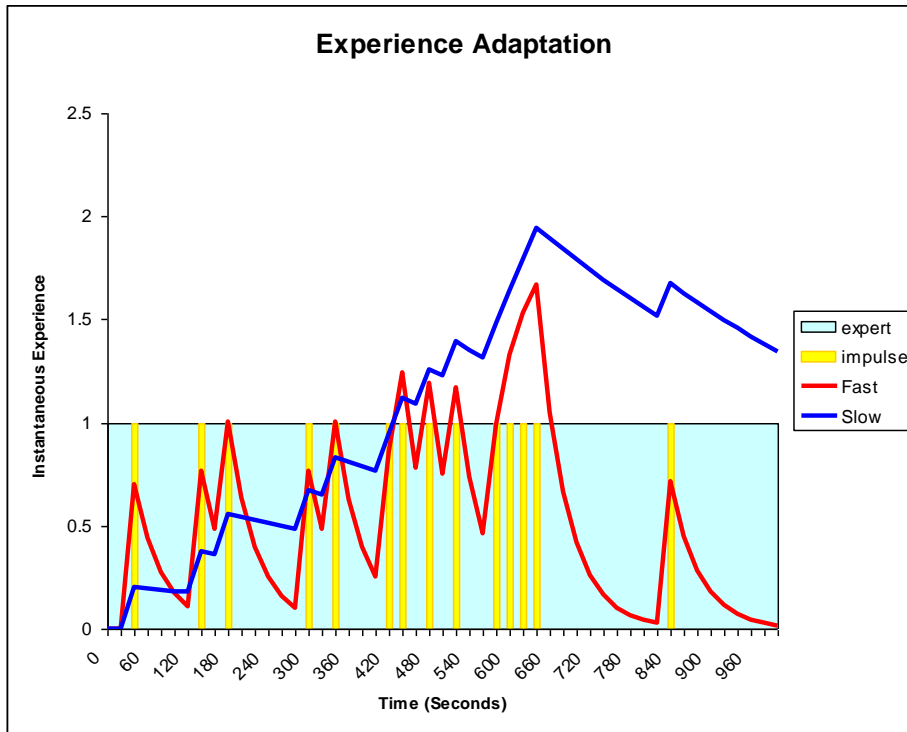
In Domain Interaction

an example of an Experience Pool



Experience Metric

(Fast and Slow Experience)



$$newExp = prevExp * e^{-0.693 \left(\frac{deltaTime}{halfLife} \right)} + impulseWt$$

Legend:

newExp = resultant new experience level

prevExp = experience level at deltaTime ago

deltaTime = time elapsed since last experience of state

halfLife = how long it takes for experience to fade to ½

impulseWt = how much experience gained with an encounter

Tapping into Automaticity

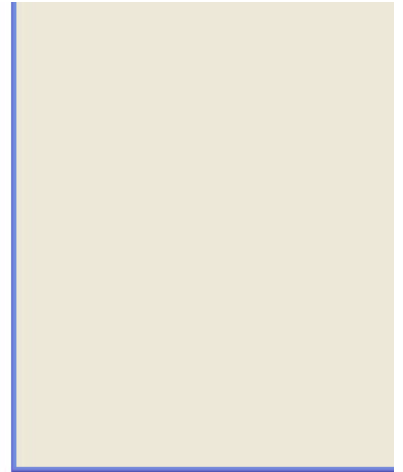
- Automaticity:
 - Doing something so well that you do not have to think about it while doing it
 - Complex activity that requires little effort or attention
 - Doing things without dwelling on details
 - The delegation of behavioral nuance
 - Less micro-management
 - Second nature
 - Riding a bike

Cassandra Video



ejTalk Cassandra

Cassandra understood:
Cassandra said:



Thinking Meta

- More Natural
 - The user experience is **less rigid** and can be **more consistent**
- Easier to Author
 - Like systems based on delegation (e.g. military) each level has a **manageable amount of detail** to react to
- Automatic
 - People only drive a manual transmission car for fun and that “fun” **costs more** too!
- What rules?
 - As **subtle** and **sophisticated** as needed but sensibly **encapsulated**

Remember

- **Delegate** at a semantic level
- Syntax is **Derived** in “the moment”
- **Consistent** behavior over the entire system
- Simplify dialog design (**Divide/Conquer**)
- Create more **Natural** experiences
- Greater than the sum of the parts
(**Emergent Behavior**)

Thank you!



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