

Table Talking:

Conversational Rendering of Table Data

Presented:

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Emmett Coin
Industrial Poet

Who Am I?

- Emmett Coin
 - Speech Scientist
 - Advanced conversational systems
 - Adaptive natural synthetic agents
 - Technologies:
 - Embedded/wearable/harsh-environment
 - Synthetic Agent (SA) network systems
 - Architect
 - Advisor
 - Industrial Poet
 - Rugged solutions
 - Compact and elegant methodology
 - The power of the spoken word

What Is “” Talk

- Mapping the Frontier
 - What is required to “converse with the machine”?
 - Charting a course to the next level
 - Can we make it meta?
- Helping Others
 - Evaluate dialog/conversation technologies
 - Guide development using advanced methods
 - Embed sophisticated new components

Ideas this talk should provoke...

- How can we address an **entire class** of conversation?
 - How it will **simplify** dialog design.
 - Why it will **improve** conversational efficiency.
- Reducing big problems into manageable chunks.
 - Why **reassembled chunks** are better
- Dealing with the task at hand
 - Delegate the rest to **derived behavior**
 - Why it improves **consistency**.
- What do we **expect** from a real conversation?

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

Tapping into Automaticity

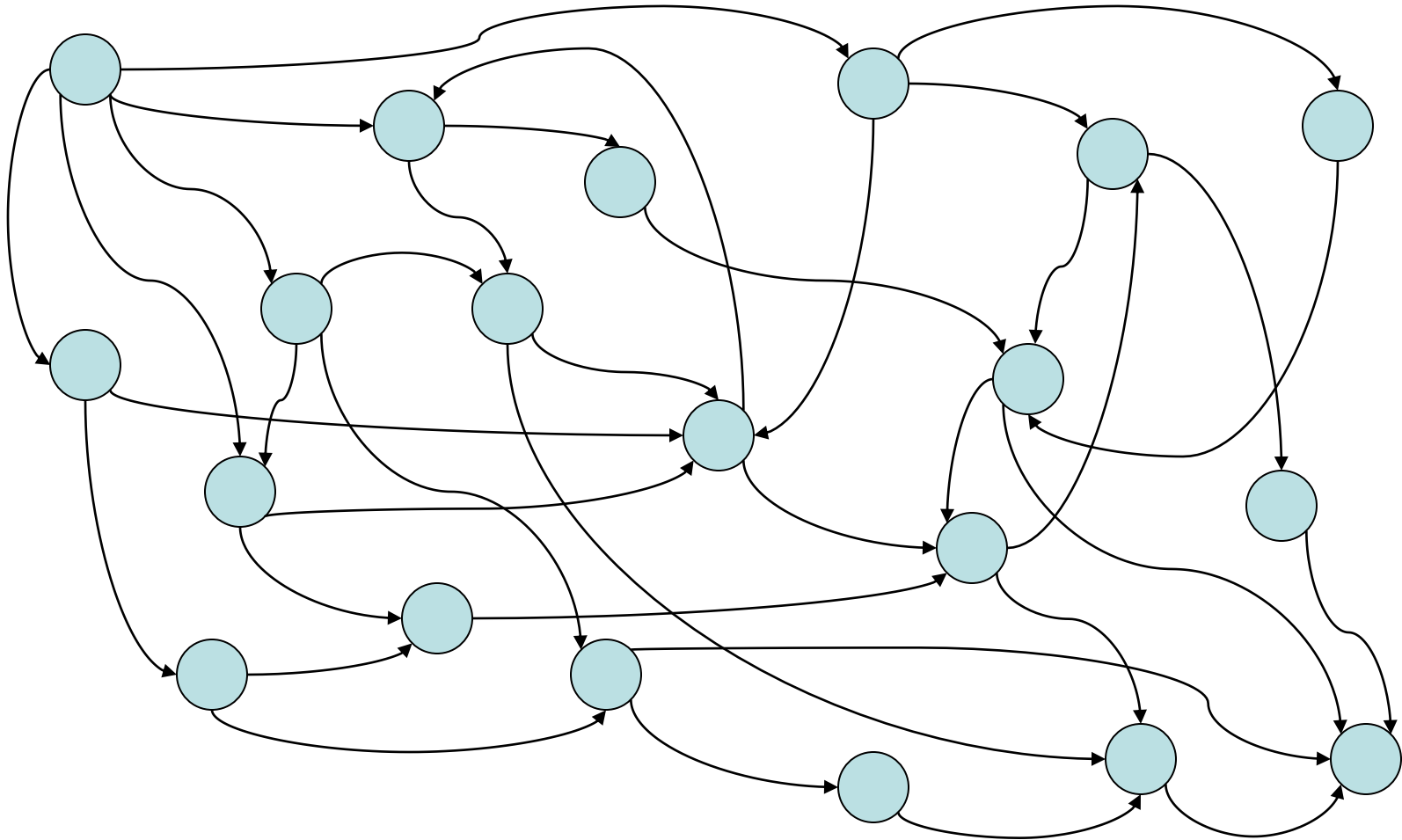
- Automaticity:
 - Doing something so well that you do not have to think about it while doing it
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“Automatic” Implies

- Rules
 - Proven algorithms
 - Describable by a formalism
 - High level semantics – derivable syntax
- Delegation
 - Relinquish control to a “separate” intelligence
 - Trust it will be accomplished
 - Accept a “high-level” activity summary.

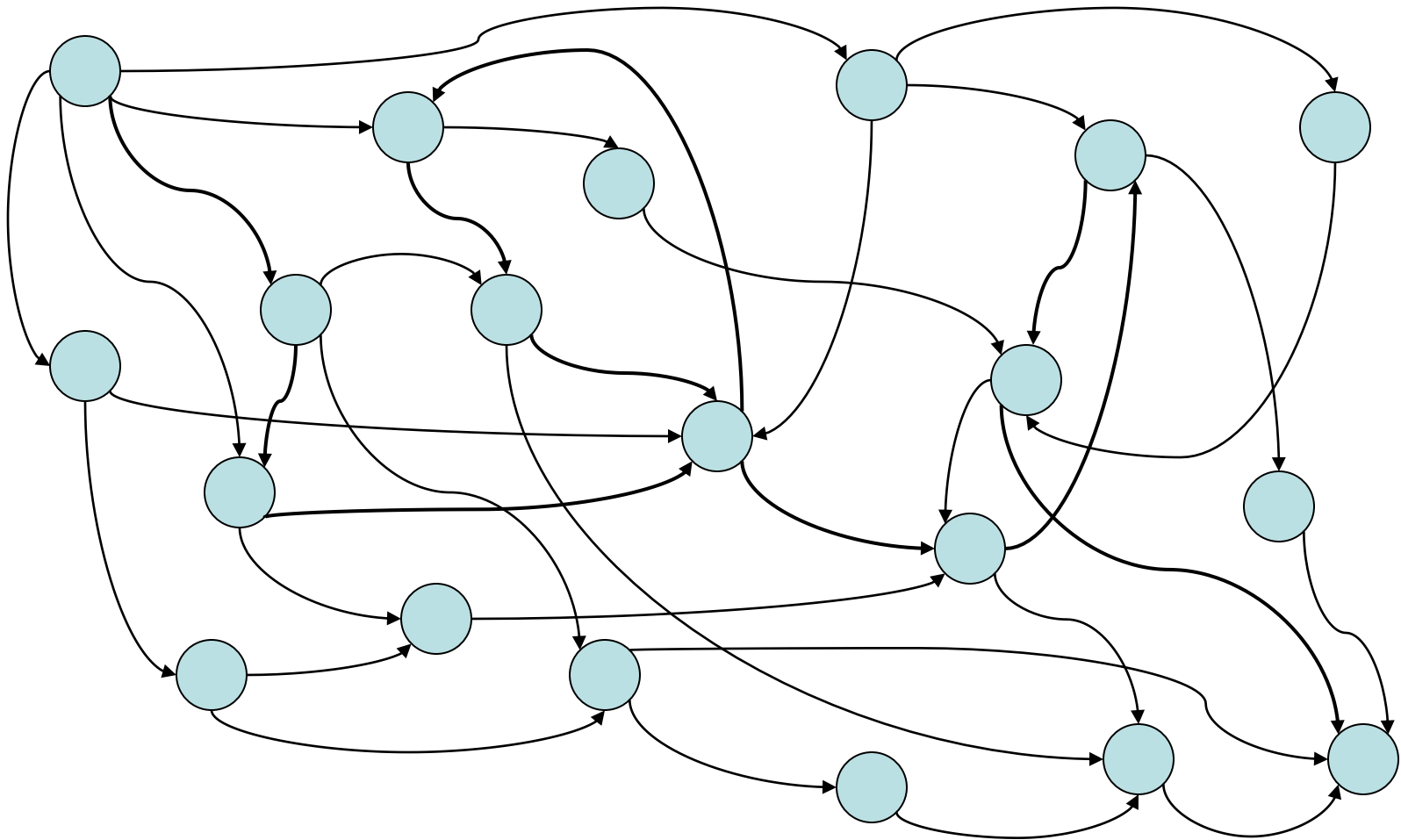
Dialog Network

Meta Memory



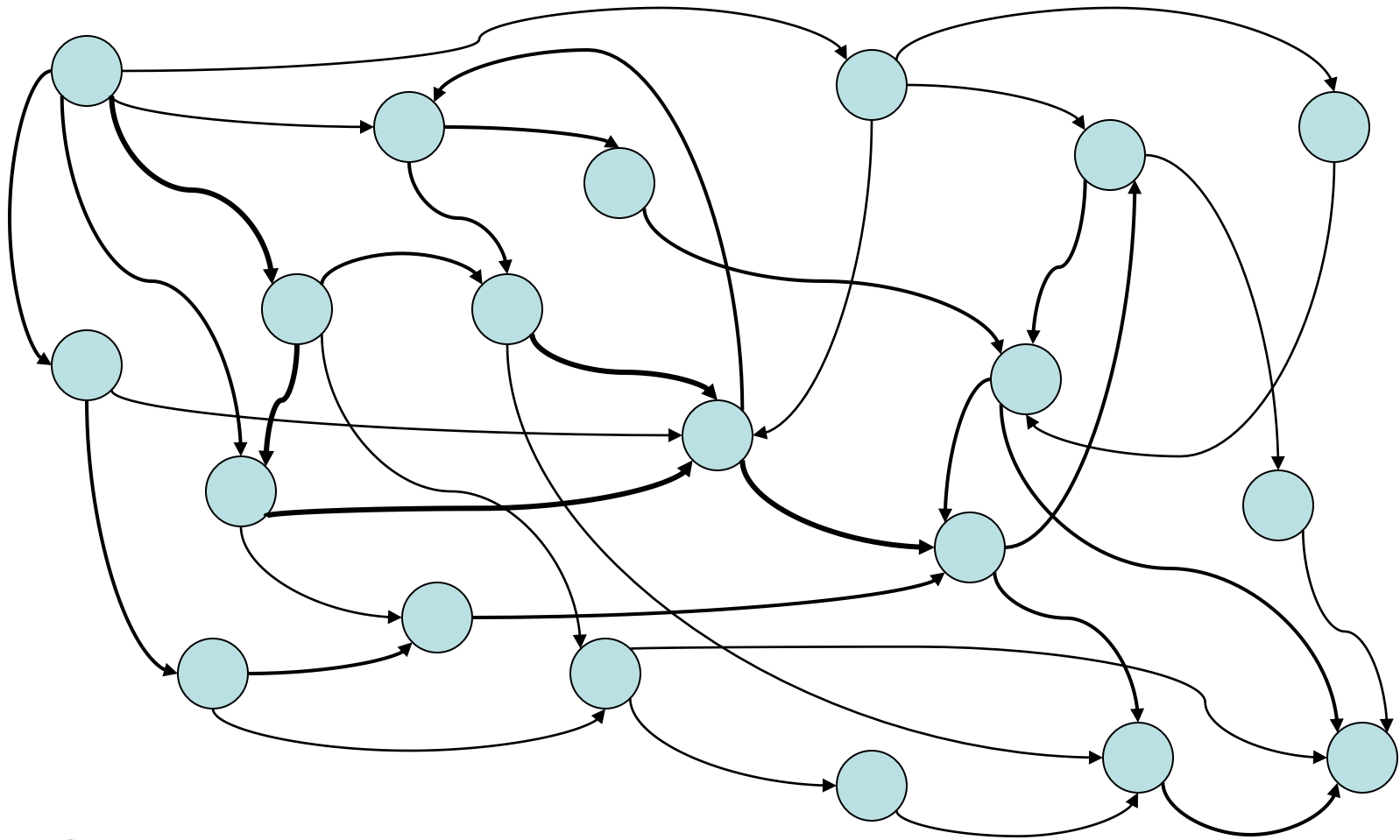
Dialog Network

Meta Memory



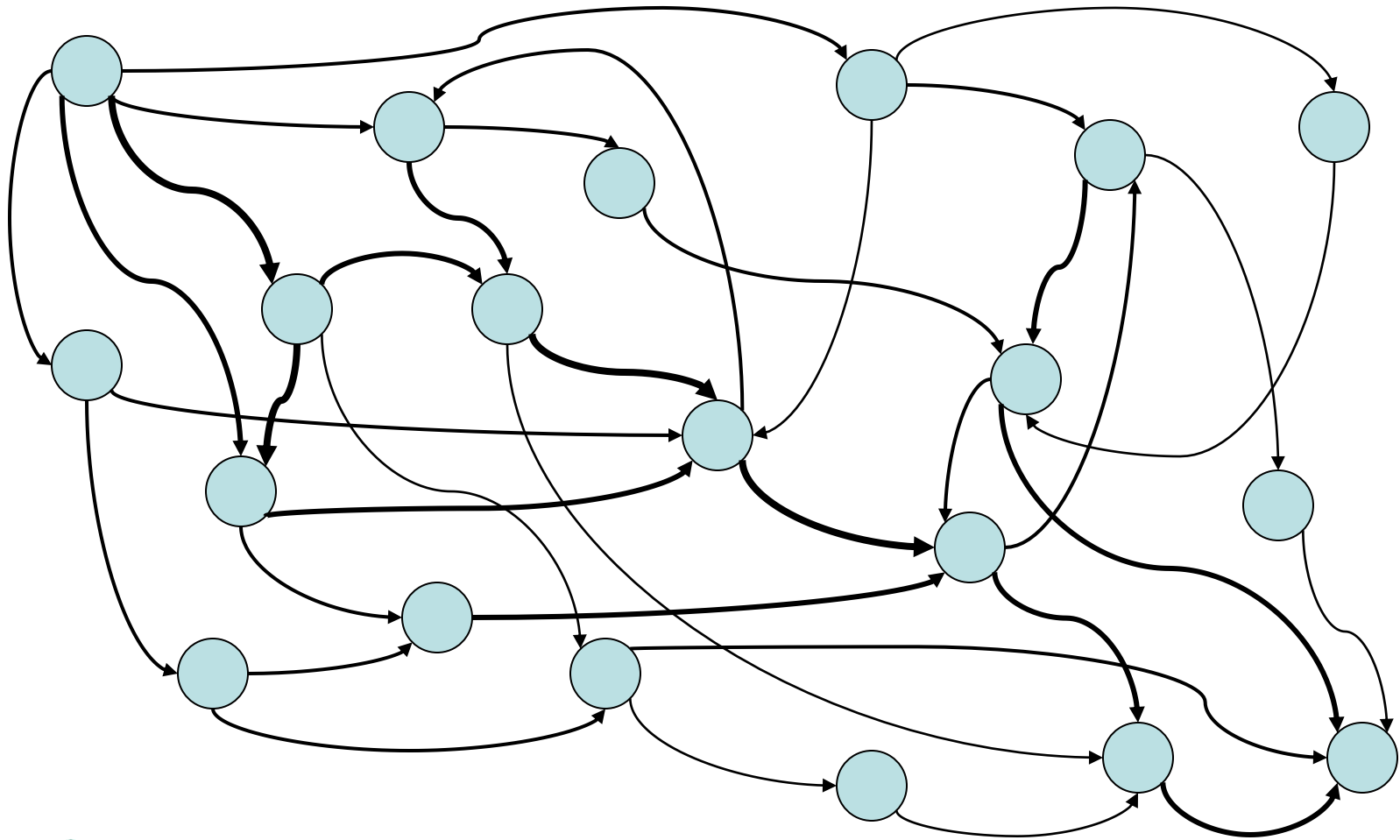
Dialog Network

Meta Memory



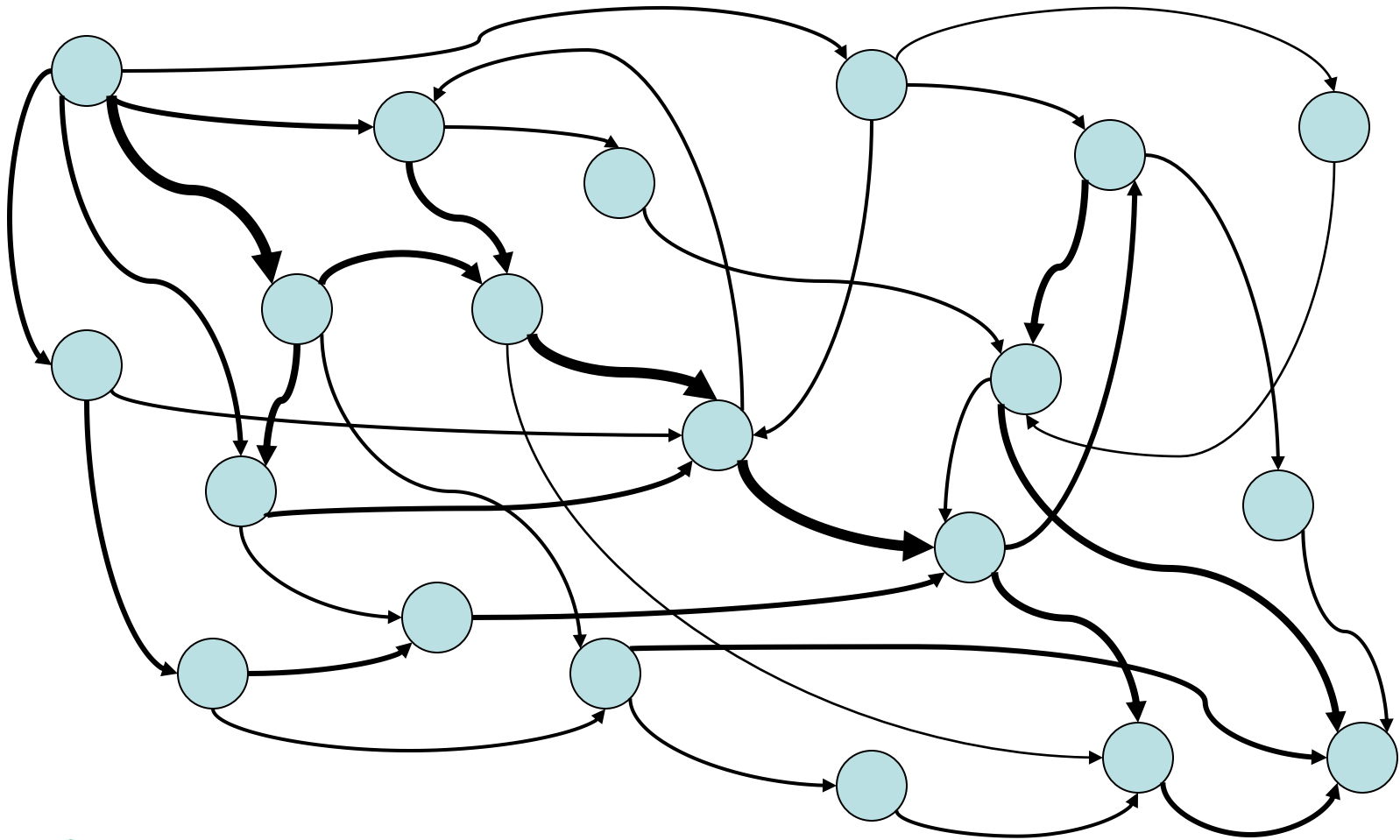
Dialog Network

Meta Memory



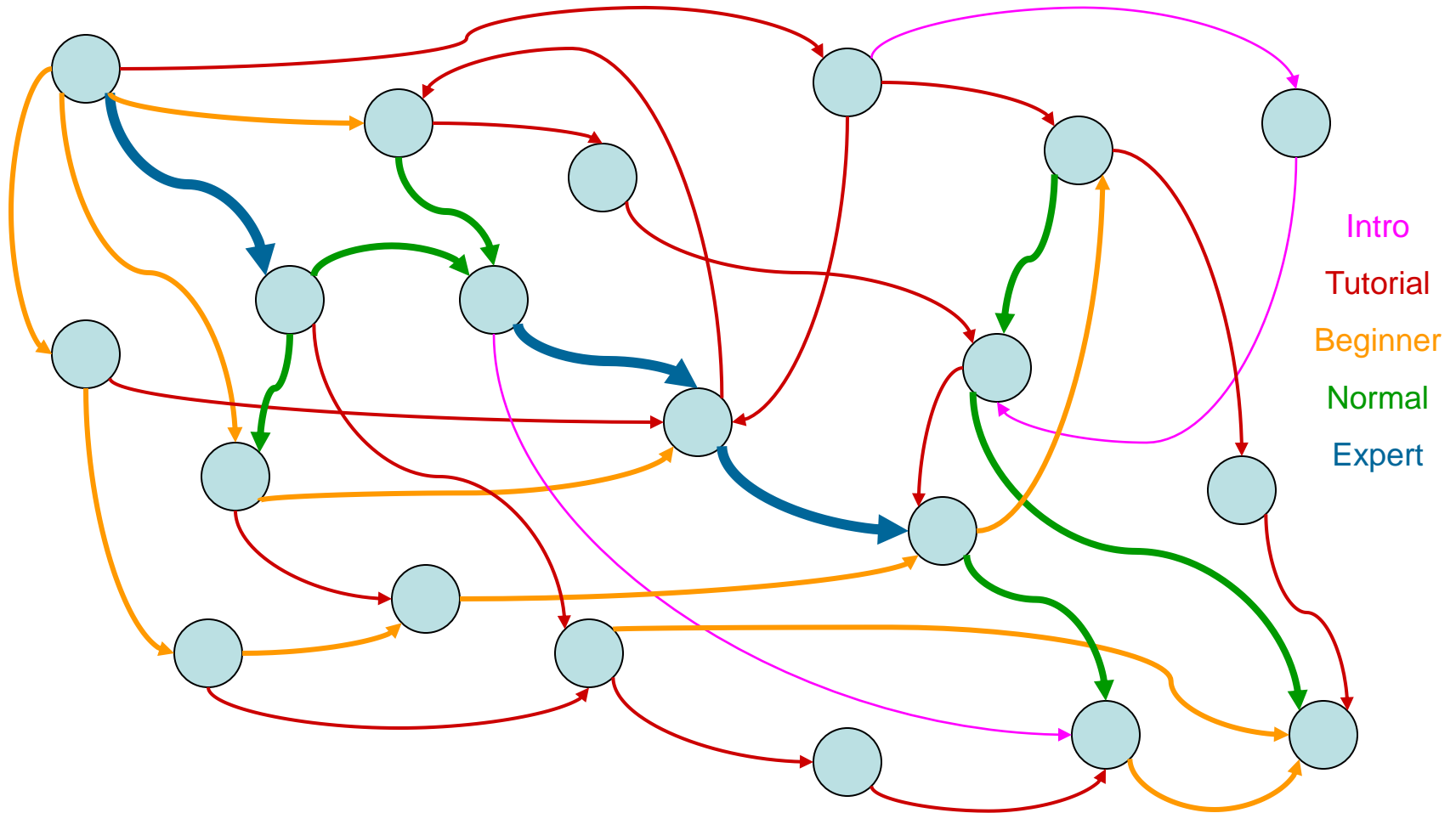
Dialog Network

Meta Memory



Dialog Network

Meta Memory



Tables: a Meta Concept

- Universal Concepts of Table Interaction
 - Display
 - Show the table, highlight the elements at the focus
 - Focus
 - Use more “in context” domain language when appropriate
 - Manipulate
 - Add, Delete, Inquire, Sort the elements
 - Reference
 - Name, Index, Relative Position, Deixis
 - Multimodality
 - Operations by voice and/or keystrokes and/or ???

Display

Display Focus Manipulate Reference Multimodality

- Language (grammar)
 - “show me my [someListName] table” variations
 - Use simple listOfListNames grammar to flavor a generic (standard) ejListControl.srgs grammar
- Remember
 - Previously used row/column manipulation focus
- Render
 - Read the table data (from the BlackBoard)
 - Format it as HTML (including “touch” responses)
 - Insert it into the page on the browser

Name of Planet Table Domain

(to move the focus to the domain)

```
<grammar LANGID="409" root="grammar">
  <rule id="ejListType" semFormat="listTypeSpecific">
    <one-of semName="ejListCategory">
      <item semValue="ejAppointmentList">appointment</item>
      <item semValue="ejAppointmentList">appointments</item>
      <item semValue="ejReminderList">reminder</item>
      <item semValue="ejReminderList">reminders</item>
      <item semValue="ejGroceryList">shopping</item>
      <item semValue="ejGroceryList">grocery</item>
      <item semValue="ejHardwareList">hardware</item>
      <item semValue="ejSuppliesList">supplies</item>
      <item semValue="ejToDoList">to_do</item>
      <item semValue="ejPlanets">planet</item>
      <item semValue="ejPlanets">planets</item>
      <item semValue="ejPlanets">solar_system</item>
    </one-of>
  </rule>
</grammar>
```


List of Planet Names

(to incorporate into generic list control grammar)

```
<grammar LANGID="409" root="grammar">
  <rule id="ejPlanetNames">
    <one-of semName="ejPlanetType">
      <item semValue="real">Mercury</item>
      <item semValue="real">Venus</item>
      <item semValue="real">Earth</item>
      <item semValue="real">Mars</item>
      <item semValue="real">Jupiter</item>
      <item semValue="real">Saturn</item>
      <item semValue="real">Uranus</item>
      <item semValue="real">Neptune</item>
      <item semValue="dwarf">Pluto</item>
    </one-of>
  </rule>
</grammar>
```

Display: table format

(to paint the table in html for display)

```
<listFormat name="planetListFormat2">  
  <tableTitle>The Planets</tableTitle>  
  <tableFormat>ejTable2</tableFormat>  
  <primaryValue>name</primaryValue>  
  <rowFocusClass>ejTableRowFocus</rowFocusClass>  
  <rowIndexClass>ejTableIndex</rowIndexClass>  
  <fieldFocusClass>ejTableFieldFocus</fieldFocusClass>  
  <record node="planet" showColumnTitles="TRUE" numberOfRows="TRUE">  
    <field title="Planet">  
      <data>name</data>  
      <format>ejText</format>  
      <displayClass>ejNormal</displayClass>  
    </field>  
  </record>  
</listFormat>
```

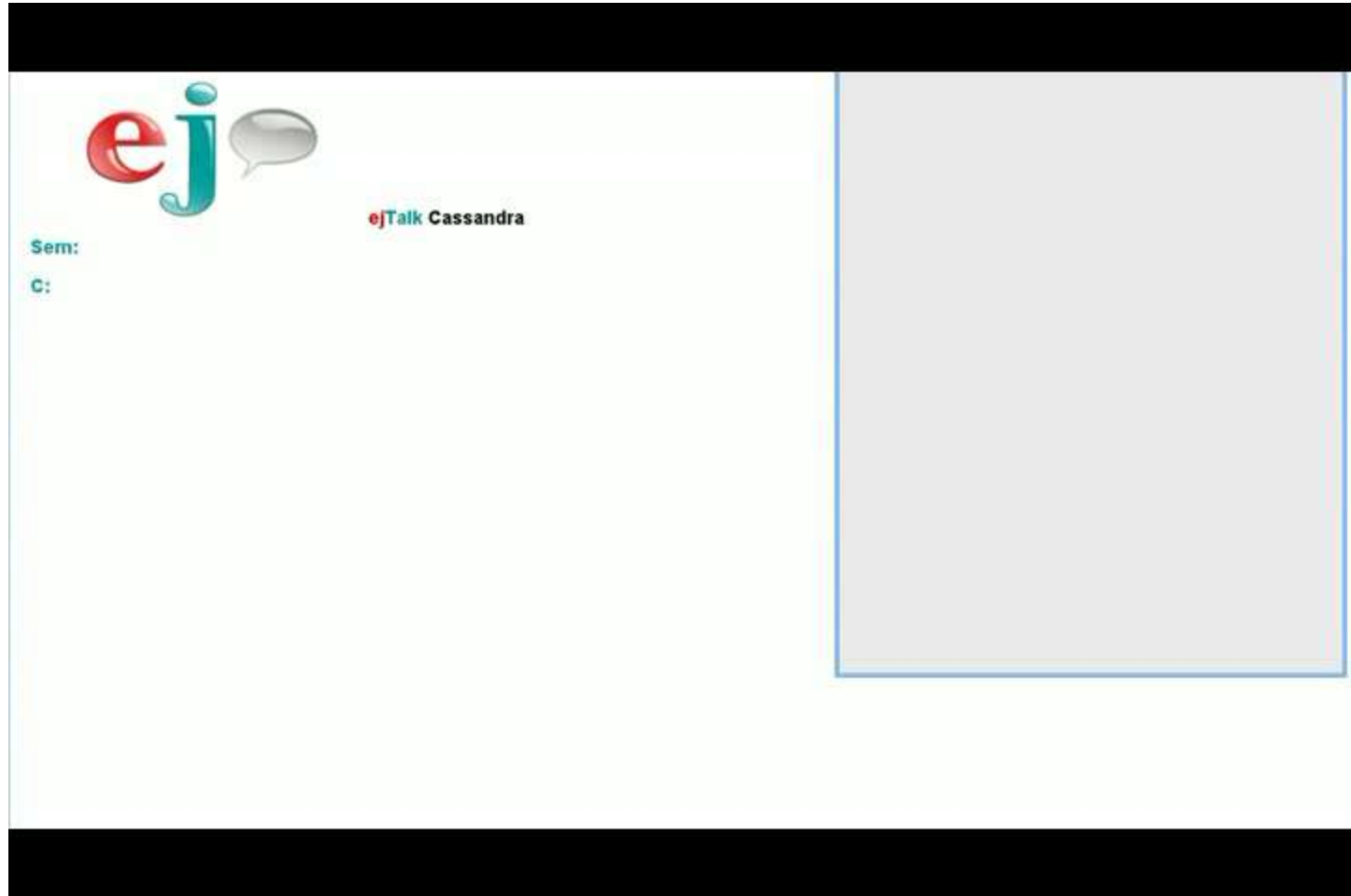
Data on the BB

(ejTalker short and long term memory)

```
<planets>
  <list open="TRUE" format="planetListFormat2.xml" dataPath="planets/list" focusRecord="6" focusPath="name"
  focusValue="Saturn" pathClicked="name">
    <planet>
      <name>Mercury</name>
      <distFromSunAU>
        <avg>0.387</avg>
        <perihelion>0.307</perihelion>
        <aphelion>0.467</aphelion>
      </distFromSunAU>
      <radiusKmEQ>2439</radiusKmEQ>
      <volumeEU>0.054</volumeEU>
      <massEU>0.055</massEU>
      <densityEU>0.984</densityEU>
      <!-- lots more data here -->
    </planet>
    <planet>
      <name>Venus</name>
      <distFromSunAU>
        <avg>0.723</avg>
        <perihelion>0.730</perihelion>
        <aphelion>0.716</aphelion>
      </distFromSunAU>
      <!-- lots more data here -->
    </planet>
    <!-- and lots more planets -->
  </list>
</planets>
```

.....

Display Demo



Focus

Display **Focus** Manipulate Reference Multimodality

- Domain shifters
 - “show me the planets table”
 - “add coffee to my shopping list”
- Domain specific dialog
 - “What about Pluto?” makes sense for planets (or Disney characters?)
 - “Add coffee” is only obvious if the conversation domain is *the shopping list*

Step Rule to Focus Table

(a <rule> in the ejPlanets.xml Step File)

```
<rule name="displayPlanetNames">
  <pattern input="{R:ejShowCMD:ejExist}_{S:ejListCategory:}">TRUE_ejPlanets</pattern>
  <examplePattern>
    <ex>show me a list of the planets</ex>
  </examplePattern>
  <action>
    <function>
      <AFS function="list.display">
        <paramNode>
          <listFormatName>planetListFormat2.xml</listFormatName>
          <dataLocation>planets/list</dataLocation>
        </paramNode>
        <resultNode>planets</resultNode>
      </AFS>
    </function>
    <presay>
      <text>Here you go.</text>
    </presay>
    <displayHTML>
      <information type="treeReference">planets/display/form/div</information>
    </displayHTML>
  </action>
  <goto>ejPlanets.xml</goto>
</rule>
```

Manipulate

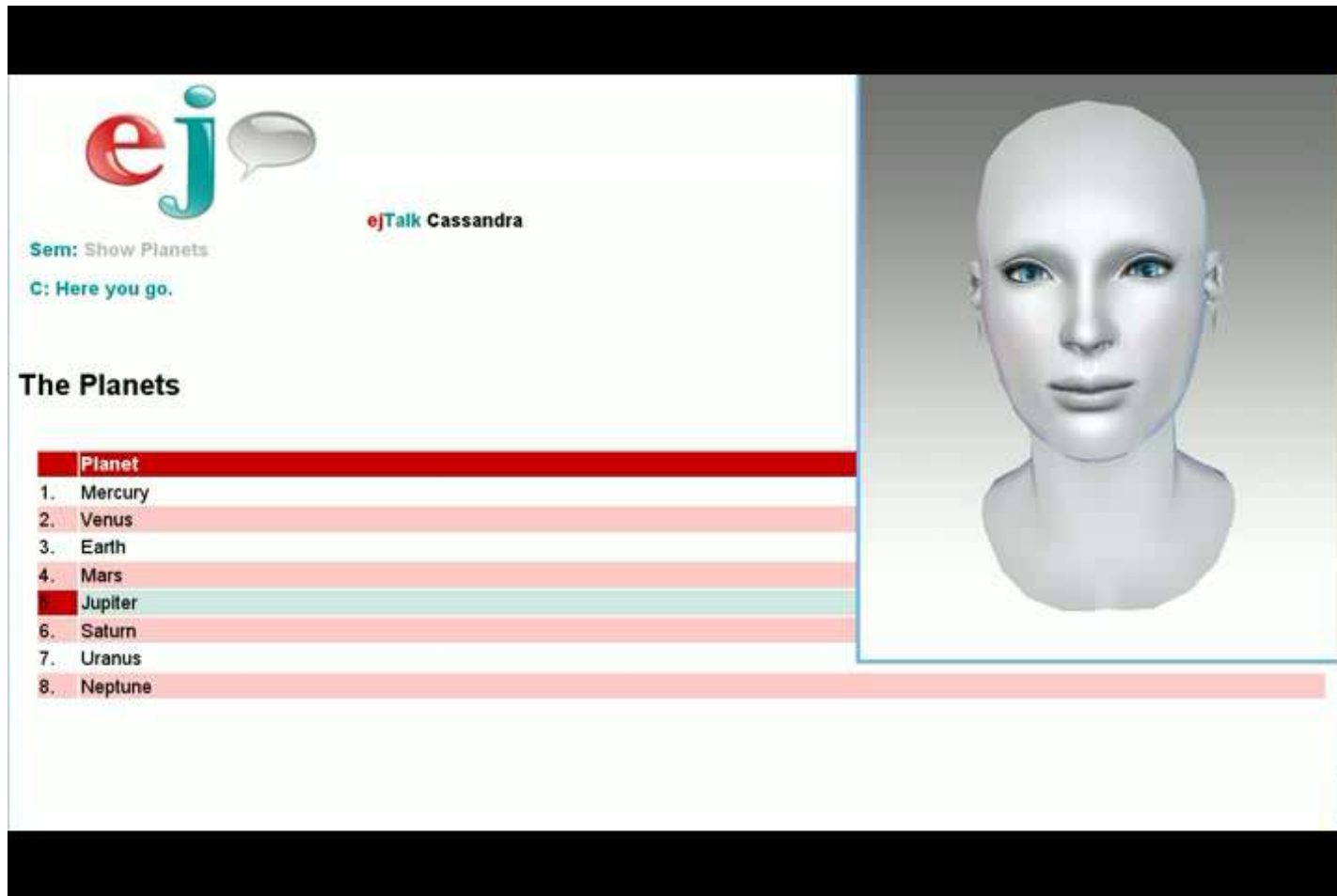
Display Focus **Manipulate** Reference Multimodality

- Add things
 - “put coffee on the list”
- Delete things
 - “delete bananas”
- Test existence
 - “Is Jupiter on the list?”
 - Confirm with TTS and text
 - Highlight in display
- Sort the list
 - “sort by distance from the Sun”
 - “group by aisle number”


Step Rule to Add Item

```
<rule name="simpleAddVar" maxDeriveDepth="0">
  <pattern input="{R:ejListSimpleOP:ejExist}_{R:ejAddCMD:ejExist}_{R:groceryItems:ejExist}">TRUE_TRUE_TRUE</pattern>
  <examplePattern>
    <ex>add scallops</ex>
  </examplePattern>
  <action>
    <function>
      <AFS function="list.addRecordValue">
        <paramNode>
          <listFormatName>shoppingListFormat1.xml</listFormatName>
          <dataLocation>grocery/currentList</dataLocation>
          <field name="description">{R:groceryItems:ejSpanText}</field>
        </paramNode>
        <resultNode>grocery</resultNode>
      </AFS>
    </function>
  </action>
  <branch>
    <case id="RECORD_ADDED">
      <action>
        <presay>
          <text>I added {V:grocery/addedValue:} to the list.</text>
        </presay>
        <displayHTML>
          <information type="treeReference">grocery/displayform/div</information>
        </displayHTML>
      </action>
    </case>
    <case id="RECORD_EXISTS">
      <!-- do stuff if the record is already on the list -->
    </case>
  </branch>
</rule>
```


Focus and Manipulate



The screenshot displays a user interface for an application named 'ejTalk'. On the left side, there is a list titled 'The Planets' with eight entries, each with a colored bar to its right. The entries are: 1. Mercury (red bar), 2. Venus (light red bar), 3. Earth (light red bar), 4. Mars (light red bar), 5. Jupiter (teal bar), 6. Saturn (light red bar), 7. Uranus (light red bar), and 8. Neptune (light red bar). The 'Planet' header is highlighted in red. On the right side, there is a 3D rendered avatar of a woman's head and shoulders, with a grey body and blue eyes. The interface also includes a logo 'ej' with a speech bubble, the name 'ejTalk Cassandra', and some status text: 'Sem: Show Planets' and 'C: Here you go.'


ej 

ejTalk Cassandra

Sem: Show Planets
C: Here you go.

The Planets

	Planet
1.	Mercury
2.	Venus
3.	Earth
4.	Mars
5.	Jupiter
6.	Saturn
7.	Uranus
8.	Neptune



Reference

Display Focus Manipulate Reference Multimodality

- Name
 - Use a “key” field
 - Say: “What kind of planet is Jupiter?”
- Index
 - Use the row number
 - Say: “delete item 3”
- Relative
 - Say: “read the first one”
- Deixis
 - Say: “are bananas on the list?”
 - Then say “delete them”
 - Then say “sorry add them”

```

<rule name="whatTypeOfPlanetAnaphora">
  <pattern input="{R:ejPlan_typeofPlanet:ejExist}">TRUE</pattern>
  <examplePattern>
    <ex>What kind of planet is that?</ex>
  </examplePattern>
  <action>
    <function>
      <AFS function="list.isPresentInList">
        <paramNode>
          <listFormatName>planetListFormat2.xml</listFormatName>
          <dataLocation>planets/list</dataLocation>
          <field name="name">{V:planets/ejPlanetNames:Earth}</field>
        </paramNode>
        <resultNode>planets</resultNode>
      </AFS>
    </function>
  </action>
  <branch>
    <case id="RECORD_EXISTS">
      <action>
        <function>
          <AFS function="list.getValue">
            <paramNode>
              <listFormatName>planetListFormat2.xml</listFormatName>
              <dataLocation>planets/list</dataLocation>
              <fieldFocus name="name"/>
              <fieldSpoken name="type"/>
            </paramNode>
            <resultNode>planets</resultNode>
          </AFS>
        </function>
        <presay>
          <text emotion="ejShy">{V:planets/ejPlanetNames:Earth} is a {V:planets/fieldSpoken:} type planet.</text>
        </presay>
        <displayHTML>
          <information type="treeReference">planets/display/form/div</information>
        </displayHTML>
      </action>
    </case>
    <!-- more cases handled here - - >
  </branch>
</rule>

```

Anaphoric Reference

Step Rule for “What kind of planet is **that**?”



Multimodality

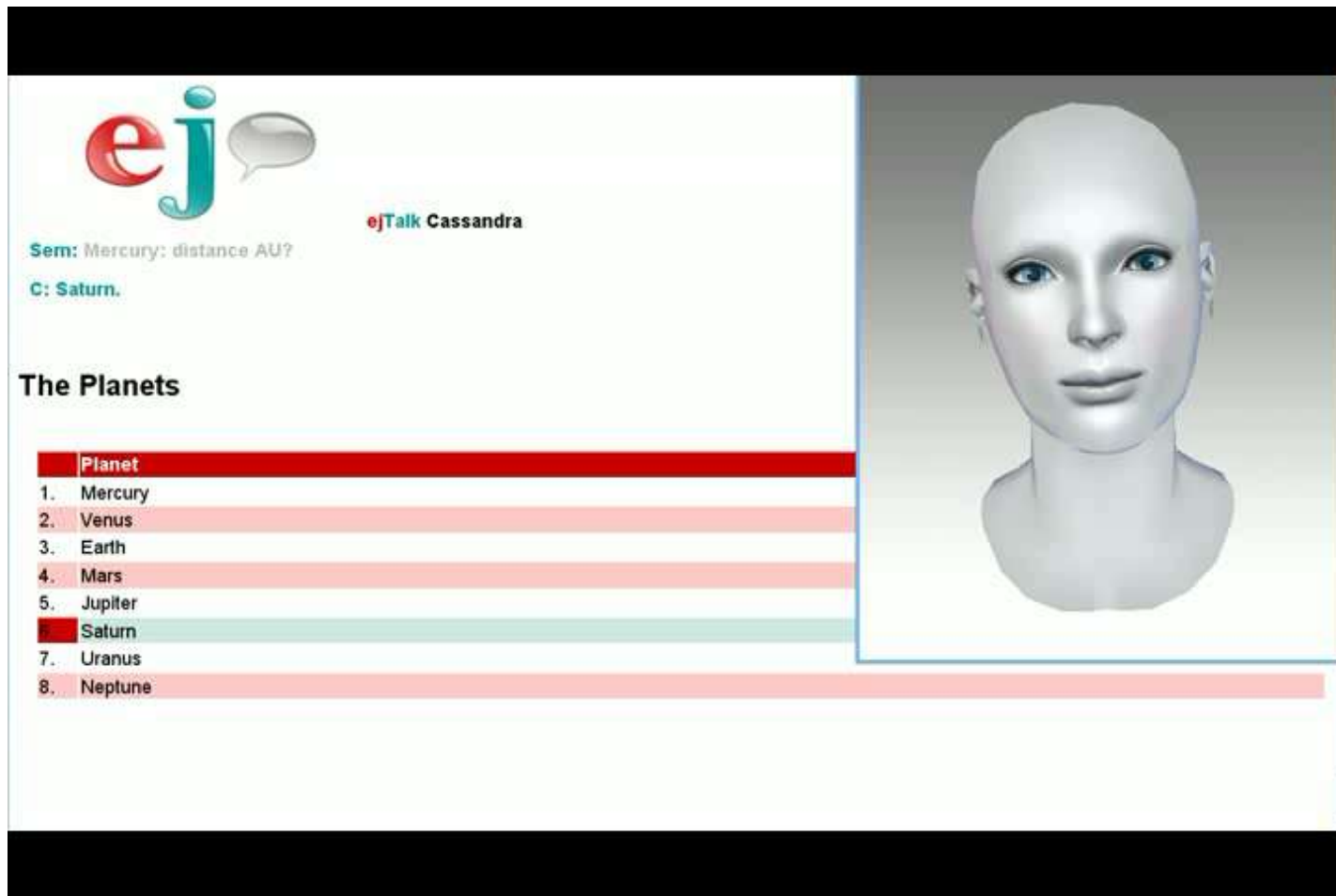
Display Focus Manipulate Reference Multimodality

- Atomic
 - Push a button to display and focus a list ... or
 - Say “display the planets list”
- Compound
 - Example 1
 - Click on a row ... then
 - Say “what is the density of that?”
 - Example 2
 - Say “are bananas on my list?” ... then
 - Type over *bananas* with *red bananas*

Step Rule for Multimodal “touch”

```
<rule name="MMfieldClick">
  <pattern>(ejMM)(TABLE List:[W:tableID],Record:[W:recordIndex],Field:[W:fieldName])</pattern>
  <examplePattern>
    <ex>(ejMM)(TABLE List:shoppingListFormat1.xml+grocery/currentList,Record:5,Field:description)</ex>
  </examplePattern>
  <action>
    <function>
      <AFS function="list.getValue">
        <paramNode>
          <listFormatName>shoppingListFormat1.xml</listFormatName>
          <dataLocation>grocery/currentList</dataLocation>
          <recordFocus>{V:system/asr/vars/recordIndex:}</recordFocus>
          <fieldFocus name="description"/>
          <fieldClicked>{V:system/asr/vars/fieldName:}</fieldClicked>
          <fieldSpoken name="description"/>
        </paramNode>
        <resultNode>grocery</resultNode>
      </AFS>
    </function>
  </action>
  <branch>
    <case id="RECORD_VALUE_SET">
      <action>
        <presay>
          <text>{V:grocery/fieldSpoken:}. |</text>
        </presay>
        <displayHTML>
          <information type="treeReference">grocery/display/form/div</information>
        </displayHTML>
      </action>
    </case>
    <case> <!-- more cases for other conditions --> </case>
  </branch>
  <goto>groceryListDomain.xml</goto>
</rule>
```

Reference and Multimodality



The screenshot shows a user interface for 'ejTalk Cassandra'. On the left, there is a chat log with a user 'Sem' asking 'Mercury: distance AU?' and a system response 'C: Saturn.'. Below the chat is a table titled 'The Planets' with a list of planets from 1 to 8. The planet 'Saturn' is highlighted in red, and a horizontal red bar extends from this entry to the right, where it points to a 3D rendered head of a female avatar with blue eyes and a neutral expression. The 'ej' logo is visible in the top left corner of the interface.

ejTalk Cassandra

Sem: Mercury: distance AU?
C: Saturn.

The Planets

	Planet
1.	Mercury
2.	Venus
3.	Earth
4.	Mars
5.	Jupiter
6.	Saturn
7.	Uranus
8.	Neptune

Meta Table Talking

- 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** of 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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