Advanced Dialog Workshop:
Hands-on experience with a conversational framework

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Emmett Coin
Industral Poet, CEO

ejTalk, Inc.
www.ejTalk.com
The Problem

Voice development systems today are not very aware of the conversational context.

They DO NOT:

- Have easy ways to resolve pronouns. (“it” refers to?)
- Inherently adapt to repetitious tasks. (shared knowledge?)
- Automatically remember things. (we were talking about?)
- Coordinate multimodal activities with speech.

They are missing CONTEXT
The Solution

Integrate all of the application technologies into a single engine that **WILL:**

- **Persist** the details of a conversation
- Persist the details of a … relationship.
- **Track** the history of previous conversational paths.
- **Understand** “that one” is the “one” we just talked about.

An engine that is built on **CONTEXT**
Is This Time The Time?
(For an truly conversational agent)

- Speech infrastructure is in place
- This generation is comfortable talking to “things”
- Voice search is getting more natural
- Understanding of “natural” speech is improving
- R&D departments experimenting with “conversation”
- Indications are that the public is seriously ready for more
- But most “conversational” apps are just “voice search”
  - Single query … no context
  - Lack adaptation to familiar tasks
  - No relationship with the user

However, context is a BIG PART of any real conversation
Workshop Goals

- Hands-on experience
  - View the specifications
  - Edit & Experiment in a simple development environment
- Exposure to Advanced Dialog Concepts
  - Mechanisms for adaptation and context
- Modify and test behavior on a live system
  - Edit on a laptop and test on an Android phone
- Experience “post search” speech app design
  - It is good if the app remembers things
  - It is better if it uses those memories to adapt automatically
Platform Technologies
(What we will use today)

- Speech ASR/TTS
  - All the usual suspects for recognition and synthesis
  - Google ASR & Native Android TTS
- Conversation Manager
  - VoiceXML?
  - State Charts?
  - ejTalker … more on the next slide
- Generic client device
  - HTML rendering, text & touch interaction
  - AJAX communications to the conversation manager
  - Android phones, laptop browsers
What Is “ej” Talker

This is the Conversation Manager that we will use today:

- **ejTalker** (pronounced: “edge” talker)
  - It coordinates all aspects of a conversation
  - It has been around for years
- **Cloud based or embedded**
  - Small executable footprint
  - Low compute loads
- **A declarative language for conversations**
  - XML formalism
  - Syntax reminiscent of rule based systems
- **Invoke rich conversational behavior**
  - Persistent interaction memory
  - Automaticity (automatic adaptation to usage)
  - Variability (non-static prompts)
  - Derivation of behavior

Cassandra is based on ejTalker
What we will do today

- Brief overview of the platform.
- Describe declarative engine methods
  - Transitions: Rules (in STEP files)
  - Adaptive behavior: metaText files
  - Variability: Production Grammars (prodGram files)
  - Memory: Persisting information
- Derivation
  - Use predefined behaviors (<derivedFrom> declaration)
The Conversation Engine
(Just Thoughts)
Adding Input and Output
e.g. PC, Smartphone

e.g. Chrome,

Specification Files
(we will edit these today)

RESTful APIs

Persisted XML
(we will use this)
Specification File Architecture

Understanding
- Concept Files
- Semantic fragments
- Input Grammar

Memory
- Persistent Data Store (XML)

Rules
- STEP Files
  - Overall conversation design
  - Coordinate system features

Access & Manipulate
- displayFormats
- XML Databases
- ejScripts

Adaptation
- metaText Files
  - Frequency
  - Recency

Variability
- prodGram Files
  - Constrained Semantic SRGS grammars

Presentation
- Text
- Graphics
- Speech

Natural Language Processing
- Text
- GUI
- Speech

Content Handling

MVC, April 15, 2013
The ejTalker’s declarative language.

- **STEP files**
  - Initial instructions for what to say and do
  - Sets of **Rules** that specify how to react.

- **MetaText files**
  - Automatic adaptation specs
    - How often and how recently have we done something

- **ProdGram**
  - Specs for automatic variability
    - Choosing parts of output phrases from semantically equivalent alternatives.

- **setMEM & \{V: some/path/to/data: default\}**
  - How to persist a simple memory:   setMEM
  - How to access that memory: \{V:a/path/:no memory found\}
Let’s Log On Now!

- Set your wireless network to use
  - Network Name: “Dialog”
  - Password: “myinitial1”

- Open your browser
  - (Chrome, Firefox, etc.)

- Type in address bar:
  - You should see the Logon Page with Cassandra

- Type your assigned User Name: e.g. “user73”
- Type (or verify) your Starting STEP File: “myMovie.step.xml”
- **ONLY THEN** click on the “LOGON: Text I/O”
STEP Files: Top level domain descriptions

- Some administrative parameters
  - `<head>`
    - Similar function to the `<head>` in an HTML file
- Content and Interaction Components
  - `<body>`
    - Similar to the `<body>` in an HTML file
    - What to do when we enter this domain
      - `<introduction>`
        - Say and display things
    - Instructions on how to “listen” etc.
      - `<attention>`
        - Select a recognition environment (optional)
  - Rules that decide what course we take
    - `<response>` & `<rule>`
      - Test the input, context, data, etc. then react
      - Where most of the interesting stuff happens!
STEP Files: A first look

```xml
<step>
  <head>
    <name>myMovie.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text> Say something about Lincoln. </text>
        </presentation>
      </action>
    </introduction>
    <attention></attention>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text> Lincoln was a good movie! </text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
```
STEP: A Prompt

```xml
<step>
  <head>
    <name>myMovie.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text> Say something about Lincoln. </text>
        </presentation>
      </action>
    </introduction>
    <attention></attention>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text> Lincoln was a good movie! </text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
```
STEP: A Rule

```xml
<step>
  <head>
    <name>myMovie.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text> Say something about Lincoln. </text>
        </presentation>
      </action>
    </introduction>
    <attention></attention>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text> Lincoln was a good movie! </text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
```
STEP: A Reply

<step>
  <head>
    <name>myMovie.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text> Say something about Lincoln. </text>
        </presentation>
      </action>
    </introduction>
    <attention/>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text> Lincoln was a good movie! </text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
The ejTalker’s declarative language.

- **STEP files**
  - Initial instructions for what to say and do
  - Sets of **Rules** that specify how to react.

- **MetaText files**
  - Automatic adaptation specs
    - How often and how recently have we done something

- **ProdGram**
  - Specs for automatic variability
    - Choosing parts of output phrases from semantically equivalent alternatives.

- **setMEM & {V:some/path/to/data:default}**
  - How to persist a simple memory:  `setMEM`
  - How to access that memory:  `{V:a/path/:no memory found}`
metaText: A Prompt

<step>
  <head>
    <name>myMovie1.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text>{M:movie.metaText.xml#promptForLincoln:Say something about Lincoln.}</text>
        </presentation>
      </action>
    </introduction>
    <attention/>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text>Lincoln was a good movie!</text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
**metaText**: What does it look like?

Cassandra says:
{M:myMovie.metaText.xml#promptForLincoln:Say something about Lincoln.}

She uses the following specification:
(this is an XML snippet from the file “myMovie.metaText.xml”)

```xml
<promptForLincoln>
  <int>
    <val>So, do you have any comments or thoughts about the movie Lincoln?</val>
  </int>
  <tut>
    <val>Why don’t we talk about the Lincoln film.</val>
  </tut>
  <beg>
    <val>Say something about Lincoln.</val>
  </beg>
  <nor>
    <val>Comments on Lincoln?</val>
  </nor>
  <exp>
    <val>Okay, sure, one more time! Please share your thoughts about Lincoln.</val>
  </exp>
</promptForLincoln>
```
metaText: What does it do?

- Track frequency and recency of usage
  - Uses an impulse/amplitude and decay/half-life methodology
- Quantify the concept of familiarity
  - How many times has it been done
  - How recently has it been done
- Abstract the adaptation to repeated behavior
  - Repeated sub tasks can automatically become more concise
- Accommodate dynamically and in the moment
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- **setMEM & {V:some/path/to/data:default}**
  - How to persist a simple memory:  setMEM
  - How to access that memory:    {V:a/path/:no memory found}
prodGram: Mix it up!

```
<step>
  <head>
    <name>myMovie2.step.xml</name>
  </head>
  <body>
    <introduction>
      <action>
        <presentation>
          <text>{M:movie.metaText.xml#sayLincoln:Say something about Lincoln.}</text>
        </presentation>
      </action>
    </introduction>
    <attention/>
    <response>
      <rule name="mentionLincoln">
        <pattern>*lincoln*</pattern>
        <action>
          <presentation>
            <text>Lincoln was a {G:ejCore.prodGram.xml#great:good} movie!</text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
```
What does prodGram look like?

Cassandra says: …{G:ejCore.prodGram.xml#great:good}…

She uses the following specification:

```xml
<rule id="great" scope="public" ex="That joke was GREAT.">
  <one-of>
    <item>great</item>
    <item>terrific</item>
    <item>wonderful</item>
    <item>amazing</item>
    <item>fantastic</item>
    <item>grand</item>
    <item>marvelous</item>
  </one-of>
</rule>
```
Production Grammars
prodGram

- What does it do?
  - Adds variability via a simple semantic reference
  - Abstracts variability in the dialog

- What is it?
  - Rules written in exactly the same SRGS form as used for recognition grammars
    - It is a familiar syntax
  - A library of prodGram rules
    - Common phrases
    - Simplifies composing
    - Encourages persona consistency
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- **setMEM & \{V:some/path/to/data:default\}**
  - How to persist a simple memory:  setMEM
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setMEM: Remember

```xml
<step>
  <head>
    <name>myMovie3.step.xml</name>
  </head>
  <body>
    <introduction>…</introduction>
    <attention></attention>
    <response>
      <rule name="mentionLincoln">…</rule>
      <rule name="mentionSkyfall">
        <pattern>*skyfall*</pattern>
        <action>
          <setMEM>
            <v>movie/dislike=Skyfall</v>
          </setMEM>
          <presentation>
            <text>Bond? I didn’t like {V:movie/dislike:that movie} very much.</text>
          </presentation>
        </action>
      </rule>
    </response>
  </body>
</step>
```
What does setMEM look like?

ejTalker <action> element that sets a persistent memory.

It uses the following specification:

```
<setMEM>
  <v>movie/dislike=Skyfall</v>
  ... (set as many as you want) ...
  e.g.
  <v>movie/genre=action</v>
  <v>some/other/variable=127</v>
</setMEM>
```

Use them later like this:

“I think the genre is {V:movie/genre:who knows what}.”
... (it is remembered forever) ...

Remember setMEM

- **What does it do?**
  - Saves strings in a hierarchical data store
  - Persists data over the relationship

- **What is it?**
  - String assignments set within `<action>` elements
    - Arbitrarily deep pathing
    - Hierarchy promotes ontologies
  - String value evaluation wherever “constant” string can be used
    - Common evaluation syntax for all system values
Contributors
(members AVIOS and/or Advanced Dialog Group)

- **David Thomson**, PMTS - AT&T Labs
- **Emmett Coin**, CEO & Industrial Poet - ejTalk Corp.
- **Deborah Dahl**, Principal - Conversational Technologies
- **John Tadlock**, Lead Principal Technical Architect - AT&T Services
- **K. W. ‘Bill’ Scholz**, President - NewSpeech LLC
- **Lorin Wilde**, CTO - Wilder Communications, Inc.
- **Marie Meteer** – Brandeis University
- **Ria Farrell Schalnat**, Counsel – Dinsmore & Shohl LLP
Thank you

Emmett Coin
ejTalk, Inc
emmett@ejTalk.com