A Conversational System That Reduces Development Cost

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Monday, August 7 at 1:30 PM
GyrusLogic the Company

- GyrusLogic, Inc.
  - Phoenix, AZ, USA
  - Incorporated in 2001
  - Privately funded

- Technology
  - 20,000+ Man hours of software development
  - University projects
  - Patent pending

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Language Processing

Speech Input

Speech Recognition

Speech Analysis

Speech Understanding

The Right Answer

What does the speaker say?

What does the speaker mean?

What does the speaker want?

Unambiguous Understanding in the Dialog Context

Acoustic Language Models
Word Lists

Grammar
Lexical Meaning

Discourse Context Knowledge about Domain of Discourse

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Natural Language Understanding

• GyrusLogic Platica approach for Natural Language Understanding
  - Robust Linguistic approach coupled with Artificial Intelligence (no SLM)
  - Full conversational capabilities (no transcriptions)
  - Easy industry standard solution (no proprietary scripting)
  - Interfacing existing “Voice” environments (IVR, ASR, TTS, VoiceXML)
  - Declarative developments
  - Significant less effort, with additional operational savings and more application functionality

• Traditional approaches for Natural Language Understanding (NLU)
  - Statistical Language Modeling (SLM)
  - Statistical Semantic Modeling (SSM)
    - “Say Anything”, “Speak Freely”
  - Transcription of 20 - 30,000 utterances
  - Procedural developments
Typically Two Types of Requests

- **A Fuzzy request:**
  - They can be *spontaneous*, arbitrary, ad-hoc, and/or vague
  - The majority of user queries are *fuzzy* questions
  - The best approximation to satisfy the request
  - User expected accuracy, completeness and an *answer the first time*
    - Do I have some bucks in my account?
    - How much money do I have?
    - What is the amount of the last deposit?

- **An Exact request:**
  - *Specific transactions* don’t allow for fuzzy approach, but they can still be spontaneous. *(expanded directed dialog)*
    - Transfer $100 from checking to savings
    - Did check number 123 clear on July 1st.?
    - I want to travel at 3pm today from Phoenix to Burbank
Platica Server Architecture

N-best input

Prompts to play (TTS and/or Audio)

Universal Grammar & Dictionaries

API

NLU Directed Parser

User Transaction Grammar

High Level Dialog and Context Director

Fuzzy Requests

Exact Requests

Q & A Sub-dialog System

Execution Interface

Transaction Sub-dialog System

XML Answer Knowledge Base

API

Web services, dB’s, etc.

XML Transaction Rules

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ASR and TTS Engines

• The GyrusLogic Platica solution can be used with any ASR engine. It is irrelevant which ASR engine the customer uses. Anyone of them can be used easily with GyrusLogic Platica.

• GyrusLogic will easily interact with any TTS engine available in the market place.

• GyrusLogic provides a Server Engine that wraps Nuance’ RealSpeak Text To Speech.
GyrusLogic Platica Configuration Example

Other than a JSP interface to a VoiceXML browser, an interface to any ASR / TTS / IVR exists or can be provided.
VoiceXML - JSP Example

```xml
<?xml version="1.0"?>
<vxml version="2.0">
<form>
  <gs.setAccount(request.getParameter("account") ) >
  <field name="phrase">
    <grammar src="Gyrus.gram" />
    <if ( request.getParameter("phrase") != null ) {
      gs.addQuestion(request.getParameter("phrase") );
      GyrusResponse gr = cl.ask(gs);
      session = gr.getNewSession();
    }
  />
  <prompt>
    <%=gr.getFullPrompt() %>
    </prompt>
  </field>
</form>
<disconnect />
</vxml>
```

- No Dialog Flow to develop
- No Exceptions to develop
- Send the text phrase we received from the ASR
- Receive the prompt or audio prompt identifier to play
Load Balanced
(infinite engines = infinite scalability)
Multiple Servers Serving Different Applications in the Same Host
XML Transaction Rules Example

<REQUEST name="transfer" type="action">
  <STATE type="AMOUNT">
    <PROMPT>how much would you like to transfer? </PROMPT>
  </STATE>
  <STATE type="ORIGIN">
    <PROMPT>from which type of account would you like to transfer?</PROMPT>
  </STATE>
  <STATE type="DESTINATION">
    <PROMPT>to what type of account would you like to transfer?</PROMPT>
  </STATE>
  <CONFIRMATION>You want to transfer AMOUNT dollars, from your ORIGIN to your DESTINATION. Is this correct?</CONFIRMATION>
</REQUEST>

REQUEST is activated when certain information IS provided.

STATE is activated when a piece of information IS NOT provided.

CONFIRMATION is activated when information for all states is provided.

OBJECT invokes user’s backend API

XML Transaction Rules only apply for Exact Requests

<OBJECT name="com.gyruslogic.GyrusExamples.BankingDemo">
  <METHOD name="transfer">
    <PARAM>AMOUNT</PARAM>
    <PARAM>ORIGIN</PARAM>
    <PARAM>DESTINATION</PARAM>
    <RESULT>ACTION_MESSAGE</RESULT>
  </METHOD>
</OBJECT>

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XML Answer Knowledge Base Example

```xml
<GYRUS>
  <OBJECT name="com.api.BankingDemo">
    <METHOD name="queryDatabase">
      <PARAM>ACCOUNT</PARAM>
    </METHOD>
    <METHOD name="getBalanceSav">
      <RESULT>SAVEBALANCE</RESULT>
    </METHOD>
  </OBJECT>
  <ANSWER_TEMPLATE>
    <ANSWER>The current balance in your savings account is SAVEBALANCE dollars</ANSWER>
    <ANSWER>There are no fees with your existing accounts.</ANSWER>
    <ANSWER>There is no debit or credit limit with your existing accounts.</ANSWER>
  </ANSWER_TEMPLATE>
</GYRUS>
```

**OBJECT** invokes user’s backend API

XML Answer Knowledge Base only applies for Fuzzy Requests

The system determines which answer to return depending on the context of the user’s question

Retrieves data value and populates the variable in the answer.
Typical Dialog with GyrusLogic

System: How can we help you?
User: I would like to transfer funds from my checking to my savings.
System: How much money do you want to transfer?
User: How much money do I have in my savings account?
System: The balance in your savings account is 4000 dollars.
I apologize for asking again, how much did you want to transfer?
User: Five hundred.
System: Ok, let's review this transaction, you want to transfer 500 dollars from your checking to your savings, is this correct?
User: No, actually transfer a thousand bucks from savings!
System: Ok, let's review this transaction, you want to transfer 1000 dollars from your savings to your checking, is this correct?
User: Yes
System: How else can we help you?
User: What are the last five transactions in my checking?
System: The last three transactions in your checking account are....
**No Dialog Flow Development or Maintenance**

- The user application does not need a specification for how the logic of the dialog should look like.
- GyrusLogic’s inference engines mimic human’s reasoning and **build the dialog on the fly**, thereby delivering a natural conversation.
- It is a **true conversational** AI system and a true AI **declarative paradigm**.
- It allows the user to be **spontaneous** and to **interrupt** a dialog with questions outside the ongoing dialog.
- It allows the user to make **any correction** to a specific transaction, either implicit or explicit.
Grammar Generation Process

- Corpus for Fuzzy queries
- User's Gyrus ABNF grammar
- User XML with embedded grammars
- Static grammar & dictionaries
- ASR dynamic grammar
- GyrusLogic Server
- GyrusLogic Client/API

Speech Grammar Generator (static grammars)
VoiceXML Mixed Initiative Example

- GyrusLogic Platica more spontaneous out of the box!
- Automatic dialog interruption and implicit correction
- Exponential savings for more complex applications

Agent: Thanks for calling Acme Travel Company. How can I help you today?
Caller: I'd like to book a flight.
Agent: Okay. What is your point of origin, and where are you going?
Caller: I wanna fly to Boston, Massachusetts.
Agent: You want to fly to Boston, Massachusetts. Where are you flying from?
Caller: From San Francisco, California.
Agent: Okay, you'll be traveling from San Francisco, California to Boston, Massachusetts. Is that correct?
Caller: Yes.
How does GyrusLogic’s Platica help?

- **Declarative** vs. Procedural or Icon based developments.
- Implicit and Explicit corrections without additional coding.
- Automatic implicit verifications without extra effort.
- **Spontaneous user interruptions** in call flow without additional development effort.
- Context and semantics recognition.
- Significant savings in time and money with the deployment of Speech related applications.
- The same application can be used for Chat, Web and SMS.
Add the Advantages of GyrusLogic Platica

• **No dialog flow design** or coding is necessary; at any point human like reasoning as in any conversation.
• Making distinctions between **Fuzzy** requests and **Exact** requests based on context and semantics.
• Resolving your **false positives** automatically.
• Powerful **implicit and explicit** transaction **correction** functionality.
• **Implicit confirmation** capability with Exact (transactional) requests.
• **Declarative paradigm**, the typical developments will be **significantly less error prone and less time consuming** than with other procedural developments or *icon based* approaches.
• Virtually **no language dependency**.
• **Patented context and semantics** recognition and parsing technology.
• **Spontaneous user interruptions** in “call flow” without additional development effort.
Average Speech project deployment costs

Average Project Costs Today

- Base Software Licence: 27.8%
- System Integration: 19.9%
- Application Development: 27.5%
- Hardware: 11.2%
- Training: 13.6%

Average Project Costs with GyrusLogic NLU

- Base Software Licence: 27.7%
- System Integration: 17.8%
- Application Development: 2.7%
- Hardware: 11.2%
- Training: 13.6%

> 27% project costs savings

Source: Voice Information Associates, ASR in Telephony Applications, the World Market
Operational savings with Conversational Natural Language Systems

• Directed Dialog
  - 1:48 avg. call

• Conversational Dialog
  - 0:57 avg. call

• Savings
  - 51 seconds per call saved
  - Avg. 50,000 calls / day
  - Initial 20% use of conversational dialog
  - Over 3.1 million minutes saved in initial year
Summary of a GyrusLogic Implementation

- **Fully conversational dialog system**, based upon industry standards
- Flexible answers with enterprise variables in **XML knowledge base**
- Powerful **implicit and explicit corrections, implicit confirmation**
- **No dialog design**, minimal grammar development
- **Natural language** with context and meaning understanding
- **Improved “recognition rates”** by resolving false positives
- Easy, XML based, implementation of a transactional dialog
- Automatic parsing for corpus development
- Back-end database and application support
- **ASR & IVR independent, VoiceXML 2.0 support**
- New language Universal Grammar development can be completed in several days
- **First contact customer resolution** for improved customer satisfaction
- **Significant savings in development and total cost of ownership**
Just Say It

Empowering Your customers and employees with speech technologies

SpeechTEKI 2006
The Voice Solutions Showcase

Empower

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Thank You