The use of NLP technologies to engineer oral proficiency test items

Ross Hendrickson, Deryle Lonsdale
ross.hendrickson@gmail.com, lonz@byu.edu
Brigham Young University
Problem: Testing EI

- Elicited Imitation
- Hear and repeat
- Requires in-depth item creation
  - The husband has become a father.
  - Big ships will always make noise.
  - He had a voracious appetite the height of a towering weed and the strength of a malicious rancorous hippopotamus.
Features: What we are looking for and why

- Previous work analyzing influence of sentence-level features on an IRT based difficulty score using Akaike's Information Criterion and stepwise linear regression.
- Features were chosen that were found to be significant for different syllable counts.
- Examples of some of the 23 features recognized by the tool
  - Past tense
  - Lexical Frequency
  - Syllable Count
  - Simple or Complex Sentence
What the tool can do

- Sentence level feature annotation
- Parse documents and annotate each sentence
- Interface with extant Penn Treebank databases and annotate them
- Retrieve sentences with desired features from database
Incorporated NLP tools

- Wordnet 3.0
- Stanford Parser
- Stanford Tregex
- CELEX v2.0
- British National Corpus
- Sample Tree - Regular expressions
  - @DT
  - SBAR <, IN|WHADVP|WHNP|WHVP
- Wordnet – Semantic Calculation
  - In 7 another 1 moment 6 down 26 went 30 Alice after 4 it 1 never 2 once 3 considering 9 how in the world 9 she was 14 to get 37 out 17 again 1 .
- Avg Senses: 11.133
A player threw the ball to me.
Hesitating before she spoke her next line the actress reached the pinnacle of her nervousness.
Documents

- Typical News article (approx 40 sentences)

After getting word that the long rumored *The Beatles: Rock Band* game would be coming later this year we turned our attention to the existing Rock Band music. There have been two versions of the game released in *Rock Band* and *Rock Band 2* as well as full of music and hundreds of songs via DLC.

As of our research, the official tally of playable music in the *Rock Band* catalog is unknown. We wanted to take a look at this list and see what we can tell about the songs that have been included so far. We took time to make graphs to show some of the data compiled so far, decade, source, and more. Some of what we found is a little surprising.

**WHERE IS THE MUSIC FROM?**

One of the best features of *Rock Band* has been the availability of the purchase of standalone games. The catalog includes a diverse range of music genres and artists, and new content is added regularly. The games are available in both PC and console versions, with updates released periodically.

Both Xbox Live and PlayStation Network users have access to the latest music packs, which are released every few days. The creators of *Rock Band* have been particularly active in releasing new content for the franchise, keeping fans engaged and satisfied.

Right now, the *Wii* has 27% of the music library, with most of the songs available on the PC and console versions. The Wii version has been praised for its unique, interactive gameplay, which includes gestures and movement-based controls.

**What Kind of Music is in this Catalog?**

There are 17 genres represented in the catalog so far. It is worth pointing out that most of the music in the catalog are the master recordings from the original albums. The graph shows that the music is heavily dominated by rock, not surprising given the game's rock music theme. Almost 40% of the music that is playable is from the last 9 years, which is a testament to the game's popularity and the continuous release of new content.
Extant Corpus Integration

- Input follows Penn Tree Bank WSJ format
Simple Sentence Retrieval

- Simple Sentence
- Past Tense
- Contractions
- Syllable Count between 8 and 16

But it doesn't take much to get burned.
### Complex Sentence Retrieval

- Complex Sentence
- Progressive Tense
- Plural
- Modal
- Interrogative
- Semantically complex
- Syntactically complex

Who knows what will happen down the road, in three to six months, if foreign investment starts to erode?
Potential Applications

- EI item development
- Develop items for more traditional tests
- Reading comprehension tests
- ESL teachers could use the tool to develop sentences that illustrate usage of particular lexical or grammatical features being taught
- Annotate learner written language for specific sentence-level features.
- Annotate content for students to have reference guide of features / ready explanation of concepts illustrated.
Tool Impact

- Time per item generated
  - Test form E – 6 weeks (2 graduate students)
  - Test form F – 3 weeks (3 undergraduate students)
- Will significantly speed up analysis of future tests
- Provide consistent annotation
Future work

- More theory-centric calculations
  - Semantic
  - Syntactic
  - Morphological
  - Lexical Frequency
- More stringently evaluate algorithm performance
- Add additional sentence-level features of interest
- Develop word- and syllable-level features
- Possible use of database with adaptive language assessment
- Expand database selections
- Improve GUI ease of use and information display capability