alex: Bootstrapping a Spoken Dialogue System for a New Domain By Real Users

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Motivation: Bootstrapping a Dialogue System with No In-domain Data

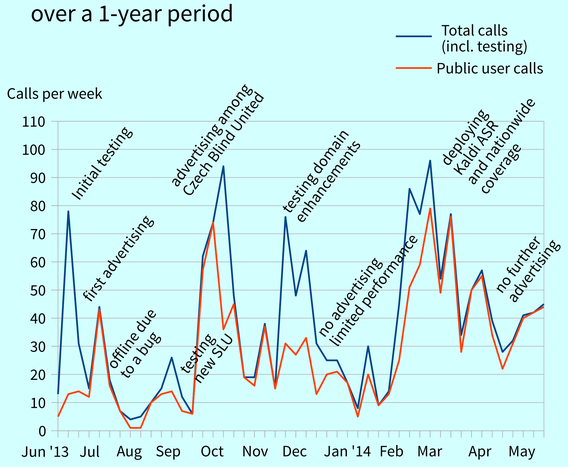
- Our approach: **use the public to bootstrap the system**
- Starting from a very minimal implementation
- **Iterative approach**
- Gradually introducing statistical components
- Minimal cost, alternative to Wizard-of-Oz

The Alex SDS Framework

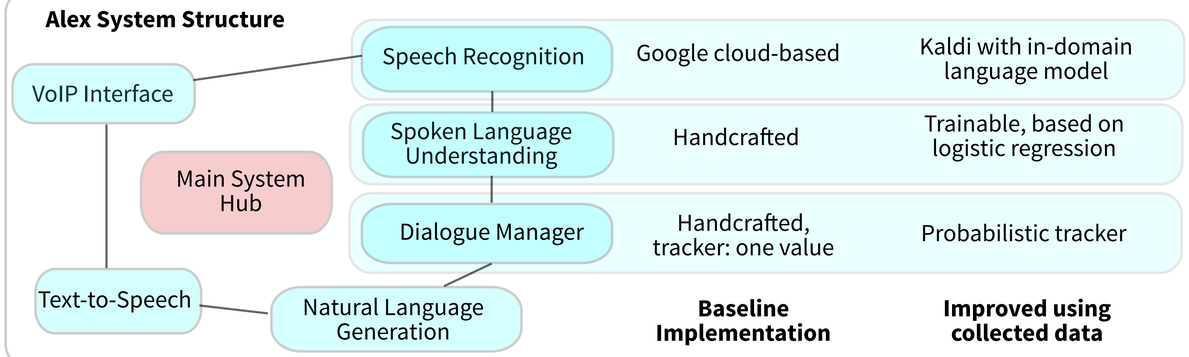
- **Open-source spoken dialogue systems framework**
- Available for download on Github
- Includes all usual SDS components
- **Easy to customize**, adapt for new domains and/or languages

Data Collection

- Domain: Czech public transport information
- System available at a toll-free phone number: **call 800-899-988** from the Czech Republic
- All calls recorded (including our testing)
  - consent required at the beginning of the call
- Small-scale (free) advertising
- More than 1,300 calls from the public over a 1-year period



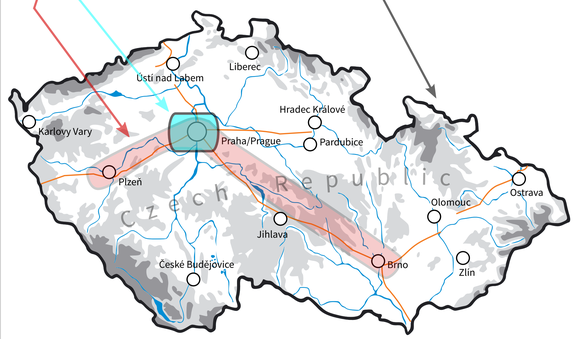
Alex System Structure



Czech Public Transport: Domain Extensions

Public transport network coverage:

1) Prague (ca. 2,500 bus/tram/subway stops)
   - using Google directions
2) Prague, Plzeň, Brno
3) Nationwide coverage (ca. 5,000 towns and cities, 45,000 stops)
   - using Czech Ministry of Transport service



Baseline abilities:

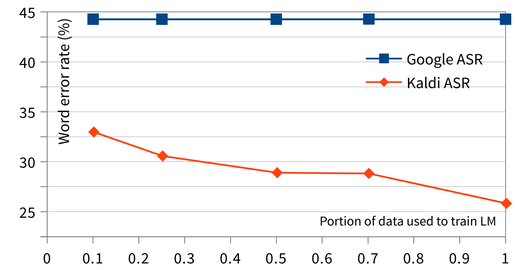
- **Next connection**(s)
- Repeat last statement

Improved:

- Specifying **departure/arrival time**: e.g., *in 15 minutes, at 6 p.m. tomorrow*
- **Connection details** (transfers, duration)
- Travel among different cities
- **Guessing city from stop name** (and vice versa)
- **Weather** information (for any city or town, for a given time)

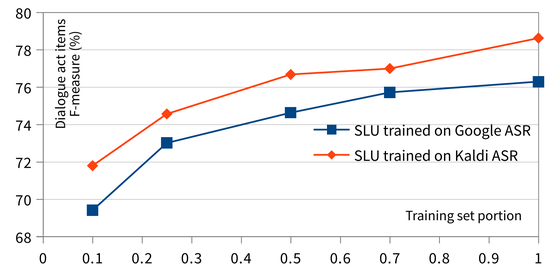
Speech Recognition Improvements

- Replacing Google ASR with **Kaldi** (see other poster!)
- In-domain LM trained on collected data
- **Substantial WER reduction** even for small data



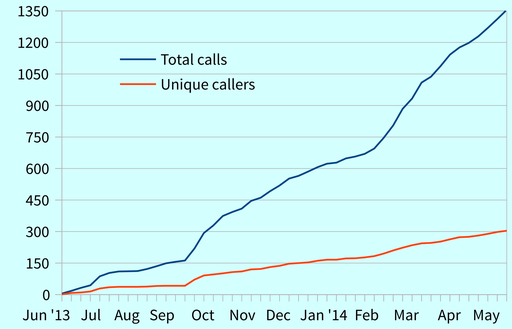
Spoken Language Understanding Improvements

- SLU based on **logistic regression**
- Trained on **annotation generated from transcripts** (fast to acquire, can be rerun for domain extensions)
- Learns to overcome frequent ASR errors



Call Tracking & Evaluation

- Google Analytics, detailed call logs
- Total numbers of calls and callers keep growing



- Information provided in vast majority of calls
- Question at the end of each call: "Did you receive the information you wanted?"
  - Answers mostly positive

Conclusions

- Even a very **limited system can be used to gather data** from the public
- Very **small amounts of in-domain data** greatly **improve ASR** accuracy
- **Generating semantic annotation** from dialogue transcripts **helps maintain statistical SLU**

Download / Fork Us!

- The Alex framework & the system for our domain are **available under Apache 2.0 license** at:

https://github.com/UFAL-DSG/alex

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