Resources for Arabic Natural Language Processing

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Background

• Language resources necessary component to language development
• Language resources expensive to create
  – require special skills/staff, specialized equipment
• Organizations that create language resources may not distribute
  – no interest, no infrastructure, reduce competitive advantage
• Problem: Lack of adequate supply of resources stands as an impediment to language development.
• Solution: Build non-profit language resource center to promote language development through the sharing of resources
• Acquire specialized equipment, develop specialized staff
• Build relationships with corpus authors, other data providers, and research communities
• Maintain permanent data archives with bug reports, re-releases, on-going rights to data
• Provide standard reference data to evaluate competing algorithms/analyses
LDC Roles

• Founded April 15, 1992 as a non-profit activity of the University of Pennsylvania

• Specialized publisher (>15,000 copies of 209 publications)
  – resources for linguistic education research and technology development
  – activities supported primarily through membership fees

• Open consortium: any organization interested in language resources may join (almost 1400 users)

• Intellectual property intermediary: negotiate agreements between data providers and data users

• Corpus Creator: create and annotate language resources to specification that can be widely shared
  – community initiatives, corporate and government sponsored projects, joint projects

• Research Group:
  – research approach to language resources
  – conduct research on standards and best practices
LDC Users Worldwide
## Resources by Language

<table>
<thead>
<tr>
<th>Language</th>
<th>Broadcast</th>
<th>Telephone</th>
<th>WideBand</th>
<th>Parallel Text</th>
<th>Newswire/Other Text</th>
<th>Lexicon</th>
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<tbody>
<tr>
<td>Arabic (Egyptian)</td>
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Albanian, Arabic, Armenian, Azerbaijani, Bangla, Belorussian, Bosnian, Bulgarian, Burmese, Cantonese, Croatian, Czech, Dari, English, Estonian, Farsi, French, Georgian, German, Greek, Hausa, Hindi, Indonesian, Kazakh, Khmer, Kinyarwanda/Kirundi, Korean, Kosovian, Kurdish, Kyrgyz, Laotian, Latvian, Lithuanian, Macedonian, Mandarin, Pashto, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Spanish, Tajik, Tatar-Bashkir, Thai, Tibetan, Turkish, Turkmen, Ukrainian, Urdu, Uyghur, Uzbek, Vietnamese
Coordinated Resources

- Focus on major languages: English, Chinese, Arabic, Spanish
- Battery of Resources to meet major research and development needs
- Supporting: language modeling, speech recognition, translation, translingual information retrieval, natural language processing
- Resources also useful for any empirical language study including linguistic analysis, language teaching
- Gigaword News Text Corpora – 1B words, variety of news sources
- Parallel Text – pairs of documents and aligned translations
- Broadcast News – with time-aligned transcripts, important domain for its inherent interest and for its broad vocabulary
- Conversational Speech – telephone conversations and meetings, with time-aligned transcripts
- Pronunciation/Multilingual Lexicons – relate source word forms to:
  - set of target glosses, syntactic and frequency information, pronunciation, morphological analysis, optionally mediated through morphological analysis/synthesis engine
- Treebanks – text annotated to show the morpho-syntactic properties of sentences and their constituents
- Technology-Specific Evaluation Resources – MT & IR
• Collecting news text since 1994
• Published Arabic Newswire, 76Mwords, in 2001
• To support robust modeling of rare phenomena need Gigaword News Text Corpora
• English, Chinese and Arabic
• Arabic: 480,000,000 words from Al Hayat, An Nahar, AFP, Xinhua, IRNA - looking for more
• Consistent encoding
• Light XML markup inline
• Other annotations should be stand-off
Broadcast News

• Goal: Database of broadcast news from around the Arabic speaking world, accurately transcribed
• Current 120 hours of Voice of America radio; 60 hours of Nile TV via SCOLA
• Topic Detection and Tracking Corpus – Phase 4 will contain Arabic broadcast news.
• 40 hours will be carefully transcribed and released jointly with ELRA under the NSF-EU funded Networking Data Centers project
• Building capacity to collect additional source locally; also interested in partnerships.
• 1995 began collecting conversations in 18 linguistic varieties to support research in language identification and automatic transcription

• Included >450 telephone calls in Egyptian Colloquial Arabic

• 10 minutes from each of 200 calls transcribed, 120 of those released

• Publications include plain audio, time-aligned transcripts and a pronouncing lexicon

• Lexicon: surface form, romanization, pronunciation, morphological analysis and frequency in 3 data sets
TDT Corpora

- Topic Detection and Tracking Corpora – support development of news understanding system
  - convert speech to text and segment into stories
  - identify new topics in the news and find all stories discussing a selected topic
- TDT-2 and TDT-3 together contain >1000 hours audio, >100K stories, annotated for relevance to 220 topics in English and Chinese
- TDT-4 will add 200 hours of Arabic news audio and transcripts plus newswire totaling 12,000 stories to similar amounts of English and Chinese annotated for 60 new topics

Hurricane Mitch

WHAT: Hurricane Mitch forms over warm ocean waters, killing thousands and causing millions of dollars in damage.
WHERE: The Caribbean and surrounding areas, particularly Honduras, Nicaragua and Central America.
WHEN: Mitch forms in late September 1998, and lasts through the month of October.

Topic Explication

Hurricane Mitch was the most destructive Atlantic hurricane since 1780, killing over 10,000 people in Central America and leaving millions homeless. On topic: coverage of the disaster itself, estimates of damage and reports of loss of life; relief efforts by the Red Cross and other aid organizations; impact of the hurricane on the economies of the effected countries.

Rule of Interpretation  Rule 4: Natural Disasters
TREC CLIR

- Text REtrieval Conference
  - organized by NIST, multiple tracks including SDR, CLIR, Q&A
  - broader topics than TDT, assessment replaces annotation

- CLIR 2001 Corpus is LDC Arabic New Corpus, 384,000 stories from Agence France Presse 1994-2000 and 25 topics; CLIR 2002 will add 50 topics

<table>
<thead>
<tr>
<th>Title</th>
<th>YES</th>
<th>NO</th>
<th>Total</th>
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<tbody>
<tr>
<td>Performing arts and Islamic institutions</td>
<td>383</td>
<td>471</td>
<td>854</td>
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<tr>
<td>Arab and western cinema</td>
<td>315</td>
<td>548</td>
<td>863</td>
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<tr>
<td>Traditional crafts and technology</td>
<td>133</td>
<td>898</td>
<td>1031</td>
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<tr>
<td>Arab cities and advertising pollution</td>
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<td>1266</td>
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<tr>
<td>Polio eradication in the Middle East</td>
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<td>825</td>
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<td>Measles immunization campaigns in the Middle East</td>
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<td>Bilharzia/Schistosomaisis prevention in Egypt</td>
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<td>Environmental protection laws in Egypt</td>
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<td>Egyptian-Libyan relations during the 1990s</td>
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<td>Dead Sea archaeological finds</td>
<td>13</td>
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<tr>
<td>Information technology &amp; the Arab world</td>
<td>132</td>
<td>958</td>
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<tr>
<td>Water resources in the Nile Valley</td>
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<td>664</td>
<td>764</td>
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<tr>
<td><strong>Totals</strong></td>
<td><strong>4122</strong></td>
<td><strong>18622</strong></td>
<td><strong>22744</strong></td>
</tr>
</tbody>
</table>
MT Corpora

- MT research lacks a stable metric to evaluate systems
- To support development of a metric, LDC created Multiple Translation Corpora
- >20,000 words, >100 stories in Chinese (Xinhua, Zaobao, VoA), Arabic (AFP, Xinhua)
- Selected from newswire and news broadcast to represent the mode story lengths
- Each story translated by at least 10 human translators, at least 3 systems to represent the range of translation practices and quality
- Translations are sentence aligned to original.
- Translations subsequently assessed by human judges
- Fluency – is the translation grammatical in target language?
- Adequacy – does story convey all information conveyed by idea translation?
- Chinese translations published in 2002; assessments to be added
- Arabic will be published with assessments in 2002.
Conclusions

• We’re keeping busy!
• This was just a survey of some resources; Maamouri will focus on part-of-speech tagged text and Treebanks
• So why is he here?
• Networks of coordinated resources are the way of the future
• Learning more about Arabic Processing
• Looking for additional resources
• Looking for users
• Looking for annotators
• Looking for collaboration that produces concrete results.