Linguistic Resources for Handwriting Recognition and Translation Evaluation

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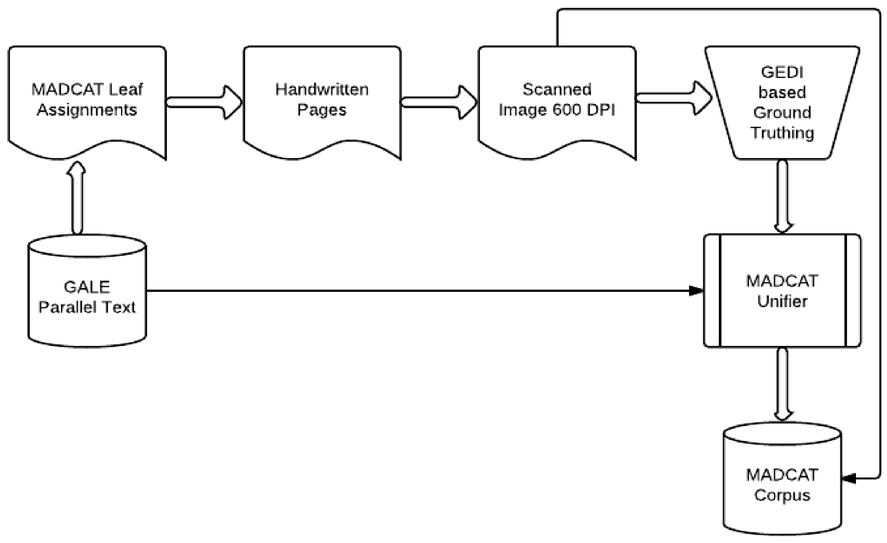
Linguistic Data Consortium

Introduction

- LDC supports handwriting recognition and translation evaluation programs: MADCAT, OpenHaRT
  - Arabic scribe collection 2008-2010
    - Handwritten version of existing GALE parallel texts
  - Chinese scribe collection in 2011
    - Handwritten version of existing GALE parallel texts that has Treebank and/or word alignment annotation



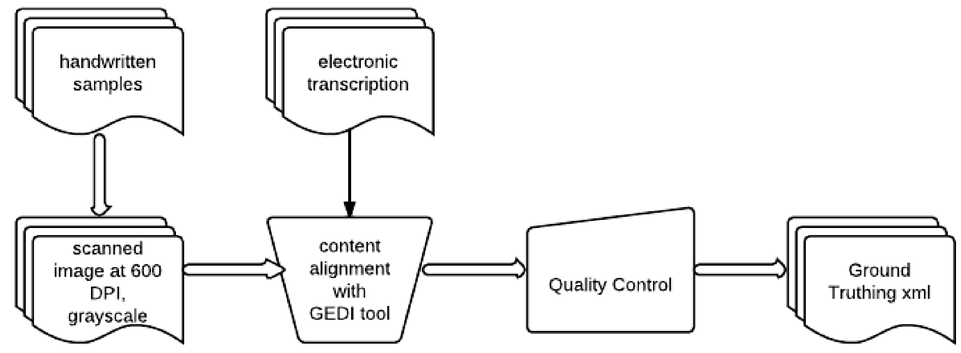
Scribe collection

- Participant recruitment, testing, training
  - Literate native speakers of Arabic/Chinese
  - All participants trained and tested
  - Vetted training assignments before production assignments
- Work flow and data management
  - Scribble: a PHP-based web application using CodeIgniter on the back end and jQuery for front end validation
    - manage scribe registration
    - handle kit creation, assignments
    - handle document validation and check-in
    - track and update kit/page status
    - manage e-text packages for ground truth annotation
  - Ground truth annotation and data delivery not handled by Scribble

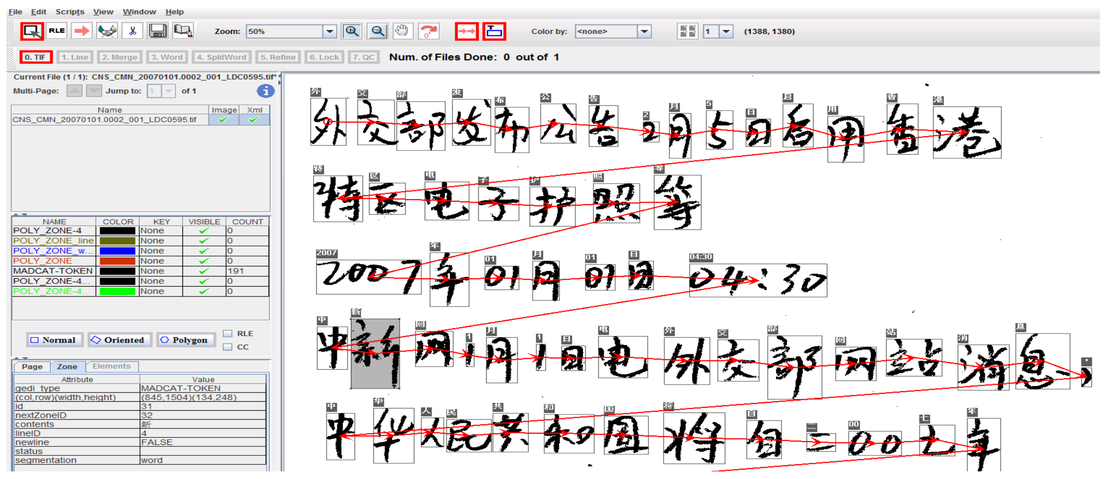
Data processing for scribe collection

- Scribe kits creation from a set of segmented GALE source documents. Three steps:
  - **Step 1**: tokenize the text, execute word and line wraps, paginate GALE source text into kit pages
    - Arabic: maximums: 20 lines/page, 5 words/line
    - Chinese: maximums: 15 lines/page, 15 characters/line
  - **Step 2**: manually review MADCAT kit pages for content and formatting
  - **Step 3**: generate alternate kits given a set of MADCAT pages and preselected kit parameters
    - Arabic: 2-7 versions of the same kit
    - Chinese: 15 versions of the same kit
    - Writing conditions: 90% pen, 10% pencil; 75% unlined paper, 25% lined paper; 90% normal speed, 5% careful speed and 5% fast speed
- Annotation preparation using Scribble to:
  - coordinate management and bookkeeping of kit selection
  - generate corresponding tokenized text of each scribe page
  - provide kit and page profiles which include ID, writing condition, scribe ID

Annotation



- Content alignment
  - using the GEDI tool to draw polygon bounding box around each line, word/character token with unique ID assigned
  - Each token's physical coordinates on the page are recorded as the "ground truth"
  - Reading order is automatically added (Chinese L>R, Arabic R>L)
  - Each token is reviewed, additional features are added to indicate status of extra token, typo, etc.
  - Missing tokens in handwritten image are aligned with empty boxes in GEDI



- QC procedures:
  - GEDI tool enforces various constraints on reading order, text alignment and consistency of token attributes
  - GEDI tool provides mechanisms for extra QC procedures

Data Processing

- Unified data format consolidates GALE source text, translation text and ground truth annotation. Output: a single XML file with multiple layers of information
  - text layer for source text with word/character tokenization and sentence segmentation
  - image layer with bounding boxes
  - document metadata layer
  - translation layer

Results

- 42,000+ Arabic handwritten pages, 223,600 Chinese handwritten pages
- All collected, annotated and released to MADCAT program participants
- Most will be made generally available to the larger research community through LDC's catalog

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