HeMT: A Multilingual System for Human Evaluation of Metadata Records Machine Translation

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ABSTRACT
We demonstrate HeMT, a multilingual Web system for human evaluation of machine translated metadata records. It allows human evaluators to examine and assess machine translation results for sample metadata records in Chinese, English, and Spanish. This paper describes the design principles, users, and the functions of the system. It also presents the research design of a small-scale usability testing that will not only examine the appearance of the Website, but also the accuracy of the content and the Website’s cultural appropriateness.

Keywords

INTRODUCTION
Digital collections contain digital objects in different formats to serve a defined community or a set of communities. Libraries and museums in the U.S. have developed numerous digital collections in order to preserve scientific, cultural, and heritage materials and to provide convenient access for their users, but most of these collections can only be accessed in English. Very few digital collections in the United States support Multilingual Information Access (MLIA) that enable non-English users to search, browse, recognize, and use information the collections (Chen & Bao, 2009). In the increasingly global knowledge society, libraries and museums need to design and implement effective and efficient MLIA in order to promote broader access and use of information (Pastore, 2009).

Metadata Records Translation (MRT) is the process of converting metadata records describing objects in a digital collection from one language into one or more other languages. It is the necessary first step to enable MLIA for a digital collection. Machine translation (MT), or strategies combining MT with human efforts, may serve to replace the expensive and time-consuming task of human translation.

We are conducting a funded research project – MRT (Metadata Records Translation) Project (http://max.lis.unt.edu/MRT/). The full title of the MRT Project is “Enabling Multilingual Information Access to Digital Collections: An Investigation of Metadata Records Translation.” This project represents a collaboration of four entities: The Department of Library and Information Sciences in the College of Information at the University of North Texas (UNT); the UNT Libraries Digital Projects Unit (DPU); the School of Information Management at Wuhan University, China; and the Autonomous University of the State of Mexico (UAEM) in Mexico.

The goal of the MRT Project is to determine how metadata records in English can be effectively translated into other languages to improve resource discovery in digital collections by non-English speaking users. Its objectives include to evaluate the extent to which current machine translation technologies generate adequate translation for metadata records and to identify the most effective metadata records translation strategies for digital collections. One of the major tasks of MRT Project is to develop HeMT, a Web system that enables human evaluation of machine translated metadata records. Once
developed, HeMT will serve as the platform for collecting data on evaluation and evaluators’ behavior in order to achieve the objectives of the MRT Project.

This paper describes HeMT, including its design principles, users, backend database structures, and functions. The implementation of HeMT will be completed by August 2011. Its usability testing will be conducted in September in China, Mexico, and the United States. HeMT will be formally launched in October 2011 when ASIST 2011 attendees are invited to participate in the evaluation.

DESIGN PRINCIPLES
HeMT is designed and implemented based on following principles: (1) Using open-source development platforms and tools for development. Based on MRT Project research plan, HeMT will be released as a free system for public use after the project is completed. Open-source tools are preferred for the convenience of libraries, museums, and researchers to adapt HeMT for use in the future; (2) Easy to use. HeMT will be used by evaluators from the United States, China, Mexico, and maybe other countries. Therefore, it is important to keep HeMT easy to understand, simple to use, and able to be quickly uploaded. Images and animations should be minimally included; (3) Language independent data management. HeMT will store data in three languages: Chinese, English, and Spanish. The backbone database must have a language independent structure to hold multilingual data. Furthermore, HeMT must be easily extended to deal with other languages and to evaluate different types of metadata records; and (4) Multilingual interface. Based on the proposed project plan, HeMT will provide Web interfaces in three languages: English, Simplified Chinese, and Spanish. The content of HeMT must be culturally appropriate.

We have selected PHP/MySQL as programming tools to develop HeMT. PHP is a widely used scripting language for building powerful Websites. MySQL is an open-source database management system which also provides multi-language support. HeMT will be released as an open-source evaluation system after this project is completed.

HEMT USERS
HeMT will be used by two major types of users in addition to the research team: (1) Translators. Translators will conduct manual translation of selected metadata records. These records were in English and were extracted from two digital collections: the UNT Catalog (http://iii.library.unt.edu), and the Portal to Texas History (http://texashistory.unt.edu). Each record needs to be translated into Simplified Chinese and Spanish. The manual translation will serve as reference translation for evaluating MT results; (2) Evaluators. Evaluators will be recruited from China, Mexico, and United States with the assistance of the partners of MRT project. Evaluators will be mainly college students and librarians. They are not required to understand English, but must be native speakers of Mandarin or Spanish.

DATABASE STRUCTURE AND WEBSITE FUNCTIONS
HeMT is a Web database system. It has two major components: a database that stores data, and a multilingual Website that interacts with the users such as evaluators.

Database Structure
The database will store metadata records, human translation results, machine translation results, data about the users including the translators and the evaluators, and the evaluation results. Table 1 presents the major tables in the database.

<table>
<thead>
<tr>
<th>Table</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDR</td>
<td>Metadata records extracted from two digital collections</td>
</tr>
<tr>
<td>REF</td>
<td>Human translation of the metadata records</td>
</tr>
<tr>
<td>MT</td>
<td>Machine translation of the metadata records</td>
</tr>
<tr>
<td>USER</td>
<td>Information about the evaluators, translators, and reviewers</td>
</tr>
<tr>
<td>EVAL</td>
<td>Results of the evaluation of machine translated metadata records</td>
</tr>
<tr>
<td>TERM</td>
<td>A multilingual vocabulary for HeMT</td>
</tr>
</tbody>
</table>

Table 1. HeMT major database tables

HeMT Website
The multilingual Website will contain or provide the following interactions: (1) allow users to register and login; (2) present metadata records for human translation; (3) train evaluators with examples; (4) present machine translation and corresponding human generated translations to evaluators; (5) display statistics of evaluations. Among them, (1), (2), (3) and (4) should be presented to the users in one of the three languages: English, Spanish, or Simplified Chinese. Figure 1 is the site map of HeMT.

Figure 1. Site map of HeMT

Figure 2 presents the screen shot of the current homepage of HeMT, which is only in English. In near future, HeMT users can choose to access the system using Chinese or Spanish.
User Registration
HeMT homepage allows new users to register before they can evaluate machine translation results. The user registration page serves as a pre-task survey for HeMT. When a user agrees to participate, he or she will fill out the registration form which collects demographic information about the user, such as educational level, languages that they can speak, and computer literacy. It also asks for an email address and password that will be used at login. The users will also specify whether they will be a translator or an evaluator for HeMT. Figure 3 presents a screen shot of the main part of the user registration page.

Manual Translation.
Four translators were recruited to generate reference translations in simplified Chinese or Spanish for each sample metadata record. They will perform manual translation using HeMT and their translations will be directly stored into the database in UTF-8 format. Six elements of each record, including title, creator, subject, description, publisher, and coverage, will be manually translated.

Evaluation of Machine Translation
Three freely available machine translation services will be applied to translate the selected metadata records. The results will be presented to the evaluators for judgment. Evaluation measures were selected based on a review of machine translation evaluation literature, especially recent workshops on machine translation evaluation (Callison-Burch, et al 2009; Chen, et al, 2011, Lavie, 2010). Figure 4 is the main page for evaluation.

In Figure 4, a metadata record and its reference translations in Simplified Chinese is presented on top of the evaluation page. The two reference translations were generated manually by two translators. Then three links labeled System 1, System 2, and System 3 direct evaluators to judge the performance of individual MT systems. Below the three links, the page asks the evaluators to compare the three systems by identifying the best and worst system. Evaluators can also comment on the performances of the three systems.

User Training
This is the only part that has not been developed so far because it has to wait until the internal testing of other pages is completed. The idea behind user training is that evaluators need to be trained and learn how to conduct MT evaluation before they start to evaluate the MT results.

User training pages will include the following: (1) A simple description of the MRT project: its purposes, funder and significance; (2) MT evaluation processes: the steps for an evaluator to conduct the evaluation; (3) The evaluation pages and questions. Explain components on the evaluation...
pages, the evaluation questions, and how to answer the evaluation questions; (4) An example on evaluation; (5) A quiz with five to six questions. These questions allow evaluators to estimate their readiness for participation; and (6) Ready to evaluate. The research team will decide whether an evaluator is ready to evaluate based on her answers to the questions in the quiz.

The second round of usability testing will be conducted ten days after the first round at UNT campus to make sure the problems discovered in the first round are solved. Similar procedures will be applied but a different group of participants will be recruited.

MRT Project has submitted applications for user studies including the usability testing. The applications have been approved by the Institute Review Board (IRB) of the University of North Texas. The results of the usability testing will be analyzed and applied to improve the interface and content of HeMT.

CONCLUSION
A multilingual Web database system HeMT will be developed to facilitate human evaluation of machine translation for the MRT Project. HeMT will serve as the data collection platform for this research. HeMT will be a language-independent evaluation system so that it can be expanded to handle data management in many languages. Usability testing will be conducted to ensure that HeMT is user-friendly and culturally appropriate.

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REFERENCES


