Multilingual Search Assistance: Interactive Aspects of Cross Language Information access

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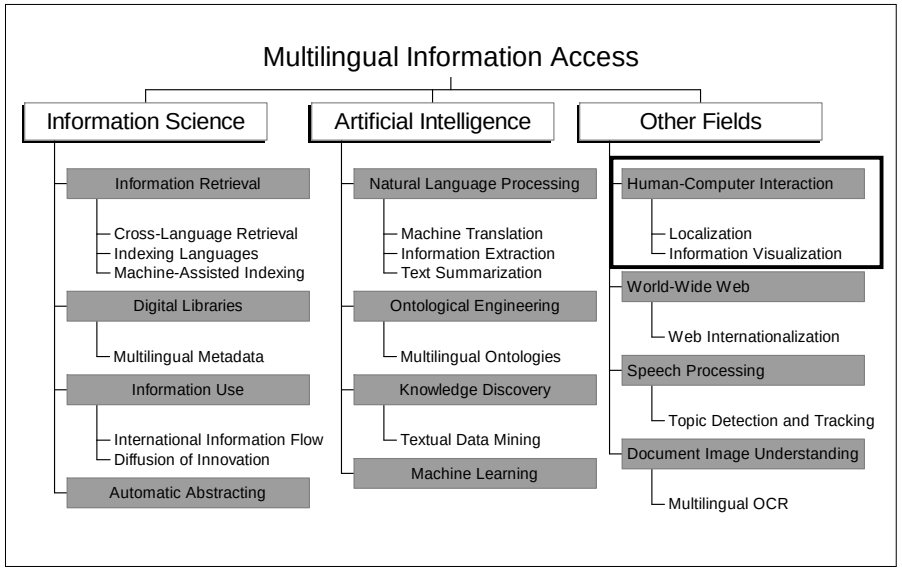
Introduction

- Multilingual IR is still an important area of research
  - Growing amount of multilingual content on the Web
  - Increasing number of users interacting with content
- Applications include
  - Sharing information between global communities
  - Selling products globally on the Web
  - Searching multilingual documents
- Need to design effective (and *usable*) systems



Source: Douglas W. Oard, IRAL99

Outline

- *Users* and search (Interactive IR)
- Designing *user* interfaces
- *Users* and evaluation
- *Users* and multilingual information access
- Example CLIR systems

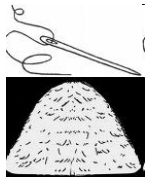
Interactive Information Retrieval (IIR)

Recommended Reading

- Belkin, N. (1993) Interaction with Texts: Information Retrieval as Information-Seeking Behavior, Universitätsverlag Konstanz, pp. 55-66 http://www.ling.helsinki.fi/courses/ctl310/IR/papers/belkin93.ps)
- Chu, H. (2005) Information Representation and Retrieval in the Digital Age, ASIST Monograph Series.
- **Hearst, M. (1999). User Interfaces and Visualization. In: Baeza-Yates, R. & Ribeiro-Neto, B. (eds.), Modern Information Retrieval, 257-323. New York: ACM Press. (Available online: http://people.ischool.berkeley.edu/~hearst/irbook/10/chap10.html)**
- Ingwersen, P. (1992) Information Retrieval Interaction. London: Taylor Graham (Available online: http://vip.db.dk/pi/iri/index.htm)
- Ingwersen, P. and Järvelin, K. (2005) *The turn: integration of information seeking and retrieval in context.* Dordrecht, The Netherlands: Springer
- **Robins, D. (2000) Interactive Information Retrieval: Context and basic Notions, Informing Science, Vol 3(2), pp. 57-61 (http://inform.nu/Articles/Vol3/v3n2p57-62.pdf)**

What's the problem in IR?

- Searching is like finding a needle in a haystack, but not all searches are the same
  - a known needle in a known haystack
  - a known needle in an unknown haystack
  - an unknown needle in an unknown haystack
  - any needle in a haystack
  - the sharpest needle in a haystack
  - most of the sharpest needles in a haystack
  - all the needles in a haystack
  - affirmation of no needles in the haystack
  - thinks like needles in any haystack
  - let me know whenever a new needle shows up
  - where are the haystacks?
  - needles, haystacks – whatever

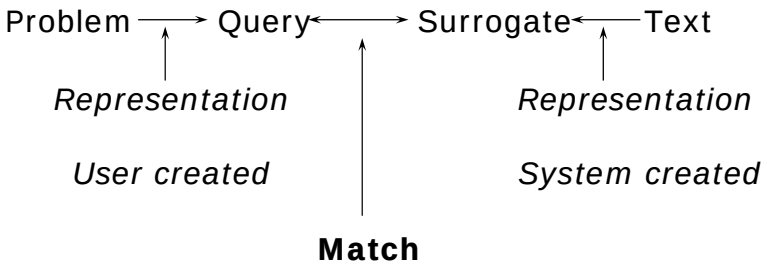


Document or information

IR system or database

Matthew Koll, 2000. "Track 3: Information retrieval," *Bulletin of the American Society for Information Science,* volume 26, number 2 (December-January), at http://www.asis.org/Bulletin/Jan-00/track_3.html

Classic search model



System solution: content matching!

The 'standard' search process

(Hearst, 1999: 263)

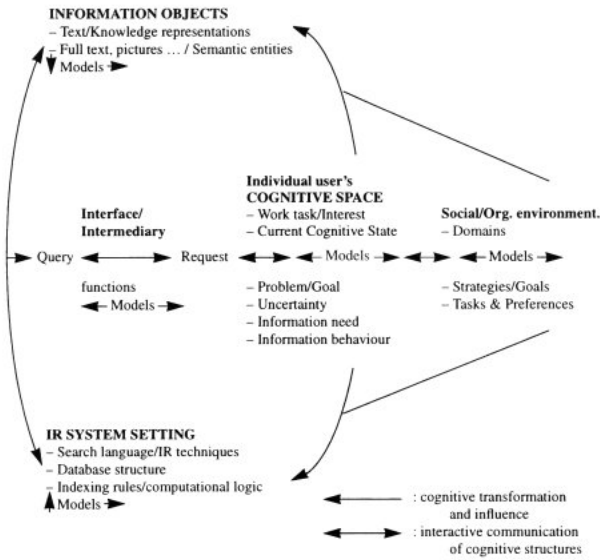
- 'Standard' (or systems) view of the IR process
  - Start with information need (goals)
  - Select system and collections to search on
  - Formulate query
  - Send query to system
  - Receive results in the form of information items
  - Scan, evaluate and interpret results
  - Reformulate query and send to system again, or
  - Stop

Assumptions about search

- Previous view of the search process limited
  - That users can express their information needs and the 'right' query exists
  - That user's information need is stable and remains static
  - That information needs are the same from user to user
  - That value to the user is in the resulting document set
  - That the value in search is to maximise precision and recall
  - That users can articulate what they want (in queries) and that they really know what they want
  - The system *knows* what the user really wants
  - That search for the user is the means to an end

Interactive IR

- *"Most IR systems are used by people and we cannot design effective IR systems without some knowledge of how users interact with them"* (Robins, 2000:57)
  - Information seeking (including IIR) is about understanding the human (or user) role in accessing information
- Often contrasted with a *systems* approach
  - Focus on the *user* not system (user-centred)
  - "Does system retrieve relevant documents?" vs. "Can people use this system to retrieve relevant documents?" (Kelly, 2008)
- Interactive IR includes many areas
  - Information seeking and behaviour, information science, human-computer interaction, user modelling, user interface design, evaluation of interactive systems …



Ingwersen's model of the IR process (Wilson, 1999; based on Ingwersen, 1996)
Source: http://informationr.net/ir/9-1/paper163.html

IIR is IR with users, right?

- "IIR exists in continuum between system-focused studies and human-focused studies" (Kelly, 2009:10)

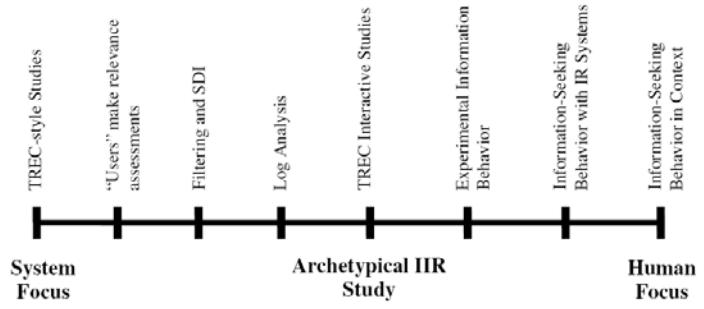


Fig. 2.1 Research continuum for conceptualizing IIR research.

Interactive IR

- Provides frameworks in which to help better understand and represent users and their interactions with IR systems
  - *Users* and their characteristics (e.g. cognition)
  - User's *information needs* (goals/tasks) and *context* when accessing information
  - Users and their *interactions* with information and search systems

> *"IR is ultimately a human activity. Humans and machines can bring complementary strengths to the interactive search process; properly coupling these capabilities can result in a synergy that exceeds the capabilities of either human or machine alone"* (Oard et al., 2008)

Information seeking

- Information seeking behaviours are activities in which people actively engage with texts, text collections or people who give access to texts, in order to be able to use information to address a specific problem or need
  - Information seeking is aimed at resolving problems and accomplishing tasks
  - **IR systems support this underlying human process**
- Exhibit a diverse range of behaviours
  - Searching library for specific book
  - Browsing journals to keep up to date
  - Asking someone for advice
  - Searching the Web for someone's homepage

Users

- "Know the user!" (Hansen, 1971)
  - Intended users of a system and their tasks (goals)
- Develop population profiles
  - Age, gender, physical abilities, cognition, education, cultural background, training, motivation, goals, personality and *language skills* …
- Can a single design can meet the individual needs of *all* intended users?
  - Typically design for *categories* of users (a community) and situations (usage classes)

Types of user
(Shneiderman, 2005:68-69)

- Novice or first-time users
  - *Novice users* - assumed to know little about the task or interface
  - *First-time users* – professionals knowing task concepts but shallow knowledge of interface
- Knowledgeable intermittent users
  - Users of a variety of systems
  - Stable task concepts and broad knowledge of interfaces
- Expert frequent users
  - Users thoroughly familiar with task and interface

Discussion

- Who uses IR systems?
- Do people use specific types of IR systems?
- What kind of user profile might they have?

Information needs

- User's information needs are critical in IR
  - Information needs will affect the user's search activities and their relevance judgments
- Information needs are often expressed in terms of the goals that people have and the tasks they perform
  - Helping a person to find information useful in accomplishing a task (activity) or achieving a goal (purpose) is core to IR
- Tasks represent the activities performed to achieve goals
  - Tasks can consist of *sub-tasks* (and form a hierarchy)
  - e.g. writing a paper consists of planning the contents; performing literature review; searching databases …
- A *topic* represents the specific subject area of the goals/tasks
  - e.g. gathering material to write a report on the *effects of the credit crunch in the UK*

Vakkari, P. (2003). Task-based information searching. Annual Review of Information Science and Technology, 37, 413-464.

Problems with information needs

- The whole concept of an information need is 'fuzzy' with a number of associated problems
  - People often find it hard to articulate needs
  - People often find it hard to translate their needs into representation appropriate for a system
  - Information needs can evolve during search process
  - Relevance assessments might change during search

Task analysis
(Hackos & Redish, 2005)

- Learning about ordinary users by observing them in action and understanding how users perform tasks
  - What user's goals are (what are they trying to achieve?)
  - What tasks do users perform to achieve these goals?
  - What personal, social and cultural characteristics users bring to the tasks
  - How users are influenced by their physical environment
  - How user's previous knowledge and experience helps
  - What users value most that will make a new interface (and system) satisfying for them

Discuss

- What do you *do* with an IR system? What do you use it for? Why?
  - What goals are you trying to perform? (Or why are you carrying out tasks with an IR system?)
  - What tasks do you carry out to achieve these goals?
  - How does an IR system help you carry out tasks?

Information access tasks

- Information access tasks
  - Could range from asking specific questions to exhaustively searching a topic
- Information seeking tasks of business analysts (O'Day and Jefferies, 1993)
  - Monitoring well-known topic over time
  - Following planned series of searches to achieve a goal (e.g. keeping up to date on current business practices)
  - Exploring topic in undirected fashion

Information seeking tasks

- Types of general search task (Shneiderman, 1998:512)
  - *Specific fact-finding* (e.g. find telephone number of Paul Clough)
  - *Extended fact finding* (e.g. what other books are there by the author of Jurassic Park?)
  - *Open-ended browsing* (e.g. is there new work on voice recognition being reported from Japan?)
  - *Exploration* (e.g. what genealogy information is available from the national Archives?)

Web search tasks

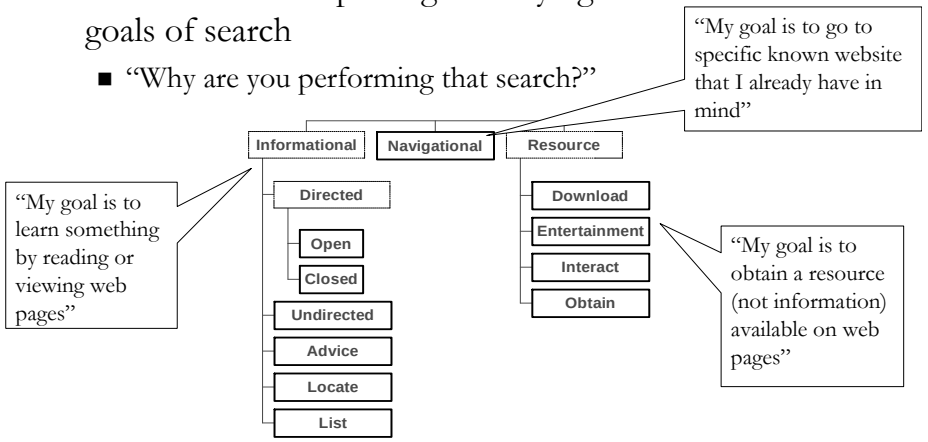
- Types of Web search task (Broder, 2002)
  - *Navigational*
    - find specific website user has in mind
  - *Informational*
    - find some information about a topic
  - *Transactional*
    - find service to initiate further interaction
    - "perform some web-mediated activity"

Broder, A. (2002) A taxonomy of web search, SIGIR Forum, Vol. 36, No. 2. (*2002*), pp. 3-10

Relating goals and queries in web search

Rose, D.E. and Levinson D. (2004) "Understanding User Goals in Web Search," Proceedings of the 2004 World Wide Web Conference, 13-19

- Framework for capturing underlying goals of search
  - "Why are you performing that search?"



Why bother with goals and tasks?

- Provide user experiences tailored towards taska and goals (i.e. *adaptive IR*)
  - Enhanced user interface
    - displaying adverts (appropriate in shopping but not educational context)
    - Invoking Boolean search
  - Relevance ranking
    - searching for advice might rank by popularity
    - open-ended search may involve ranking by traditional term (and document) frequencies

Information Processing & Management, Volume 44, Issue 6, November 2008, Pages 1819-1821
Adaptive Information Retrieval

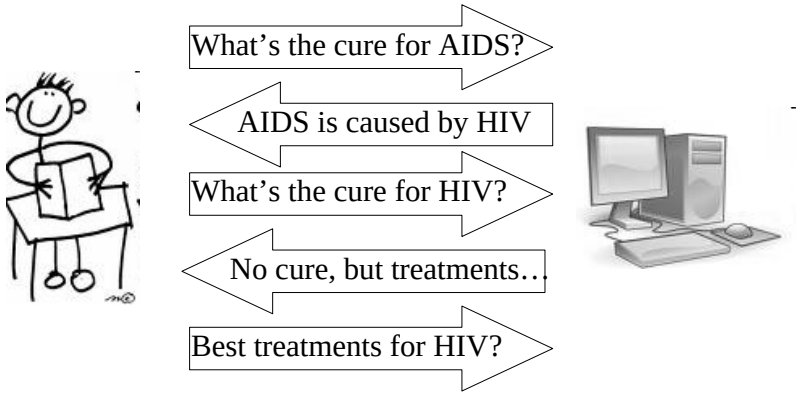
User interaction

- People have information needs but how do they find what they want?
  - They *interact* with IR systems (and databases)
- Various theories and frameworks that contrast *browsing*, *querying*, *navigating*, and *scanning* (Hearst, 1995)
  - Browsing refers to casual, undirected exploration of information structures
  - Querying produces new collections of information
  - Navigation refers to following chains of links
  - Scanning information structure (e.g. titles, category labels)
- Simpler view - *search, browse* or combination (Chu, 2005)

Searching

- Searching is a structured activity and has long been in use (e.g. querying databases)
  - Known-item vs. subject/topical search (Chu, 2005)
  - Ad hoc vs. filtering (Baeza-Yates & Ribeiro-Neto, 1999)
- Searching can be effective
  - If the user knows what he/she is looking for
  - If the query is specific (known-item)
- Typically involves *formulating queries* (Chu, 2005:59-80)
  - Recall potential words or select suggested categories or terms
  - Expressed in natural language or Boolean logic

Search is often *iterative*



Source: User experience issues in web search, Rose (Presentation)

Search is highly *subjective*

"Children playing on the beach"

Images contain *all* query words

Search depends on social and cultural *contexts*

- Cultural context
  - "pants" in UK vs. US
- Social context
  - Relevant images for "madonna and child"?
    - Art historian
    - Pop music fan

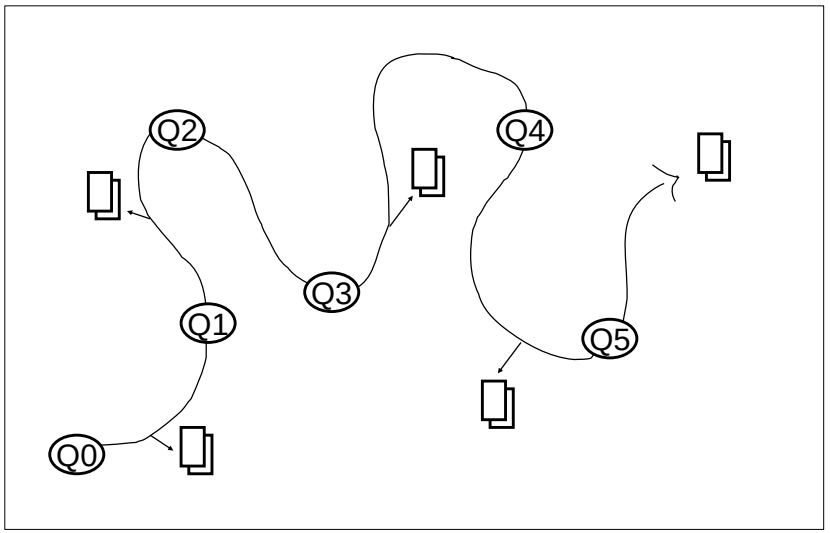
Source: User experience issues in web search, Rose (Presentation)

Berry-picking model (Bates, 1989)

- The query is continually shifting (users learn during the search process)
  - New information may yield new ideas and new directions
- Users may move through a variety of *sources*
- The query is not satisfied by a single, final retrieved set, but rather by a series of selections and bits of information found along the way

> *"Each new piece of information [users] encounter gives them new ideas and directions to follow, and, consequently, a new conception of the query."*
> Bates, M.J. (1989) "The Design of Browsing and Berrypicking Techniques for the Online Search Interface," *Online Review*, 13(5):407-24.

A sketch of a searcher… "moving through many actions towards a general goal of satisfactory completion of research related to an information need." (Bates, 1989)



Implications for design

- Allow users to track status of higher-level goals
- Interfaces should make it easy to store intermediate results
- Interfaces should make it easy to follow trails with unanticipated results
- Makes evaluation more difficult
  - Not just about evaluating whether single task is successful or not (entire *episode*)

Is Relevance the Right Criterion for Evaluating Interactive Information Retrieval?, Belkin et al., http://research.microsoft.com/en-us/um/people/pauben/bbr-workshop/talks/belkin-bbr-sigir08.pdf

Browsing

- *Browsing* allows users to look for information in a more random and unstructured way than search (Marchonini, 1995)
  - Suitable when people don't have specific search goals
  - Provides a way of exploring collections
- There are many types of browsing
  - Systematic, exploratory, casual (Marchonini, 1995)
  - Directed, semi-directed and undirected (Herner, 1970)
- Browsing online content comes in various forms
  - Viewing groups of items by category (e.g. Yahoo!)
  - Following hyperlinks

Contrasting search and browse

The chances of finding something useful unexpectedly

Approach	Information need	Efficiency	Cognitive load	Serendipity	Efforts
Search	Specific and known	High	Light	Less	More
Browse	Broad and uncertain	Low	Heavy	More	Less

Whether approach must be learned and practiced

Chu, H. (2005) Information Representation and Retrieval in the Digital Age, ASIST Monograph Series, pg. 93.

Designing user interfaces

Recommended reading

- Preece, J., Rogers, Y., and Sharp, H. (2002) Interaction design: Beyond human-computer interaction. New York: Wiley.
- Shneiderman, B. (1998) Designing the user interface: Strategies for effective human-computer interaction, Addison-Wesley.
- Petrelli, D. (2008) On the role of user-centred evaluation in the advancement of interactive information retrieval. Information Processing and Management. 44(1): 22-38.
- Hearst, M. (1999). User Interfaces and Visualization. In: Baeza-Yates, R. & Ribeiro-Neto, B. (eds.), Modern Information Retrieval, 257-323. New York: ACM Press. (Available online: http://people.ischool.berkeley.edu/~hearst/irbook/10/chap10.html)

Using IR systems

- Many people use IR systems to locate information relevant to their information needs
- But many searchers have difficulty effectively using IR systems (Jansen, 2005; Hearst, 1998)
  - Finding appropriate query terms
  - Retrieving too may results
  - Not retrieving enough results
  - Retrieving sets of disorganised lists
  - Retrieving zero results
  - Difficulty in forming specialised query syntax

User interfaces

- Interface acts as intermediary between users and IR systems
  - Need to match the tasks people do (and their goals) with *interface objects* (or functionality)
- Well designed interface will help users to
  - Clarify their information needs
  - Formulate suitable queries
  - Understand the results
  - Carry out a range of search tasks effectively

Potential points of user interaction in the search process

- Start with information need (goals)
- **Select system and collections to search on**
- **Formulate query**
- Send query to system
- Receive results in the form of information items
- **Scan, evaluate and interpret results**
- **Reformulate query and send to system again, or**
- Stop

Modes of interaction

- Using an IR system can be based on various modes of user-system interaction (cf. Chu, 2005:171-175)
  - *Command language*, e.g. forming Boolean queries
  - *Menu selection*, e.g. select from available options on menu or list (recognition over recall)
  - *Form fill-in*, e.g. advanced search
  - *Hyperlinks*, e.g. moving between web pages
  - *Graphical operation*, e.g. clickable maps, radio buttons
  - *Natural language*, e.g. a dialogue between user and system

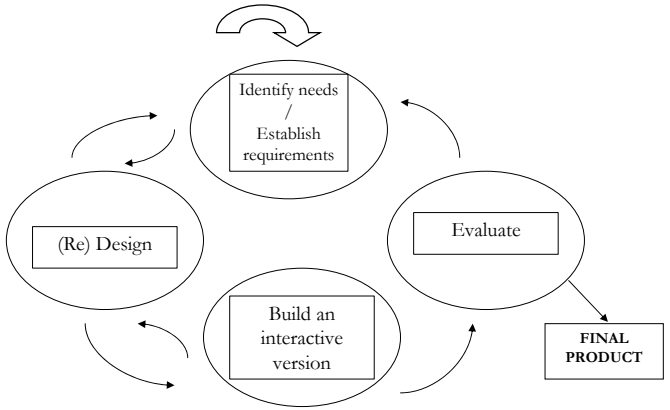
Characteristics of usable user interfaces (Hackos & Redish, 1998: 6)

- Usable interfaces
  - Reflect workflows that are familiar or comfortable
  - Support user's learning styles
  - Compatible in users' working environment
  - Encompass a design concept (metaphor) familiar to the users
  - Have consistent presentation (layout, icons, interactions) that make then appear reliable and easy to learn
  - Use language and illustrations familiar to the users

User-centered design approach

- Early focus on users and their tasks
  - User's tasks and goals are driving force behind development
  - User's behaviour and context of use are studied and system designed to support them
  - User's characteristics are captured and designed for
  - Users consulted through the design process
- Empirical measurement
  - Provides evaluation data to drive re-design
- Iterative design to development
  - Design, test, measure, re-design

Interaction design



Preece, J., Rogers, Y., and Sharp, H. (2002). Interaction design: Beyond human-computer interaction. New York: Wiley.

Personas

- A *persona* is a description of an invented character representative of a key user group
  - Helps make designers think about users (and their activities)
- Typical content includes
  - Name and photograph (makes them more realistic)
  - Background and characteristics
  - Characteristics related to application being developed
  - List of goals and attitudes when using application
  - List of factors influencing how they use the application
- Persona informed by user observation and research

Usage scenarios

- A *scenario* is an *informal narrative description* describing human activities/tasks in a story
  - Telling stories is natural way for people to explain what they are doing or how to achieve something
- Scenarios used in design
  - To describe existing activities or uses of existing system
  - To describe tasks/goals persona wants to achieve using the application being developed
- Often have multiple scenarios for each persona
- Level of detail for persona and tasks varies

http://www.uidesign.net/2000/papers/newdesignrequirements.html

Example - web search

Elizabeth: Expert Searcher

Goals:
Information I can use
Answers to specific questions

Typical Questions:
Tell me something new
I want the latest!
I need <this> information.

Top Usability Needs:
Efficient: Give me a search box and I'll tell you exactly what I want

Effective: Give me accurate, reliable, up-to-date information

Information Seeking Styles:
Find: Specific question or keyword

Query: What's new about....

Risks
Not interested in personalization or community features

Already knows the basics

"I don't stay on a site long if nothing jumps out at me"

"Where do I type? Here? We have to change that!"

For Elizabeth, the web is a vast library. She likes to keep up with healthcare information, and uses the web to do it. Starting from Google, her favorite search engine, she finds a collection of pages that look good and tries them until she finds one that seems promising.

She doesn't like a lot of personal stuff on the web - testimonials, kids, interactive tools don't interest her a lot - but she does have definite ideas about how it should work

Needs:

- Targeted information at the right level of detail
- Search box or ways to reach information directly

http://www.wqusability.com/articles/personas_storytelling.html

Principles of interaction design

- Bruce "Tog" Tognazzini has created a list of basic principles for interface design
  - http://www.asktog.com/basics/firstPrinciples.html
- Suitable as a checklist for traditional GUI and web environments
  - Effective interfaces are visually apparent and forgiving, instilling in their users a *sense of control.*
  - Users *quickly* see the breadth of their options, grasp how to achieve their goals, and do their work.
  - Effective interfaces *do not* concern the user with the inner workings of the system.
  - Work is carefully and continuously saved, with full option for the user to *undo* any activity at any time.
  - Effective applications and services perform a maximum of work, while requiring a *minimum* of information from users.

Design guidelines

- Eight golden rules for interface design (Shneiderman, 1998:74-75)
  - Strive for consistency
  - Enable frequent users to use shortcuts
  - Design dialogs to yield closure
  - Offer informative feedback
  - Offer error prevention and simple error handling
  - Permit easy reversal of actions
  - Support internal locus of control
  - Reduce short-term memory load

Usability

- Usability is an abstract concept and relates to ease of use in which functionality can be accessed
- Another way to understand usability is the ease of use in which a user communicates with a system
  - Interface between the IT system and the human activity system (Human Computer Interface or HCI)
- But if the functionality provided is easy to use, yet the functionality does not address the task at hand, then the system is not successful
- Usability depends on characteristics of the *user* and characteristics of their *tasks* (human processes)

Usability heuristics (Nielsen, 2004)

- Nielsen's ten usability heuristics
  - Visibility of system status
  - Match between system and the real world
  - User control and freedom
  - Consistency and standards
  - Error prevention
  - Recognition rather than recall
  - Flexibility and efficiency of use
  - Aesthetic and minimalist design
  - Help users recognize, diagnose, and recover from errors
  - Help and documentation

Nielsen, J. (1994b). Heuristic evaluation. In Nielsen, J., and Mack, R.L. (Eds.), *Usability Inspection Methods*, John Wiley & Sons, New York, NY

Usability and evaluating interactive IR

Recommended reading

- Hoeber, O. and Yang, X. D. 2007. User-Oriented Evaluation Methods for Interactive Web Search Interfaces. In *Proceedings of the 2007 IEEE/WIC/ACM international Conferences on Web intelligence and intelligent Agent Technology - Workshops* (November 02 - 05, 2007). WI-IATW. IEEE Computer Society, Washington, DC, 239-243 (http://www.cs.mun.ca/~hoeber/download/2007_iwi.pdf)
- **Kelly, D. (2009) Methods for Evaluating Interactive Information Retrieval Systems with Users, Foundations and Trends in Information Retrieval, Vol. 3(1-2).**
- Petrelli, D. (2008) On the role of User-Centered Evaluation in the Advancement of Interactive Information Retrieval, Information Processing and Management, 44 (1), January 2008, 22-38.
- Preece, J., Rogers, Y., and Sharp, H. (2002) Interaction design: Beyond human-computer interaction. New York: Wiley.

Evaluation

- *Evaluation* is the process of assessing the 'worth' or 'goodness' of a system, interface of interaction technique
  - E.g. evaluate two or more systems using some set of outcome measures, e.g. performance or usability
- IIR experiments similar to social science experiments
  - Examine effects of independent variable (e.g. interface) on one or more dependent variables (e.g. performance and usability)
- Evaluating multiple systems vs. single system
- Two main approaches to evaluation
  - *Formative* performed as part of the development process
  - *Summative* accesses value of completed application

DECIDE

- DECIDE is a useful framework to guide evaluation (for all kinds of scenarios, not just IR)
  - Determine overall goals evaluation addresses
  - Explore specific questions to be answered
  - Choose evaluation paradigm and techniques
  - Identify the practical issues (e.g. selecting participants and topics for IIR)
  - Decide how to deal with *ethical issues*
  - Evaluate, interpret and present the data

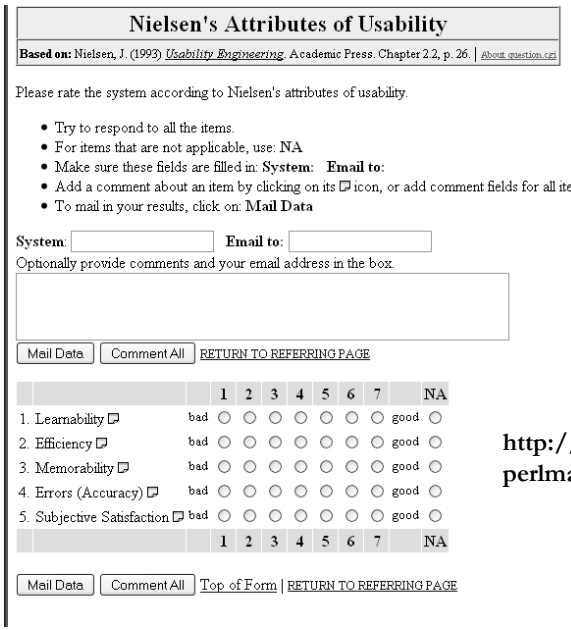
Preece, J., Rogers, Y., and Sharp, H. (2002) Interaction design: Beyond human-computer interaction. New York: Wiley, pp. 348-351)

Types of evaluation studies

- *Observation* involves watching users perform tasks (with the application)
- Gather *user opinions* through questionnaires and interviews (e.g. demographics, usability)
- *Formal experimentation* - user performs tasks under controlled experimental conditions (lab-based user testing)
- *Contextual inquiry or naturalistic observation* - watch people in their own environments (over time – *longitudinal*)
- *Predictive* evaluation, e.g. testing usability (by experts)
- *Wizard of Oz* and *simulations* often used in proof-of-concept to indicate what might happen in ideal case

Assessing usability

- Commonly cited attributes of usability come from Nielsen, J. (1993) *Usability Engineering*. Academic Press. Chapter 2.2, p. 26.
  - *Learnability* – how easy is the system to learn?
  - *Memorability* – is system easy to remember how to use?
  - *Efficiency* – is system efficient to use (e.g. delays)?
  - *Errors (accuracy)* – does the system lead to fewer human errors?
  - *Subjective satisfaction* – are people satisfied (pleased) with using the interface?
- Very helpful web page implementing many proposed usability assessment schemes
  - http://hcibib.org/perlman/question.html



http://hcibib.org/perlman/question.html

Experimental design

- *"An experiment is an examination of the relationship between two or more systems or interfaces (independent variable) and set of outcome measures (dependent variables)"*
- Common procedure for user evaluations
  - Assign participants various 'realistic' tasks to perform
  - Take quantitative measurements of 'performance' (e.g. time taken, number of tasks completed, number of errors made)
  - Make observations about how the interface/system is being used by the participants
  - Collect subjective reactions from the participants (e.g. satisfaction, usability)

Hoeber, O. and Yang, X. D. 2007. User-Oriented Evaluation Methods for Interactive Web Search Interfaces. In *Proceedings of the 2007 IEEE/WIC/ACM international Conferences on Web intelligence and intelligent Agent Technology - Workshops* (November 02 - 05, 2007). WI-IATW. IEEE Computer Society, Washington, DC, 239-243. http://www.cs.mun.ca/~hoeber/download/2007_iwi.pdf

Comparison of multiple systems

- Minimise learning effects (transfer of knowledge/experiences) from one system to another
- Can use *between-subjects* (*independent*) design
  - Each subject assigned to one condition (not both)
  - e.g. each participant tests one interface only
- More common to use *within-subjects* (or *repeated-measures*) design
  - Each subject tested twice, in each condition
  - e.g. each participant tests all interfaces
  - Requires fewer participants and allows comparison between interfaces
  - Ensure order which participants perform tasks does not bias results

Rotation and counterbalancing

- Bias reduced using *rotation* and *counter-balancing*
  - Participants perform tasks in differing orders
  - Reduces effects of learning and fatigue (i.e. order effects)
- Systematically *rotate* the order of the variables
  - *Latin square* design controls effect of *one* variable
  - *Graeco–Latin square* design can be used for *multiple* variables
- Can also use *randomization* to assign subjects to conditions and reduce ordering effects

Example experimental design

- Test 3 interfaces; use 6 topics (1 task); user will complete 2 topics per interface (Kelly, 2008: 44-60)

	Interface type		
Subjects	Interface 1	Interface 2	Interface 3
S1	1, 2	3, 4	5, 6
S2	1, 2	3, 4	5, 6
S3	1, 2	3, 4	5, 6
S4	1, 2	3, 4	5, 6
S5	1, 2	3, 4	5, 6
S6	1, 2	3, 4	5, 6

No rotation

	Interface type		
Subjects	Interface 1	Interface 2	Interface 3
S1	1, 2	3, 4	5, 6
S2	2, 3	4, 5	6, 1
S3	3, 4	5, 6	1, 2
S4	4, 5	6, 1	2, 3
S5	5, 6	1, 2	3, 4
S6	6, 1	2, 3	4, 5

Latin-square rotation of topics

Subjects	Time 1	Time 2	Time 3
S1	I_1: 1, 2	I_2: 3, 4	I_3: 5, 6
S2	I_1: 2, 3	I_2: 4, 5	I_3: 6, 1
S3	I_1: 3, 4	I_2: 5, 6	I_3: 1, 2
S4	I_1: 4, 5	I_2: 6, 1	I_3: 2, 3
S5	I_1: 5, 6	I_2: 1, 2	I_3: 3, 4
S6	I_1: 6, 1	I_2: 2, 3	I_3: 4, 5
S7	I_2: 1, 2	I_3: 3, 4	I_1: 5, 6
S8	I_2: 2, 3	$_3$: 4, 5	I_1: 6, 1
S9	I_2: 3, 4	I_3: 5, 6	I_1: 1, 2
S10	I_2: 4, 5	I_3: 6, 1	I_1: 2, 3
S11	I_2: 5, 6	I_3: 1, 2	I_1: 3, 4
S12	I_2: 6, 1	I_3: 2, 3	I_1: 4, 5
S13	I_3: 1, 2	I_1: 3, 4	$_2$: 5, 6
S14	I_3: 2, 3	I_1: 4, 5	I_2: 6, 1
S15	I_3: 3, 4	I_1: 5, 6	I_2: 1, 2
S16	I_3: 4, 5	I_1: 6, 1	I_2: 2, 3
S17	I_3: 5, 6	I_1: 1, 2	I_2: 3, 4
S18	I_3: 6, 1	I_1: 2, 3	I_2: 4, 5

Graeco-Latin square rotation of topics and interfaces

What to measure?

- Four basic measures (Kelly, 2008:101)
  - *Contextual* – characteristics of the subject and tasks
    - e.g. age, gender, search experience, language skills, task type, familiarity with topics (from *questionnaires*)
  - *Interaction* – characteristics of human-computer interaction
    - e.g. number of queries issued, number of documents viewed, query length (from *log data*)
  - *Performance* – relate to outcome of interaction
    - Number of relevant documents saved, mean average precision, discounted cumulative gain (from *log data*)
  - *Usability* – evaluative feedback from participants
    - e.g. satisfaction, attitudes, suggestions (from *questionnaires*)

iCLEF (http://nlp.uned.es/iCLEF/)

- Interactive Cross Language Evaluation Forum (iCLEF)
  - Evaluation of interactive CLIR systems
- Since 2006 iCLEF moved from news collections to Flickr (large-scale photo-sharing website)
  - Naturally multilingual
  - Challenging content
  - Large and realistic dataset
- Participants provided with common system and framework (e.g. search tasks) to conduct user studies
  - Generate large *log file* that can be shared amongst participants
  - Participants can recruit their own users and conduct their own *interactive experiments* with the interface
- Users perform a known-item search as part of a *game*

Please advertise to your friends and participate!

iCLEF

- Provided system has basic cross-language front-end functionalities (http://cabrillo.lsi.uned.es/flickling/)
  - *Multilingual search* (query in one language, search results in up to six languages: Dutch, English, French, German, Italian and Spanish)
  - Allows the user *pick/remove translations*, and *add their own translations* (added into the user's personal dictionary)
  - Provides search *suggestions* and relevance feedback facilities
  - Controls the *game-like features* of the task: user registration and user profiles, flow of images, recording of session logs, hall of fame, etc.

Karlgren, Jussi and Clough, Paul and Gonzalo, Julio (2006), Multilingual Interactive Experiments with Flickr, ERCIM News, 66, July 2006.

Clough, P., Goinzalo, J., Kargren, J., Barker, E., Artiles, J. and Peinado, V. (2008), Large-Scale Interactive Evaluation of Multilingual Information Access Systems - the iCLEF Flickr Challenge , Proceedings of Workshop on novel methodologies for evaluation in information retrieval, 30th European Conference on Information Retrieval, Glasgow, 30th March-3rd April

Multilingual user interfaces and interaction

Recommended reading

- **Oard, D., He, D. and Wang, J. (2008) User-assisted query translation for interactive cross-language information retrieval *Information Processing & Management, Volume 44, Issue 1*, January 2008, Pages 181-211**
- **Oard, D., Gonzalo, J., Sanderson, M., López-Ostenero, F. and Wang, J. (2004) Interactive Cross-Language Document Selection, *Information Retrieval*, Vol. 7, Issue 1-2, Pages 205-228, 2004.**
- Oard, D. (1997) Serving Users in Many Languages – Cross-Language Information Retrieval for Digital Libraries, D-Lib Magazine, December 1997
  - http://www.dlib.org/dlib/december97/oard/12oard.html
- Ogden, W.C., & Davis, M.W. (2000). "Improving cross-language text retrieval with human interactions." Proceedings of the Hawaii International Conference on System Science (HICSS-33), Vol. 3.
- D. Petrelli, S. Levin, M. Beaulieu, M. Sanderson. *Which User Interaction for Cross-Language Information Retrieval? Design Issues and Reflections.* JASIST special topic on "Multilingual Information Systems", 57(5), 2006, 709-722.

"Why do users want to retrieve documents they presumably can't read?"

- Some users are *multilingual* (polyglots)
  - Can formulate searches and judge relevance in many languages (but want convenience of a single query)
- Some users are *monolingual*, so what would they do with documents in a foreign language? (Oard et al., 2008)
  - It might suffice to know that a document exists (e.g. learning who is working in a field new to the searcher)
  - Documents appearing to be relevant could then be translated by professional services
  - Text-based search might be the start of finding relevant content which does not require specific language skills (e.g. images or instrumental music)

Use cases for multilingual access

- CLIR technologies could help (Oard, 1997)
  - Help companies expand their markets (e.g. Lexis-Nexis)
  - Government and international companies may need to search and access large amounts of multilingual documents
  - Journalists may want to search for news stories in other countries (and languages)
  - Patent lawyers may want to find patent infringements within multilingual databases
  - Business analysts may wish to gather foreign business information and provide services to different countries

Use cases for multilingual access

- Multilingual Web search (Chen & Bao, 2009)
  - Immigrants knowing little English can search US Web pages for information about immigration
  - Investors interested in examining new markets can search news reports or Web documents about foreign companies
  - Patients or caregivers can search and find medical treatment information from other countries and languages
  - Foreign travellers can search for local information en route

A recent study (Cleveland et al., 2007) demonstrated that language is a serious barrier for Chinese communities in the Dallas-Fort Worth area in Texas trying to find and use quality online medical information that is mostly in English.

Chen, J. and Bao, Y. (2009) Cross-language search: The case of Google Language Tools *First Monday* [Online], Volume 14 Number 3 (26 February 2009) http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2335/2116

Multilingual information access

- Provision of multilingual information access
  - Localisation of existing material (e.g. multilingual portals)
  - Providing *cross-language* search
- Localisation of websites
  - *International* - intended for an international audience
  - *Multilingual* - uses more than one language
  - Collection of multiple monolingual sites to completely parallel site with same structure, navigation and content
- Considerations
  - Awareness of cultural issues (e.g. 'offensive' references), identifying target languages, availability of resources, design, evaluation and *users*

Eurescom (2000) Multi-Lingual Web Sites: Best Practice Guidelines and Architecture (P923) Eurescom Project report (http://www.eurescom.de/Public/projectresults/P900-series/923d1.asp)

Tate Online

http://www.tate.org.uk

Bowl of Fruit, Violin and Bottle 1914
Compotier, Violin, Bouteille

Oil on canvas
unconfirmed: 920 x 730 mm frame: 1279 x 1093 x 63 mm
painting

Lent by the National Gallery 1997

L01895
This table-top scene, with its fruit-bowl, violin, bottle and (painted) newspaper, is constructed from areas of colour that resemble cut-out pieces of paper. The background has been left white. Picasso and Braque had been making collages that experimented with representation and reality since 1912. They soon began to simulate the appearance of collage materials in their oil paintings, sometimes adding sand to the paint to give a heightened reality to the picture surface.
(From the display caption August 2004)

Clough, P., Marlow, J. and Sanderson, M. (2006), Designing Multilingual Information Access to Tate Online, *Workshop held at the 29th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, Workshop: New Directions in Multilingual Access, Seattle, August 2006.

Study of Tate Online

- Aimed to identify current users of Tate Online and establish their multilingual needs and/or preferences
  - Useful input regarding multilingual needs of general users
- Study involved an online survey with the Tate
- Online survey provided from the Tate Collections page
  - Survey translated into Italian, French and Spanish
  - Ran in the first 2 weeks of July 2006
  - Feedback from 457 respondents
- Main results
  - End users of Tate Online wanted multilingual access
  - Multilingual access in business vs. academic research
  - Content is not equal for translation (priorities)

Marlow, J., Clough, P., and Dance, K. (2007), Multilingual needs of cultural heritage website visitors: A case study of Tate Online, In International Cultural Heritage Informatics Meeting (ICHIM07): Proceedings, J. Trant and D. Bearman (eds). Toronto: Archives & Museum Informatics. 2007. Published September 30, 2007 at http://www.archimuse.com/ichim07/papers/marlow/marlow.html.

Users and their language skills

- Individuals can have a range of foreign language abilities and knowledge
  - Range from unknown (L3) – passive (L2) – active (L1)
- Language ability is important for CLIR (Gonzalo, 2002)
  - Monolingual users may need help formulating queries in foreign languages and require document translation
  - Users with passive language abilities may not require document translation
- Gathering information about language skills
  - Self-rated (subjective)
  - Objective tests (e.g. testing abilities of reading comprehension: http://www.bbc.co.uk/languages)

Google Translate experiment

- User experiment carried out with Google Translate
  - To investigate relationship between language skills and functionalities used/appreciated
- 12 participants searching for relevant web pages relating to 12 pre-defined topics (144 searches in total)
  - 4 topics each in native language (L1), passive language (L2), and unknown language (L3)
  - For each language, two of the topics were "easy" (translated correctly by the system) and two were "hard" (translated incorrectly)

Marlow, J., Clough, P., Cigarrán Recuero, J. and Artiles, J. (2008), Exploring the Effects of Language Skills on Multilingual Web Search, In Proceedings of the 30th European Conference on IR Research (ECIR'08), Glasgow, UK, April 2008, LNCS4956, pp. 126-137.

Selected findings

Frequency of actual use of Google Translate functionalities for each language (n=48)

	Query translation	Original links viewed	Translated links viewed	Both translated and original links viewed	Query editing
L1	13 (27.1%)	4 (8.3%)	1 (2.1%)	1 (2.1%)	0
L2	37 (77.1%)	26 (54.2%)	2 (4.2%)	4 (4.2%)	3 (6.3%)
L3	46 (96.0%)	14 (29.2%)	19 (39.6%)	9 (18.8%)	0

- Users comments/observations
  - Many queries incorrectly translated
  - Dictionary support would have been useful (L2)
  - Need some way of indicating phrases
  - Want translation between all language pairs
  - Wikipedia often used as a parallel corpus

Frequency of reported most useful functionality for each language in experiment

	Query translation	Translated snippets	Query editing
L1	1	4	5
L2	5	5	1
L3	5	5	1

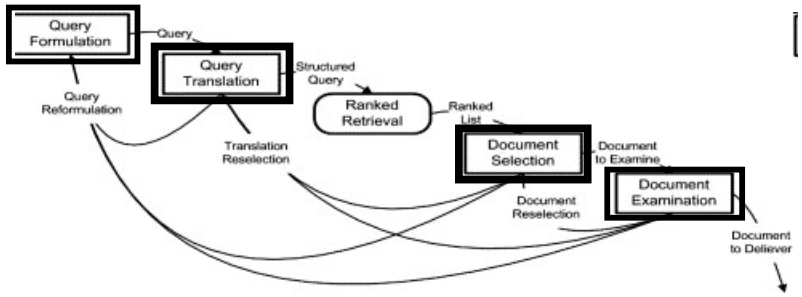
Interactive CLIR

- Interactive CLIR systems help users locate and identify relevant documents regardless of the language the documents are written in
- Users may have different language skills
  - Active and passive abilities
- Interactive CLIR systems can help users
  - Formulate and translate the query
  - Re-formulate their queries
  - Browse and navigate through results
  - Identify relevant documents
- Users can also help CLIR systems
  - By providing feedback to the system

Some design issues

- Query formulation
  - Structured query languages, input of special characters, selection of languages to search
- Query translation
  - Control of translation process (e.g. selecting correct senses, ignoring proper names)
- Presentation of search results
  - Allow users to browse multilingual answer set
- Query reformulation/refinement
  - Allow users to judge relevance of documents, e.g. relevance feedback

Four interaction points in interactive CLIR



Douglas W. Oard, Daqing He, Jianqiang Wang (2008) User-assisted query translation for interactive cross-language information retrieval *Information Processing & Management*, *Volume 44, Issue 1*, January 2008, Page 183.

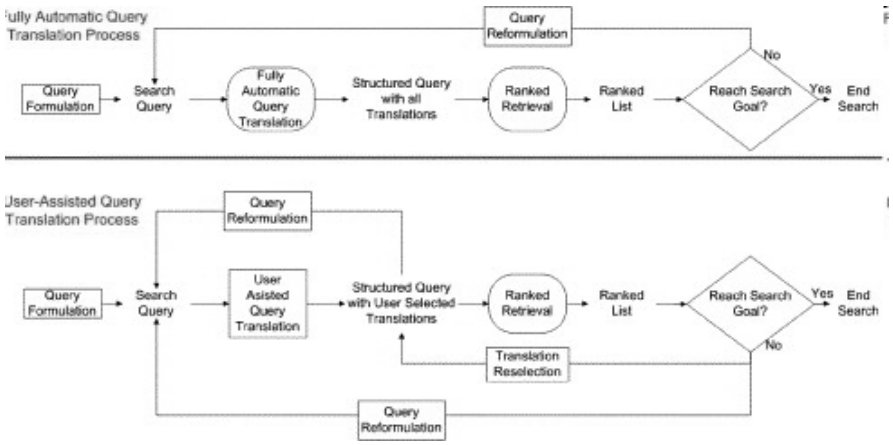
Query translation

- Automatic vs. user-assisted query translation
  - Remember the language skills of your intended user!
- Show users translated query
  - Re-translate for monolingual users (back-translation)
  - Interactive WSD
- Provide a way of altering it
  - But don't require users adjust or improve it
- Use of query translation approach will constrain possible interactivity
  - Machine Translation (MT) or bilingual dictionary (or combination)

Example translation errors (MT)

English:	***Dogs rounding up sheep***	***Museum exhibits***	***Ruined castles in England***
Italian	Dogs that assemble sheep	Exposures in museums	Ruins of castles in England
German:	Dogs with sheep hats	Museumaustell ungssteucke	Castle ruins in England
Dutch:	Dogs which sheep bejeendrijven	Museumstukken	Ruin of castles in United Kingdom
French:	Dogs gathering of the preois	Exposure of objects in museum	Castles in ruins in England
Spanish:	Dogs urging on ewes	Objects of museum	Castles in ruins in England
Chinese:	Catches up with the sheep the dog	*no translation*	Become the ruins the English castle

Automatic vs. user-assisted query translation



Douglas W. Oard, Daqing He, Jianqiang Wang (2008) User-assisted query translation for interactive cross-language information retrieval *Information Processing & Management*, *Volume 44, Issue 1*, January 2008, Page 183.

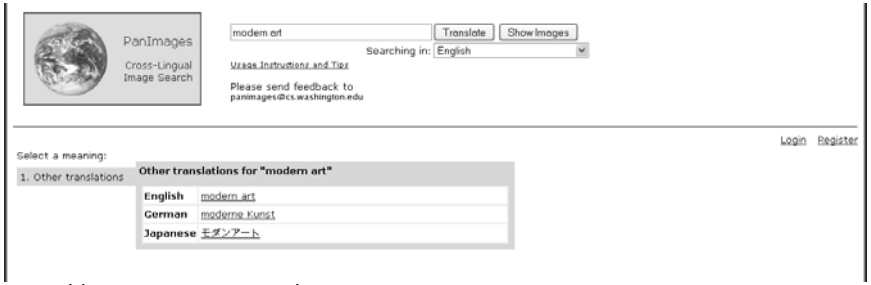
Query translation design issues

- Show users the translated query?
- Automatically detect query language?
- Show non-translated terms to the user?
- Search one or multiple target languages? (User select languages?)
- Automatically detect phrases (or provide appropriate query syntax)
- Provide back-translations of translated query terms?
- Allow users to modify the translations?
- Show all senses of ambiguous term or limited number? (Ordering?)
- Allow users to add *new* translations?
- Should the system remember previously-selected translations?
- Allow users to indicate non-translatable terms (e.g. proper names)?

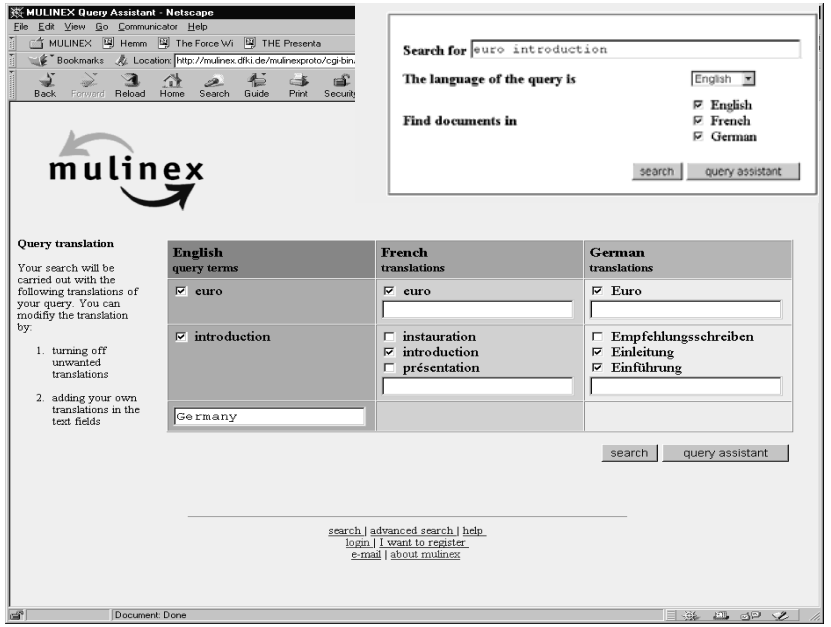
Submitting non-ascii characters

Examples you can try

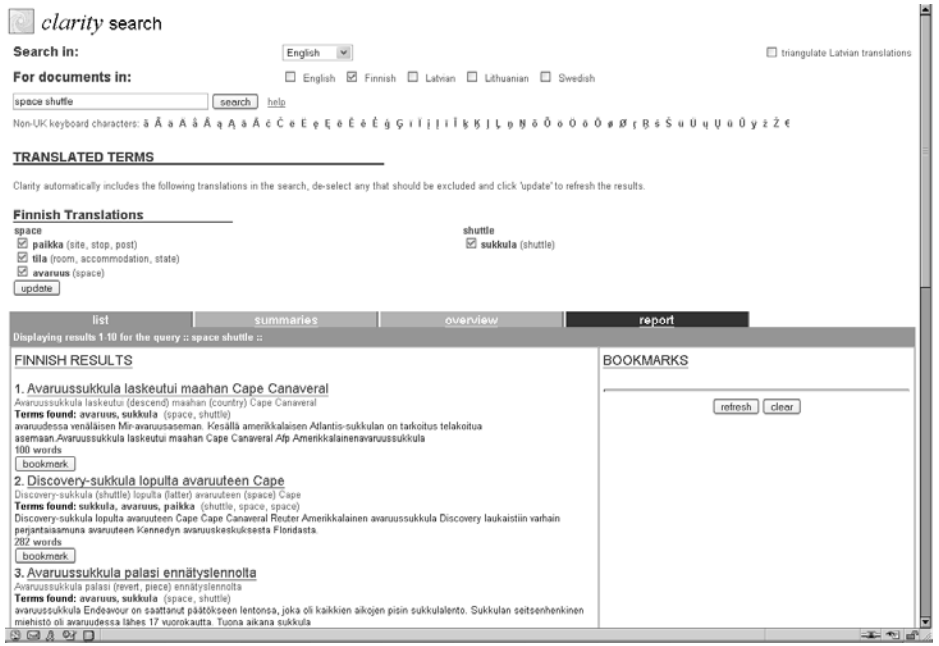
http://translate.google.com/translate_s

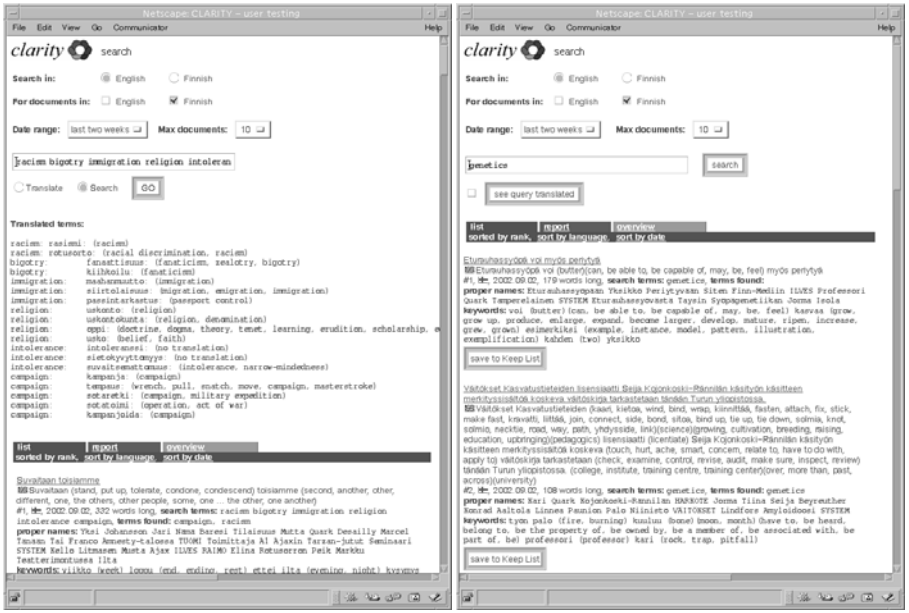


http://www.panimages.org/



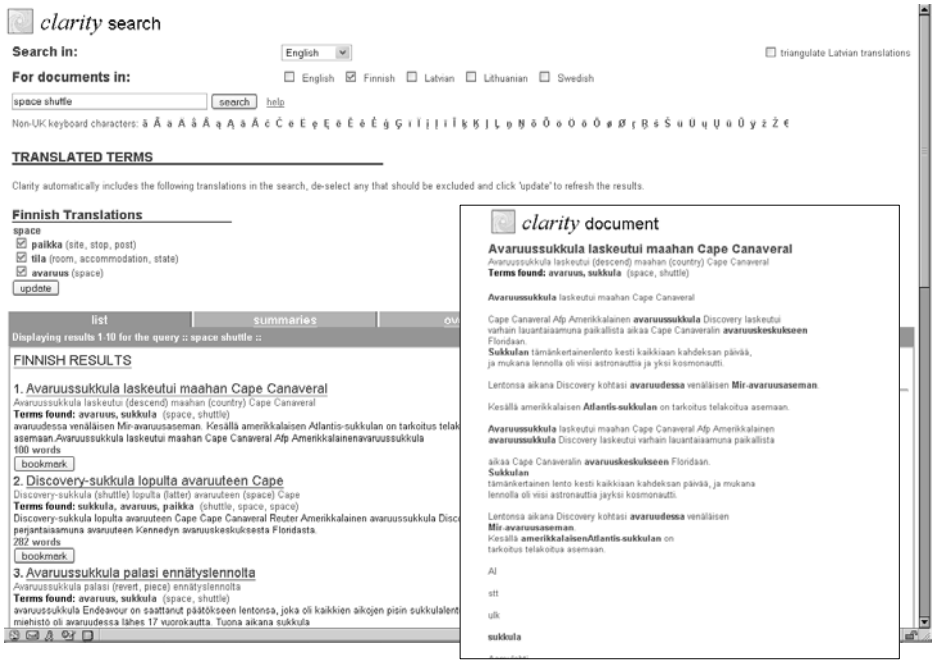
MIRACLE CLIR system, configured for Spanish





Document selection and examination

- Document selection
  - Help users scan, evaluate and interpret results
  - Present information about results (metadata, summaries, translation) that enable users to judge the judge relevance of retrieved results (may not require good translations)
- Create translated document 'surrogates'
  - Translate existing surrogates individually (e.g. snippets, titles)
  - Translate entire results page (e.g. using Machine Translation)
  - Translate selected terms from target documents (e.g. nouns and noun phrases)
- Link to full translation of selected document



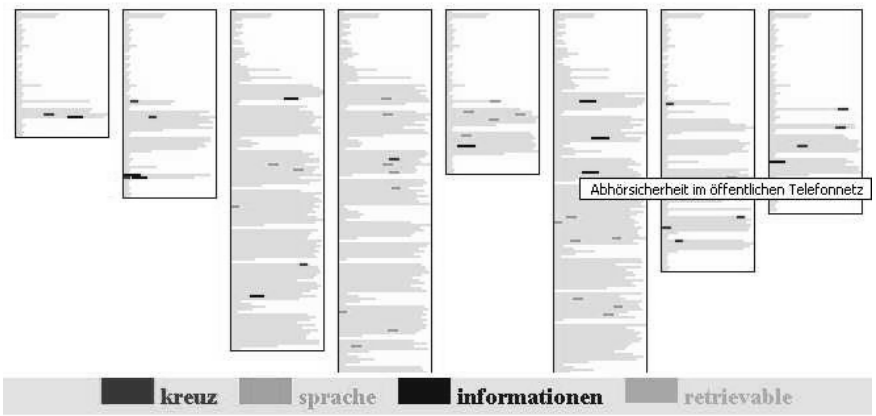
Can people judge the relevance of results?

- Resnick (1997) asked native English speakers who knew no Japanese to sort Yellow Page entries
  - Yellow Page entries translated from English to Japanese using simple word-by-word "gist" method
  - Compared sorts against sorting entries in original English (and random sort)
  - "Gist" sort results were more consistent than random results indicating people could use translations BUT less consistent than sorting human-prepared translations

Can people judge the relevance of results?

- See (Oard et al., 2004: 8-9) for further studies
  - Generally word-by-word (and noun phrase) translations sufficient to judge the relevance of documents
  - BUT people may be less confident in their judgments
- People often prefer to use documents written in languages they can read (Michos et al. 1999)

Results visualisation



ARCTOS: shows how thumbnail images can be used to support selection without knowing the document's language

Ogden, W.C., & Davis, M.W. (2000). "Improving cross-language text retrieval with human interactions." Proceedings of the Hawaii International Conference on System Science (HICSS-33), Vol. 3.

Document selection design issues

- Highlight query terms? (Yes!)
- Show original version of document and translated version? (Allow users to select)
- If search results involve more than one target language, do you group results by language or interleave? (Duplicates?)
- Translate offline vs. on-the-fly? (e.g. Google translate)
- Provide link to MT version of original?
  - Document examination

Summary

- Look at the end of this YouTube Video on Google Wave (http://www.youtube.com/watch?v=v_UyVmITiYQ)
  - Real-time translation of interactive chat
- Future research in multilingual interaction
  - More naturalistic human-computer dialogues
  - Effective real-time translation
  - Further studies of use cases for cross-language search
  - Studies exploring effects of language skills on interactive search
  - Deploying cross-language in multilingual portals (e.g. cross-language *browsing*)
  - Cross-cultural retrieval?

Example systems

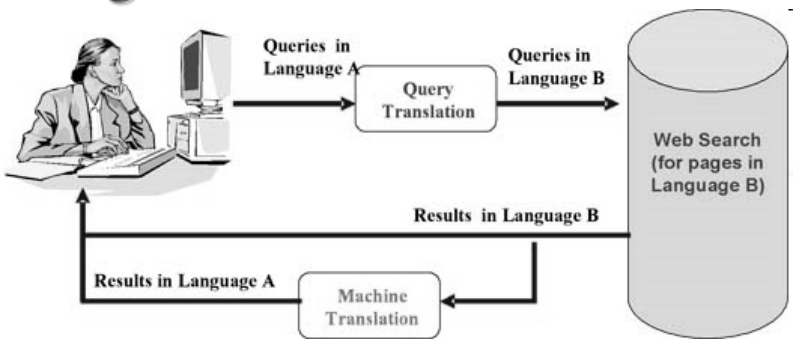
Google Translate, Clarity and Eurovision

http://terpconnect.umd.edu/~dlrg/clir/systems.html

Google Translate

- May 23rd 2007 Google launched 'translated search' in Google Language Tools
  - Integration of CLIR and MT technologies
  - One of the few search engines enabling cross-language search
- Consists of following components
  - Search interface (specify target language)
  - Query translation (> 35 language pairs and query editing)
  - Web search
  - MT of results (translated into query language)
  - Results interface (original language and translations)

Google translate



Chen, J. and Bao, Y. (2009) Cross-language search: The case of Google Language Tools *First Monday* [Online], Volume 14 Number 3 (26 February 2009) http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2335/2116

Zhang, J. and Lin, S. (2007) Multiple language supports in search engines. Online Information Review, 31(4) , 516-532.

clarity Cross Language Information Retrieval and Organisation of Text and Audio Documents

- Cross-language multi-media information retrieval system
  - For *rare* languages: few electronic translation resources exist
- Collection
  - Newspaper texts and audio documents in mixed languages
- Translation approach
  - Query translation using dictionary-based lookup
  - Transitive cross-language retrieval for varying language pairs
  - N-gram techniques for translating OOV words
  - Support for Baltic languages (e.g. Latvian and Lithuanian)
- End-users of CLARITY
  - Journalists working for BBC monitoring (UK) and Alma Media (Finland)
  - Users are *polyglots*

D. Petrelli, S. Levin, M. Beaulieu, M. Sanderson. *Which User Interaction for Cross-Language Information Retrieval? Design Issues and Reflections.* JASIST special topic on "Multilingual Information Systems", 57(5), 2006, 709-722.

Eurovision

- Multilingual access to image collections
  - Many images have associated text
  - Users often formulate queries in natural language
- Collection
  - St Andrews Historic Photographic Archive
  - 30,000 historic photographs with English captions
- Translation approach
  - MT for both query and caption translation
  - Exploited on-line version of Babelfish (http://babelfish.altavista.com/)
- End-users of Eurovision
  - Historians and general public (*monoglots*)

Clough, P. and Sanderson, M. (2006), User Experiments with the Eurovision Cross-Language Image Retrieval System, *In Journal of the American Society for Information Science and Technology (JASIST)* Special Topic Section on Multilingual Information Systems, Volume 57(5), pp. 697 - 708

Information seeking and user interfaces

- Marchionini, G. (1992). "Interfaces for end-user information seeking." Journal of the American Society for Information Science, 43(2):156-163.
- Marchionini, G. (1995) Information Seeking in Electronic Environments, Cambridge University Press (May 26 1995), ISBN: 0521443725.
- Resnick, M., & Vaughn, M. (2006). "Best practices and future visions for search user interfaces." JASIST 57(6): 781-787.
- Rose, D.E. (2006). "Reconciling information-seeking behaviour with search user interfaces for the Web." JASIST 57(6): 797-799.
- Wilson, T.D. (2000) Human Information Behaviour (2000), Informing Science, Vol 3(2). pp. 49-56. (http://inform.nu/Articles/Vol3/v3n2p49-56.pdf)

Interactive CLIR

- Capstick, J., Diagne, A.K., Erbach, G. Uszkoreit, H., Leisenberg, A., & Leisenberg, M. (2000). "A system for supporting cross-lingual information retrieval." Information Processing and Management , 36(2), 275-289.
- Clough, P., Al-Maskari, A. and Darwish, K. (2007), Providing Multilingual Access to Flickr for Arabic Users, Evaluation of Multilingual and Multi-modal Information Retrieval: 7th Workshop of the Cross-Language Evaluation Forum, CLEF 2006, Alicante, Spain, September 20-22, 2006, LNCS Vol. 4730, 2007, pp. 205-216
- Dorr, B., He, D., Luo, J., & Oard, D. (2003). "iCLEF at Maryland: Translation selection and document selection." In C. Peters (Ed.), Working Notes for the CLEF 2003 Workshop.
- He, D., & Oard, D. (2006). "Studying the Use of Interactive Multilingual Information Retrieval." In New Directions of Multilingual Information Access, A workshop of Annual Conference of SIGIR 2006.

- Dorr, B., He, D., Luo, J., & Oard, D. (2003). "iCLEF at Maryland: Translation selection and document selection." In C. Peters (Ed.), Working Notes for the CLEF 2003 Workshop.
- He, D., & Oard, D. (2006). "Studying the Use of Interactive Multilingual Information Retrieval." In New Directions of Multilingual Information Access, A workshop of Annual Conference of SIGIR 2006.

Interactive CLIR

- Ogden, W., Cowie, J., Davis, M., Ludovik, E., Nirenburg, S., Molina-Salgado, H., et al. (1999). "Keizai: An interactive cross-language text retrieval system." Paper presented at the Machine Translation Summit VII, Workshop on Machine Translation for Cross-Language Information Retrieval, Singapore, PRC.
- Oard, D., & Gonzalo, J. (2002). "The CLEF 2001 Interactive Track." Evaluation of Cross- Language Information Retrieval Systems, Springer-Verlag LNCS 2406.
- Penas, A., Gonzalo, J., & Verdejo, F. (2001). "Cross-language information access through phrase browsing." Paper presented at the 6th International Conference of Natural Language for Information Systems (NLDB'01), Madrid, Spain.
- Petrelli, D., Hansen, P., Beaulieu, M., Sanderson, M. (2002). "User requirement elicitation for Cross-Language Information Retrieval." New Review of Information Behaviour Research, 3, 17-35.
- Petrelli, D., P. Hansen , M. Beaulieu, M. Sanderson, G. Demetriou, P. Herring. (2004). "Observing Users - Designing Clarity: A Case study on the user-centred design of a cross-language retrieval system." JASIST, 55(10), 923-934.
- Zhang, P., Plettenberg, L., Klavans, J., Oard, D., & Sorgel, D. (2007). Task-based interaction with an integrated, multilingual, multimedia search engine: A formative evaluation. Proceedings of 2007 ACM/IEEE joint conference on digital libraries, 117-126.

Localisation

- Del Galdo, E.M., & Nielsen, J. (1996). International User Interfaces. New York: John Wiley & Sons.
- De Troyer, O., & Casteleyn, S. (2004) "Designing Localized Web Sites." In Proceedings of the 5th International Conference on Web Information Systems Engineering (WISE2004), 547–558.
- W3C (2003) W3C FAQ: International and Multilingual websites, (http://www.w3.org/International/questions/qa-international-multilingual)
- Yunker, J. (2003). Beyond borders - Web globalization strategies. Indianapolis, IN: New Riders Publishing.