Multilingual System for Web-Information:
The State of The Art

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Germany

Source: Feiyu Xu, 2002

Multilingual Information System

- ❑ Motivation
- ❑ Strategies
- ❑ MIETTA System

Source: Feiyu Xu, 2002

Motivation

- ❑ More and more web information are encoded in other languages than English, for example, Chinese 7%
  - ✶ English is loosing its dominance
- ❑ Improve the inter-culture and business communication
  - ✶ Quick access to information is important for every day life
- ❑ Text REtrieval Conference (TREC) (http://trec.nist.gov/)
  - ✶ English, Spanish, Chinese, etc.
- ❑ Information Retrieval for Asian Language Conference (IRAL)
- ❑ European ESPRIT consortium (French, Belgian, German)

Source: Feiyu Xu, 2002

What is Information Retrieval (http://www.lt-world.org)

- **Synonyms**: document retrieval

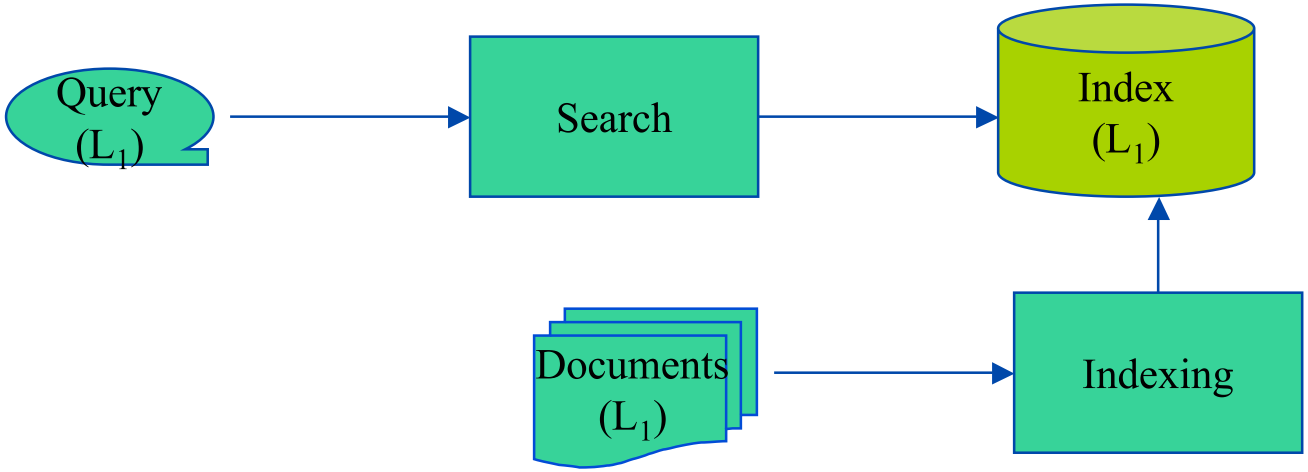
- **Definition**: Information Retrieval is the process of locating information that fits a user's requirements, where the requirements are usually expressed as a search query. The fit of the retrieved information with the information need is referred to as "relevance“ …

- http://www.lt-world.org/HLT_Survey/ltw-chapter7-2.pdf

Source: Feiyu Xu, 2002

What is Monolingual Information Retrieval?

- Query and information to be looked for are encoded in a same language



Source: Feiyu Xu, 2002

What is Multilingual Information Retrieval?

- ❑ An extension of the general information retrieval problem
- ❑ Finding information, e.g., web documents which are not encoded in the same language as the query is encoded in
- ❑ Similar terms: “crosslingual information retrieval” and “translingual information retrieval”

Source: Feiyu Xu, 2002

Different Multilingual Information Retrieval Strategies Supported by Language Technologies

❑ Online query translation

- ✶ Help user to formulate his query in a foreign language

❑ Online document translation

- ✶ Translate the found document into the query language

❑ Offline document translation

- ✶ Make web documents multilingual available

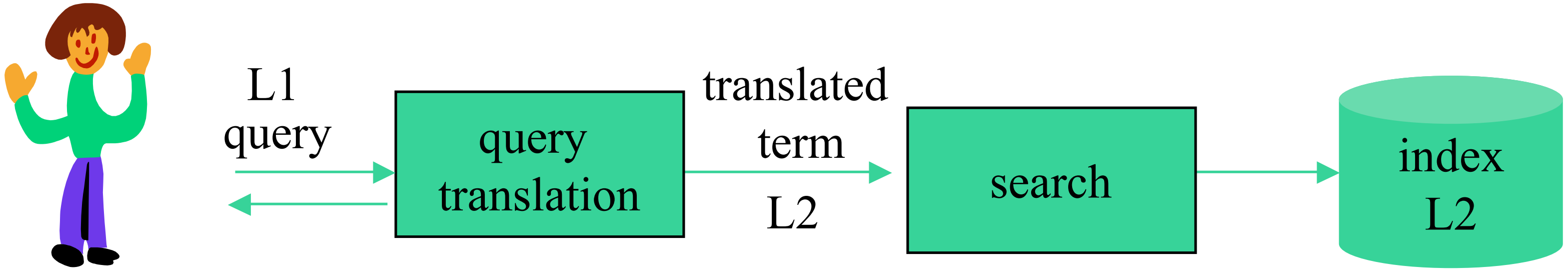
❑ Combination of information extraction and multilingual generation

- ✶ Make database information multilingual available and allow the free text retrieval of database information

Source: Feiyu Xu, 2002

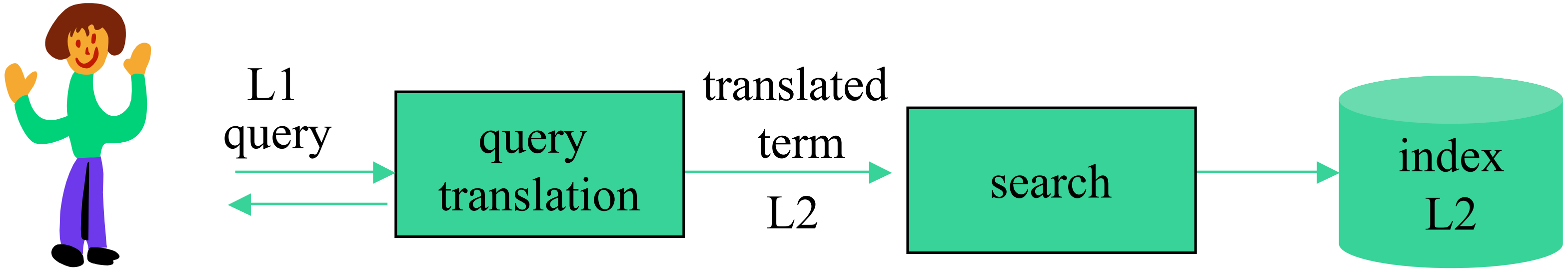
Query Translation

- ❑ Help user to formulate their query in another language



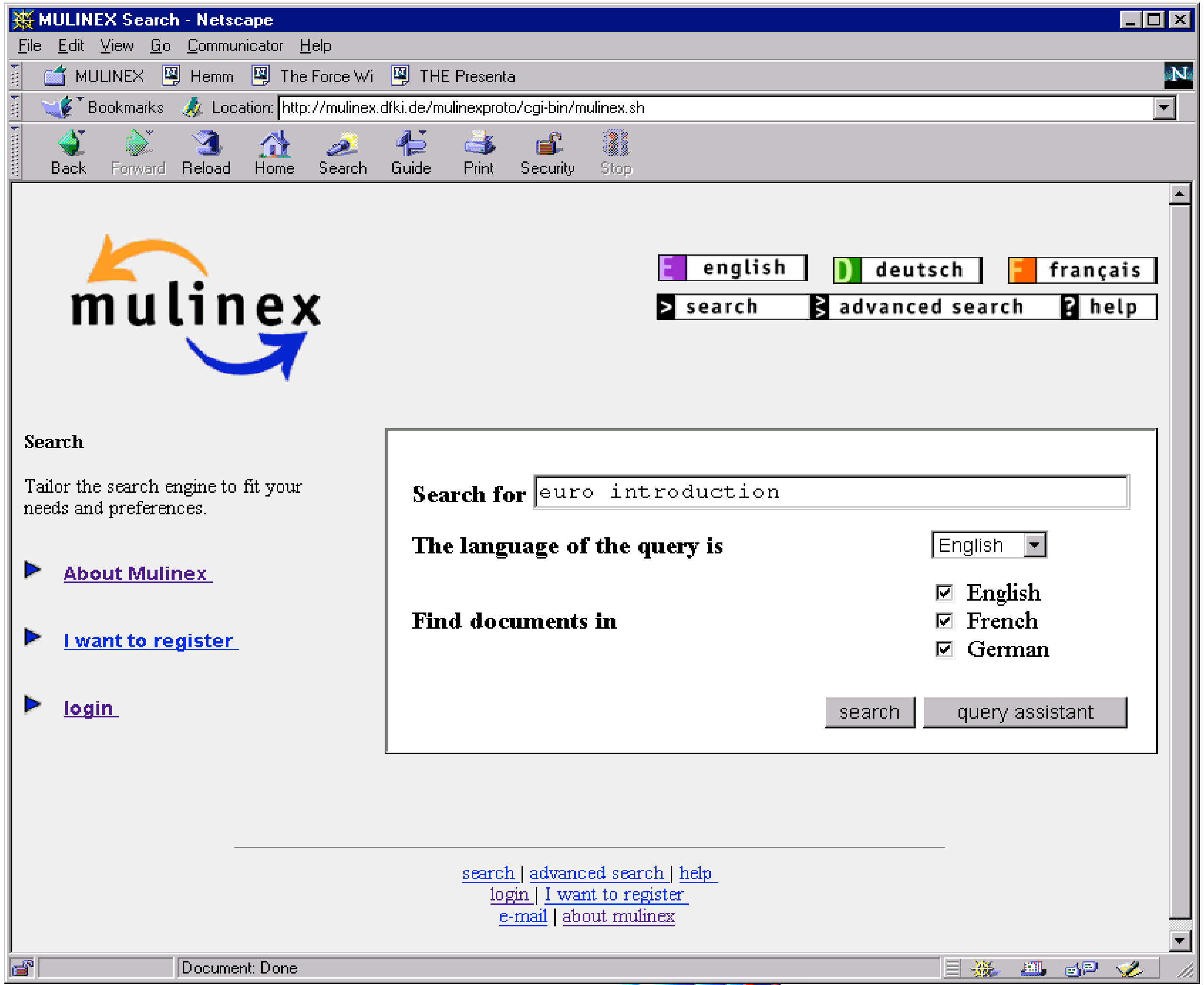
- ❑ The primary problem is that short queries provide less context for word sense disambiguation, and inaccurate translations lead to bad recall and precision
- ❑ How can the user access the content of the found document?

Source: Feiyu Xu, 2002



Source: Feiyu Xu, 2002

MULINEX System



MULINEX Search - Netscape
File Edit View Go Communicator Help
MULINEX Hemm The Force Wi THE Presenta
Bookmarks Location: http://mulinex.dfki.de/mulinexproto/cgi-bin/mulinex.sh
Back Forward Reload Home Search Guide Print Security Stop
mulinex
english deutsch français
search advanced search help

Search

Tailor the search engine to fit your needs and preferences.

- About Mulinex
- I want to register
- login

Search for euro introduction

The language of the query is English

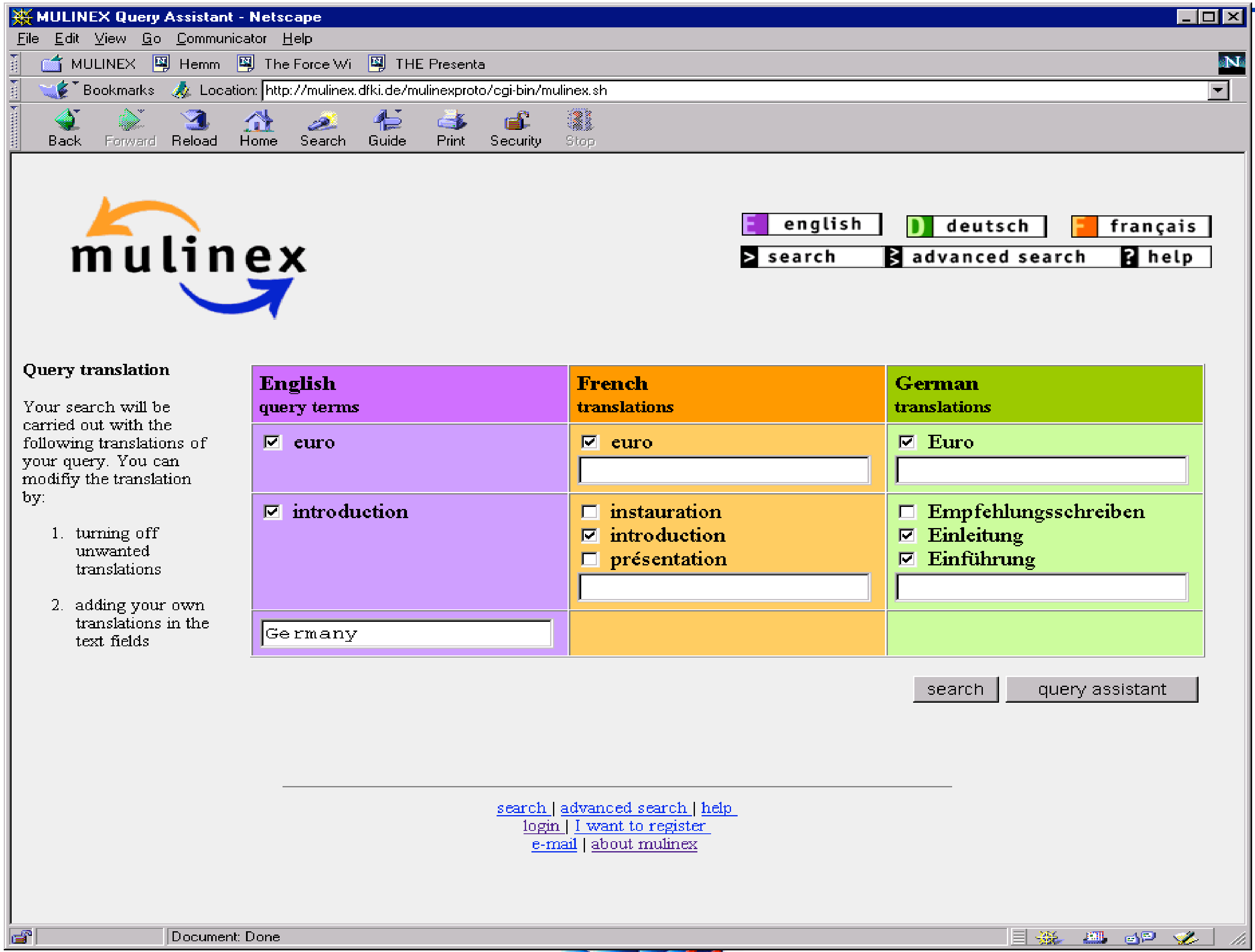
Find documents in

☑ English
☑ French
☑ German

search
query assistant
search | advanced search | help
login | I want to register
e-mail | about mulinex
Document: Done

Source: Feiyu Xu, 2002

MULINEX System


MULINEX Query Assistant - Netscape
File Edit View Go Communicator Help
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Bookmarks Location: http://mulinex.dfki.de/mulinexproto/cgi-bin/mulinex.sh
Back Forward Reload Home Search Guide Print Security Stop
mulinex
E english D deutsch F français
> search advanced search ? help
search query assistant
Document: Done

Query translation

Your search will be carried out with the following translations of your query. You can modify the translation by:

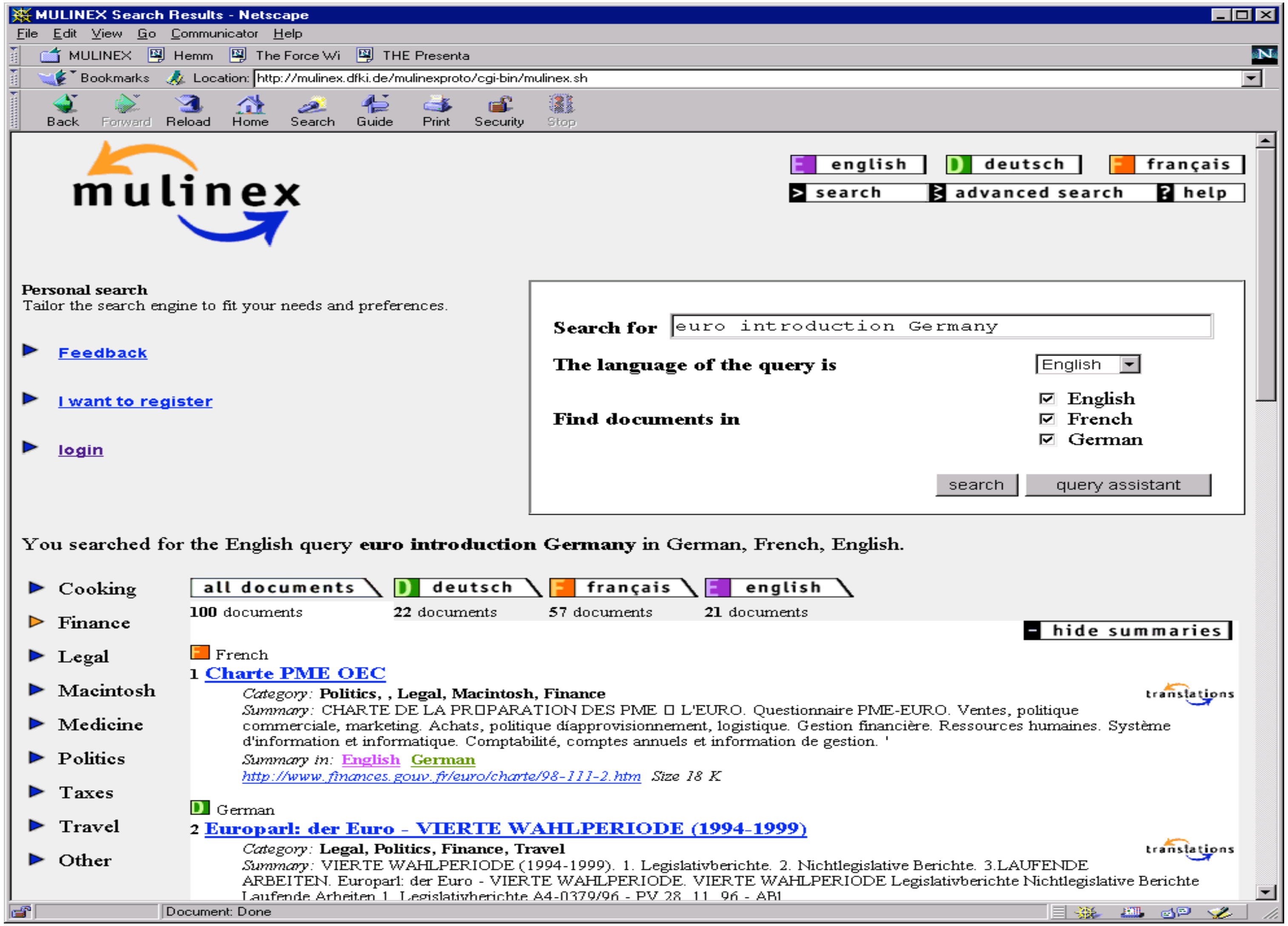
1. turning off unwanted translations
2. adding your own translations in the text fields

English query terms	**French** translations	**German** translations
☑ euro	☑ euro	☑ Euro
☑ introduction	□ instauration ☑ introduction □ présentation	□ Empfehlungsschreiben ☑ Einleitung ☑ Einführung
Germany		

search | advanced search | help
login | I want to register
e-mail | about mulinex

Source: Feiyu Xu, 2002

MULINEX System


MULINEX Search Results - Netscape
File Edit View Go Communicator Help
MULINEX Hemm The Force Wi THE Presenta
Bookmarks Location: http://mulinex.dfki.de/mulinexproto/cgi-bin/mulinex.sh
Back Forward Reload Home Search Guide Print Security Stop
mulinex
E english D deutsch F français
> search advanced search ? help

Personal search
Tailor the search engine to fit your needs and preferences.

- Feedback
- I want to register
- login

Search for euro introduction Germany

The language of the query is English

Find documents in
☑ English
☑ French
☑ German

You searched for the English query **euro introduction Germany** in German, French, English.

- Cooking
- Finance
- Legal
- Macintosh
- Medicine
- Politics
- Taxes
- Travel
- Other

all documents	D deutsch	F français	E english
100 documents	**22** documents	**57** documents	**21** documents

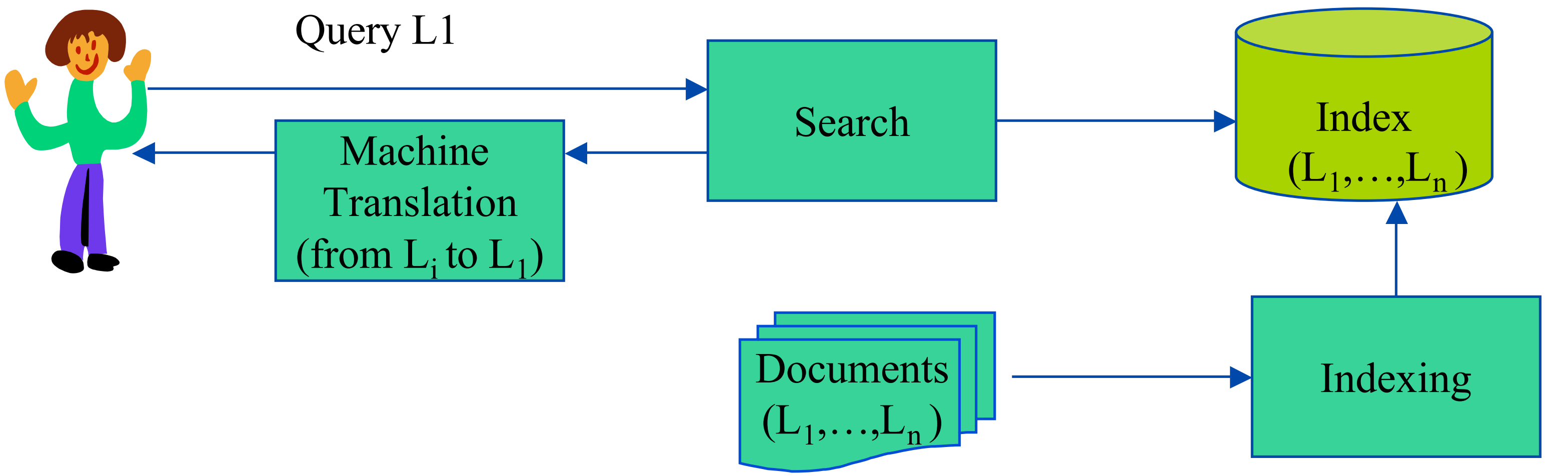
F French
1 **Charte PME OEC**
Category: **Politics, , Legal, Macintosh, Finance**
Summary: CHARTE DE LA PR□PARATION DES PME □ L'EURO. Questionnaire PME-EURO. Ventes, politique commerciale, marketing. Achats, politique díapprovisionnement, logistique. Gestion financière. Ressources humaines. Système d'information et informatique. Comptabilité, comptes annuels et information de gestion. '
Summary in: English German
http://www.finances.gouv.fr/euro/charte/98-111-2.htm Size 18 K

D German
2 **Europarl: der Euro - VIERTE WAHLPERIODE (1994-1999)**
Category: **Legal, Politics, Finance, Travel**
Summary: VIERTE WAHLPERIODE (1994-1999). 1. Legislativberichte. 2. Nichtlegislative Berichte. 3.LAUFENDE ARBEITEN. Europarl: der Euro - VIERTE WAHLPERIODE. VIERTE WAHLPERIODE Legislativberichte Nichtlegislative Berichte Laufende Arbeiten 1. Legislativberichte A4-0379/96 - PV 28. 11. 96 - ABl

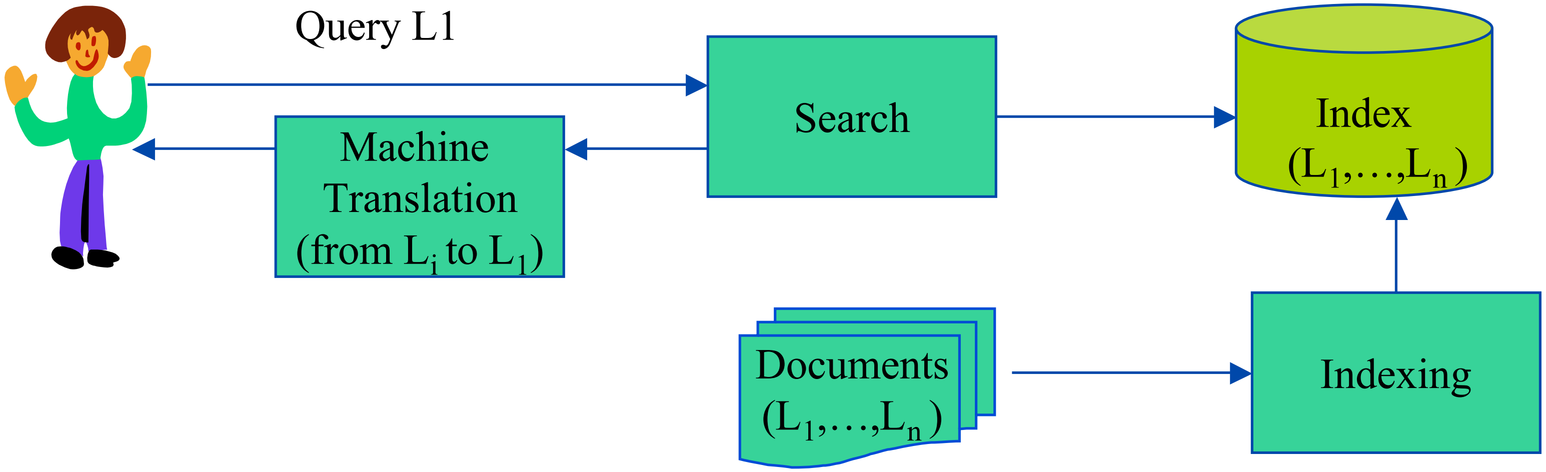
Source: Feiyu Xu, 2002

Online document translation

❑ Translating the found the documents into query language, for example, google

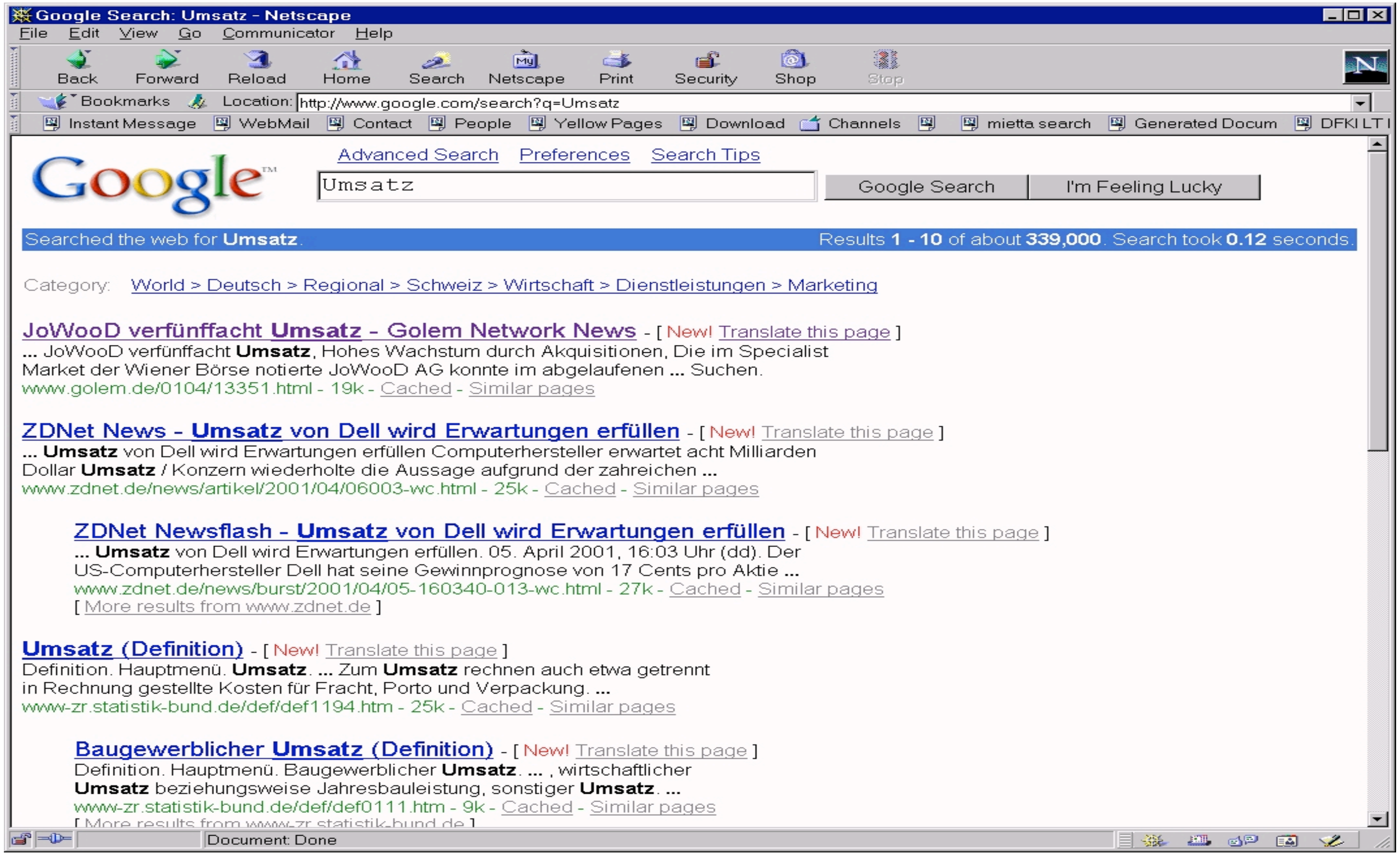


Source: Feiyu Xu, 2002


Query L1
Search
Index $(L_1,\ldots,L_n)$
Machine Translation (from L_i to L_1)
Documents $(L_1,\ldots,L_n)$
Indexing

Source: Feiyu Xu, 2002

Online document translation (Google)


Google Search: Umsatz - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Netscape Print Security Shop Stop
Bookmarks Location: http://www.google.com/search?q=Umsatz
Instant Message WebMail Contact People Yellow Pages Download Channels mietta search Generated Docum DFKI LT I
Google
Advanced Search Preferences Search Tips
Umsatz
Google Search I'm Feeling Lucky
Document: Done

Searched the web for **Umsatz**. Results **1 - 10** of about **339,000**. Search took **0.12** seconds.

Category: World > Deutsch > Regional > Schweiz > Wirtschaft > Dienstleistungen > Marketing

JoWooD verfünffacht **Umsatz** - Golem Network News - [New! Translate this page]
... JoWooD verfünffacht **Umsatz**, Hohes Wachstum durch Akquisitionen, Die im Specialist Market der Wiener Börse notierte JoWooD AG konnte im abgelaufenen ... Suchen.
www.golem.de/0104/13351.html - 19k - Cached - Similar pages

ZDNet News - **Umsatz** von Dell wird Erwartungen erfüllen - [New! Translate this page]
... **Umsatz** von Dell wird Erwartungen erfüllen Computerhersteller erwartet acht Milliarden Dollar **Umsatz** / Konzern wiederholte die Aussage aufgrund der zahlreichen ...
www.zdnet.de/news/artikel/2001/04/06003-wc.html - 25k - Cached - Similar pages

ZDNet Newsflash - **Umsatz** von Dell wird Erwartungen erfüllen - [New! Translate this page]
... **Umsatz** von Dell wird Erwartungen erfüllen. 05. April 2001, 16:03 Uhr (dd). Der US-Computerhersteller Dell hat seine Gewinnprognose von 17 Cents pro Aktie ...
www.zdnet.de/news/burst/2001/04/05-160340-013-wc.html - 27k - Cached - Similar pages
[More results from www.zdnet.de]

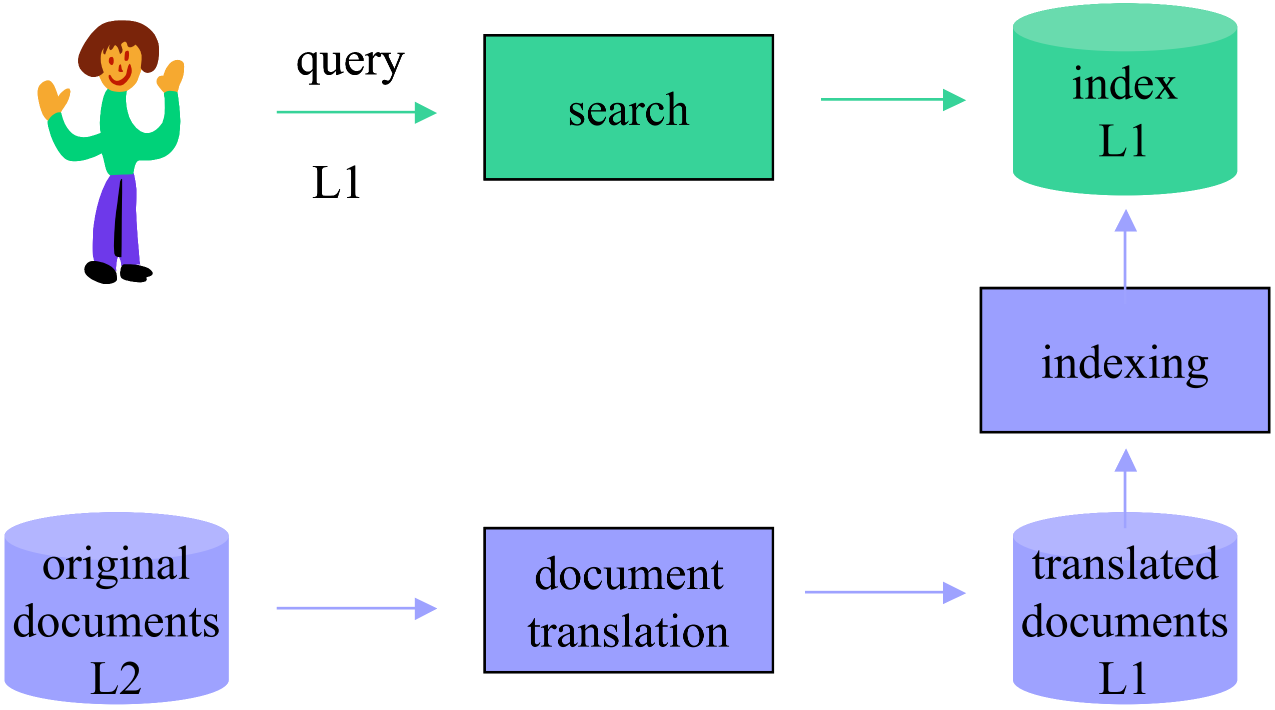
Umsatz (Definition) - [New! Translate this page]
Definition. Hauptmenü. **Umsatz**. ... Zum **Umsatz** rechnen auch etwa getrennt in Rechnung gestellte Kosten für Fracht, Porto und Verpackung. ...
www-zr.statistik-bund.de/def/def1194.htm - 25k - Cached - Similar pages

Baugewerblicher **Umsatz** (Definition) - [New! Translate this page]
Definition. Hauptmenü. Baugewerblicher **Umsatz**. ... , wirtschaftlicher **Umsatz** beziehungsweise Jahresbauleistung, sonstiger **Umsatz**. ...
www-zr.statistik-bund.de/def/def0111.htm - 9k - Cached - Similar pages
[More results from www-zr.statistik-bund.de]

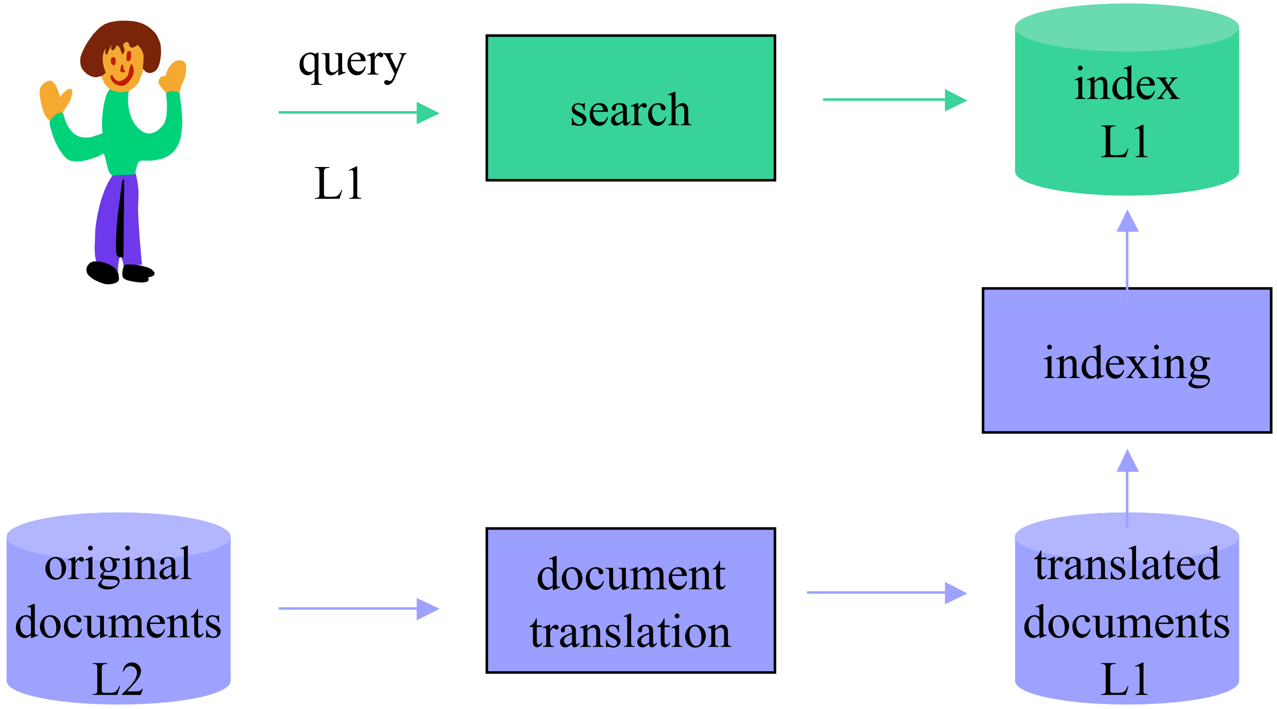
Source: Feiyu Xu, 2002

Offline Document Translation

- ❑ Automatic offline translation
  - ✶ Source text is translated into target languages
  - ✶ Index is constructed from translation
  - ✶ Search term in one language yields original and translated documents



Source: Feiyu Xu, 2002



Source: Feiyu Xu, 2002

Offline Document Translation

- ❑ A higher translation and retrieval performance, since the full original document provides more context for disambiguation. The word sense disambiguration problem is less severe than query translation
- ❑ The main limitation is the duplication of the indices, and the translated documents also need to be stored
- ❑ The offline translation is practically not viable due to big cost of computation and storage for the general search engines like Alta-Vista, Yahoo, etc.

Source: Feiyu Xu, 2002

Facts Sheet - MIETTA

- ❑ Title: MIETTA -Multilingual Information Extraction for Tourism and Travel Assistance
- ❑ Funding: EU Language Engineering Sector of TAP (HLT-IST)
- ❑ Technical Partners: DFKI, Celi, University of Helsinki, Polito, Unidata
- ❑ User Partners: Commune DI Rome, City of Turku, Staatskanzlei of the Saarland

Source: Feiyu Xu, 2002

Objectives

- ❑ Multilingual internet portal and specialised information system for tourist information

  Five languages: English, Finnish, French, German, Italian

  Three regions: Rome, Saarland and Turku

- ❑ Integrated access to heterogeneous data sources and make it fully transparent to end users whether they are searching in
  - ✶ WWW documents or
  - ✶ Databases

Source: Feiyu Xu, 2002

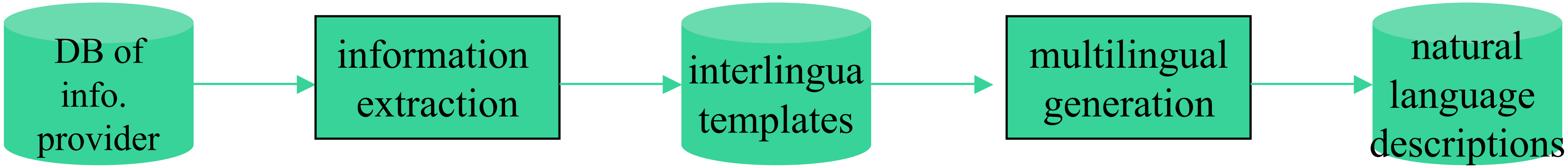
Offline Document Translation in MIETTA

- ❑ Use document translation as the main strategy. The reason is that it allows direct access to the content, it provides better performance within a restricted domain
- ❑ Use LOGOS for document translation, which covers the following directions:
  - ✶ German⇒ English, French, Italian
  - ← English⇒ French, German, Italian, Spanish
- ❑ The final document collection in MIETTA after the document translation yielded an almost fully covered multilingual setup.

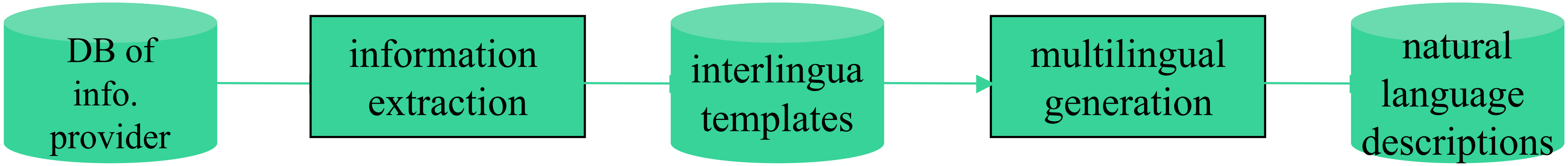
Source: Feiyu Xu, 2002

Information Extraction and Multilingual Generation

- Motivation
  - Make the database content more structured and multilingual accessible.
  - Apply the same free text retrieval method to the generated descriptions as to the web documents



Source: Feiyu Xu, 2002



Source: Feiyu Xu, 2002

Information Extraction

- The objective of information extraction is twofold:
  - To extract the domain relevant information (templates) from the unstructured data so that the user can access more facts and more accurately
  - To normalise the extracted data in a language independent format to facilitate the multilingual generation
- Three steps for template extraction in MIETTA
  - Natural language shallow processing: named entities, np, vp
  - Normalisation: converting information into a language independent format
  - Template filling: mapping the extracted information into template slots by employing specific template filler rules

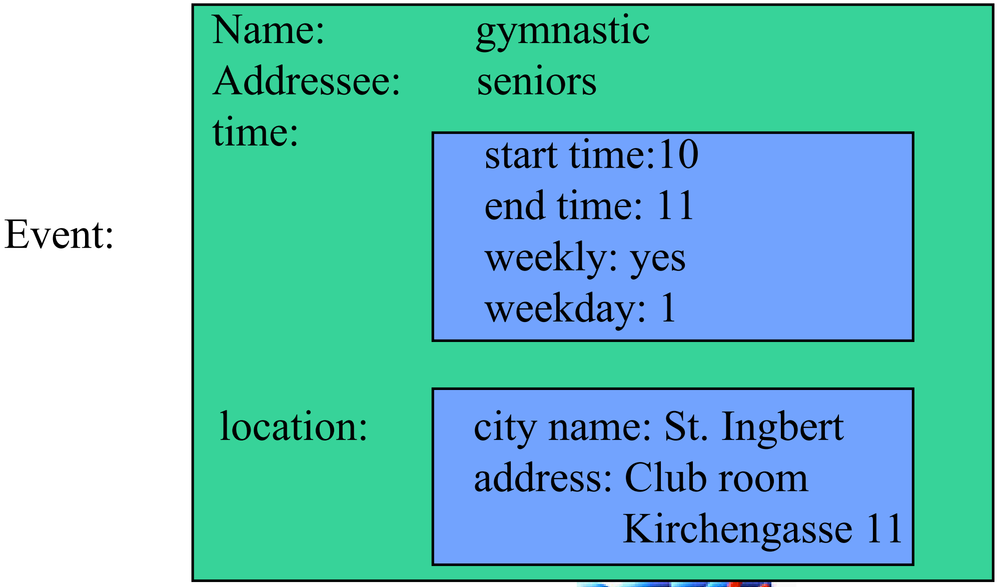
Source: Feiyu Xu, 2002

Example of IE

German text from an event calendar in Saarland

St. Ingbert: -Sanfte Gymnastik für Seniorinnen und Senioren, montags von 10 bis 11 Uhr im Clubraum, Kirchengasse 11.

English: St. Ingbert: -Gentle Gymnastic for seniors, every Monday from 10:00 to 11:00 am, in Club room, Kirchengasse 11



Event:

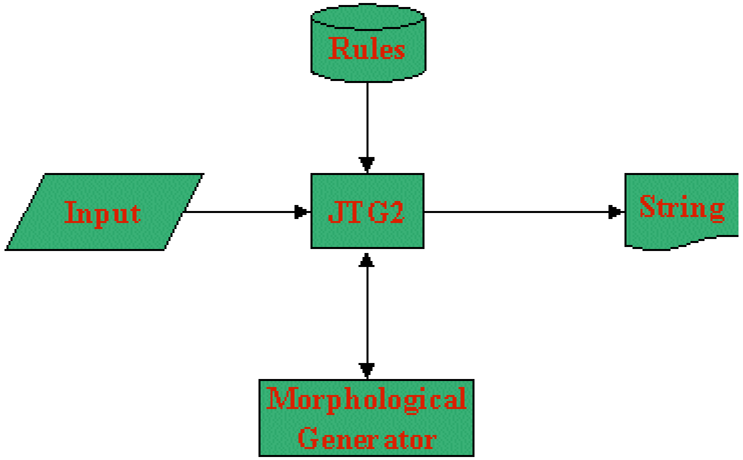
Name: gymnastic
Addressee: seniors
time:
start time:10
end time: 11
weekly: yes
weekday: 1

location:
city name: St. Ingbert
address: Club room
Kirchengasse 11

Source: Feiyu Xu, 2002

Multilingual Generation

❑ Template Generation system (JTG/2)



❑ Language independent input allows for easy extension of the generation component to other languages

Source: Feiyu Xu, 2002

Example

Level1: Event
Level2: Theater
Level3:
Event-Name: Faust
StartDate: 21.10.99
PlaceName: Staatstheater
Address: Schillerplatz, 66111 Saarbrücken
Phone: 0681-32204

English:

The theater show Faust will take place at the Staatstheater in Schillerplatz 1, 66111 Saarbrücken (in the downtown area).

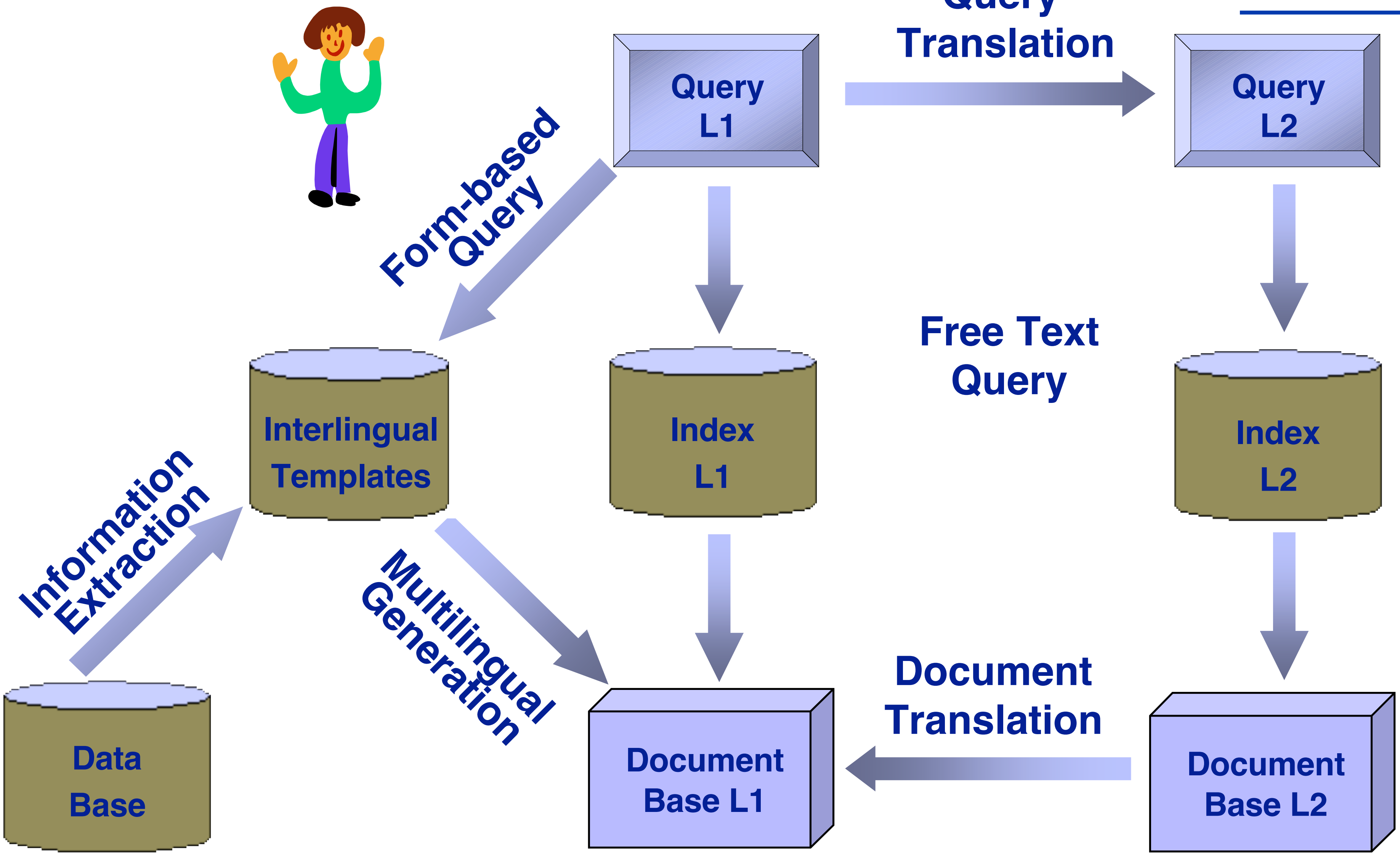
The scheduled date is Thursday, October 21, 1999. Phone: 06 81-32204

Finnish:

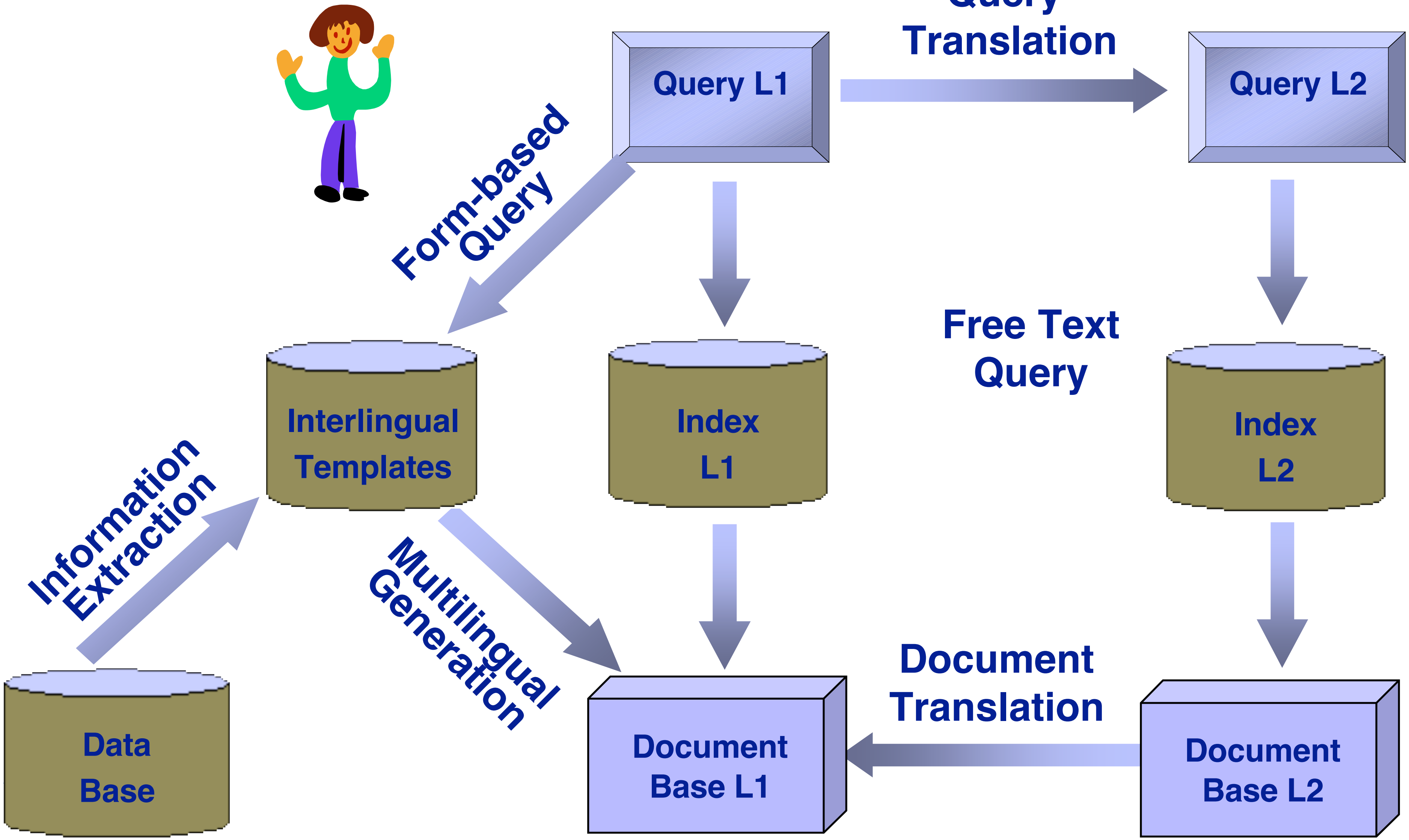
Teatteriesitys Faust järjestetään Staatstheaterissa, osoitteessa Schillerplatz 1, 66111 Saarbrücken (keskustan alueella). Tapahtuman päivämäärä on 21. lokakuuta 1999. Puhelin: 06 81-32204.

Source: Feiyu Xu, 2002

Mietta Framework



Source: Feiyu Xu, 2002



Query L1

Query Translation

Query L2

Form-based Query

Free Text Query

Interlingual Templates

Index L1

Index L2

Information Extraction

Multilingual Generation

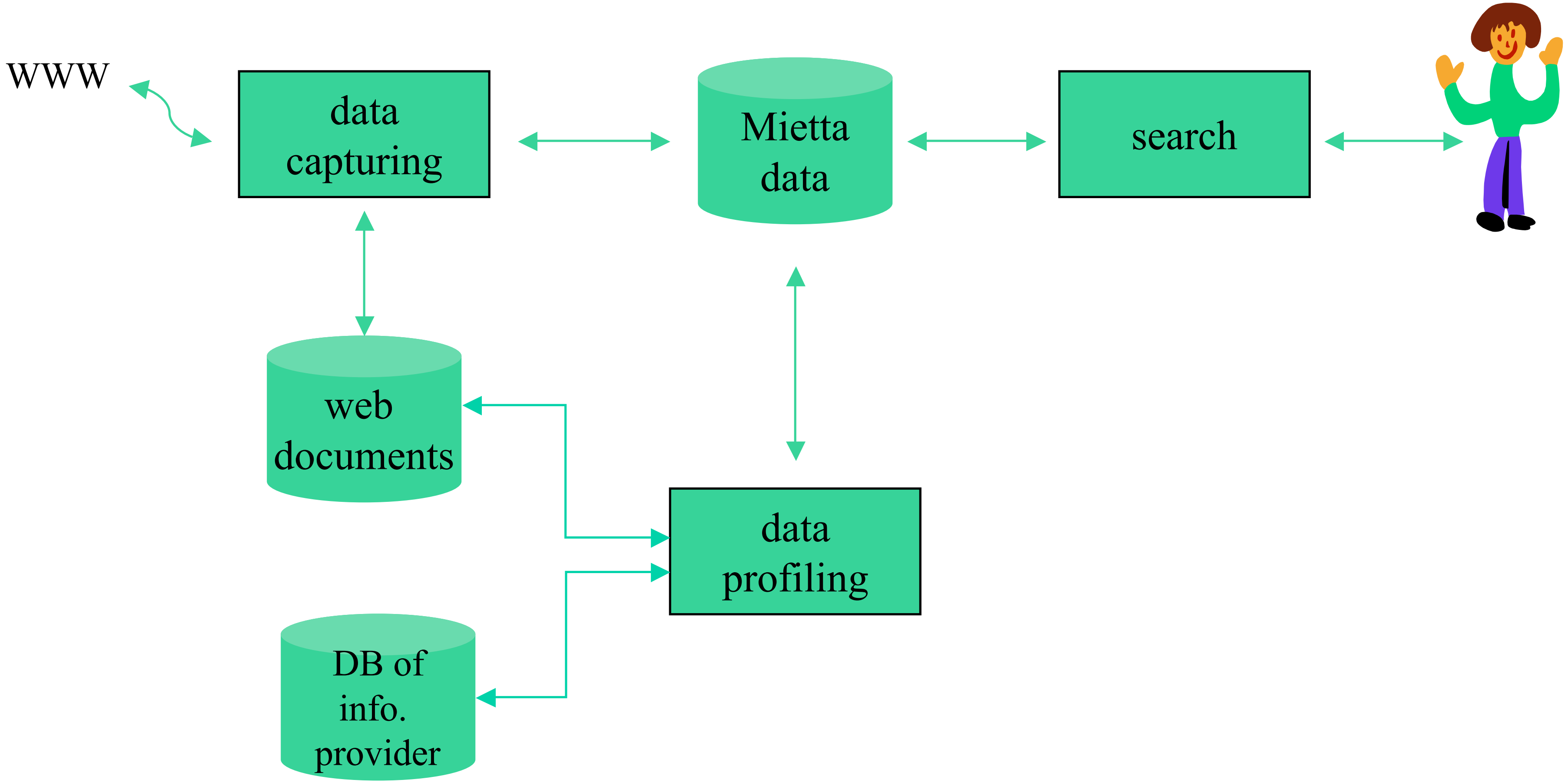
Data Base

Document Base L1

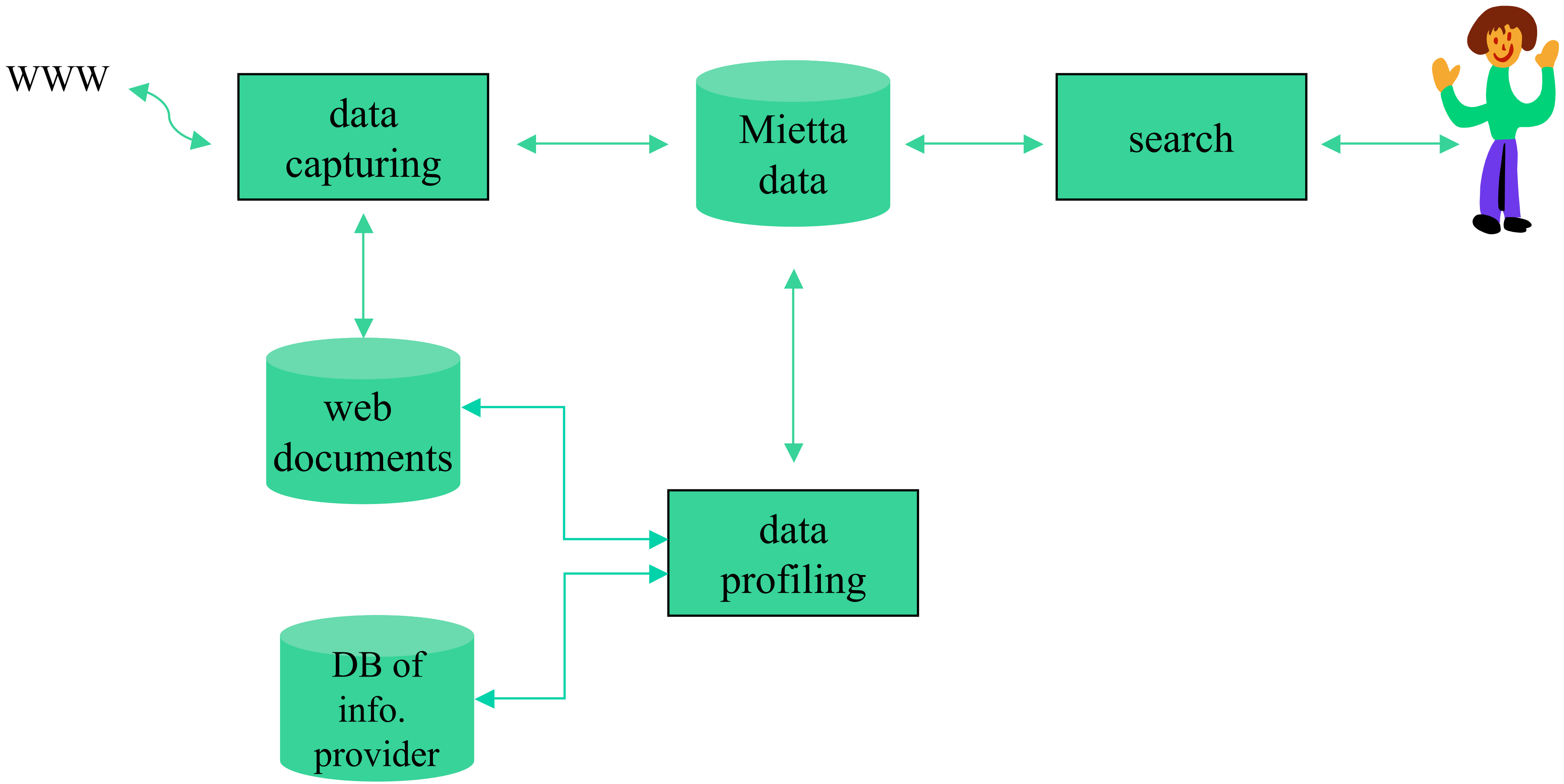
Document Translation

Document Base L2

The Overall MIETTA System



Source: Feiyu Xu, 2002



Source: Feiyu Xu, 2002

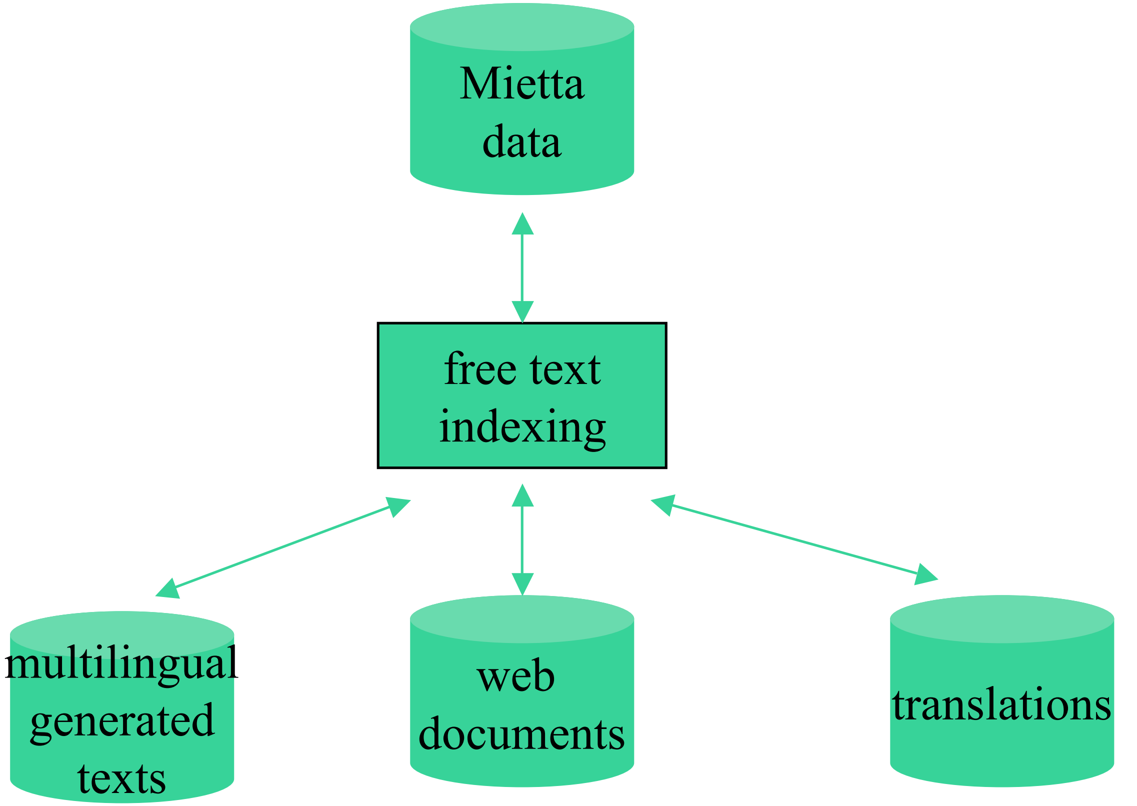
Data Profiling

- ❑ Document translation, based on LOGOS machine translation system
- ❑ Information Extraction from database entries for template construction
- ❑ Multilingual generation from templates to obtain natural language descriptions
- ❑ Free text indexing

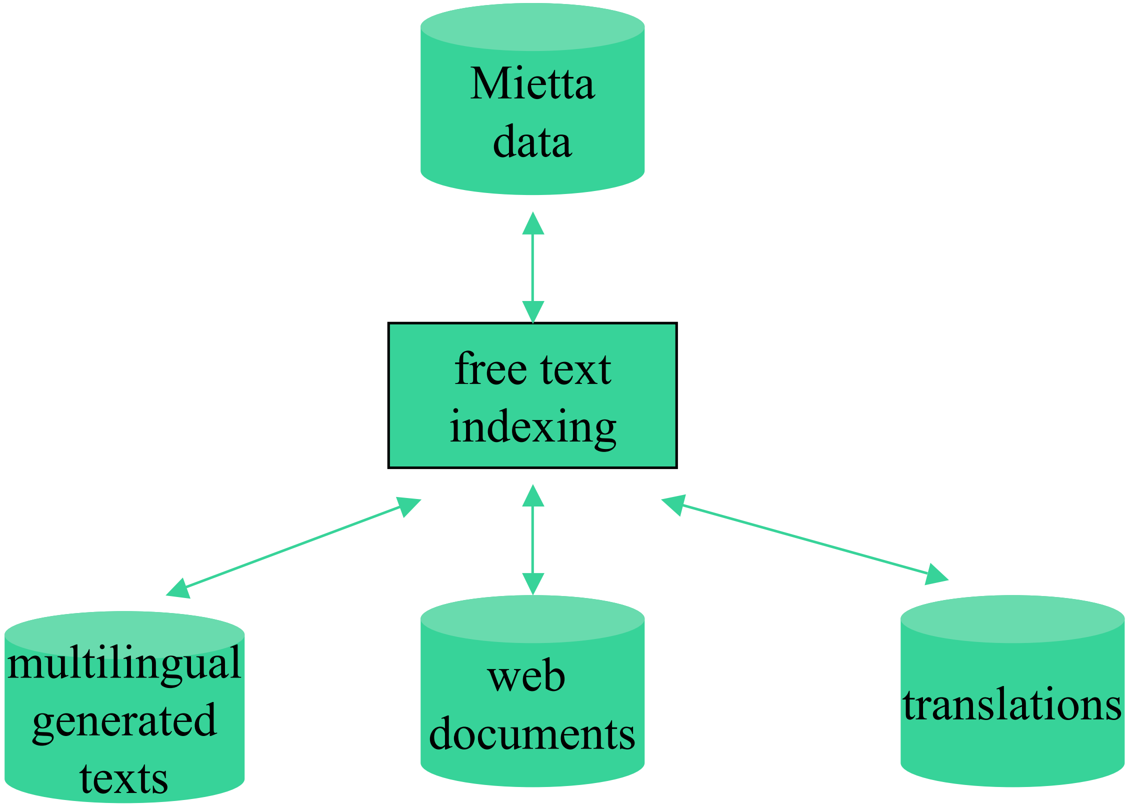
Source: Feiyu Xu, 2002

TNO (ISM, VSM) Indexing Toolkit

- ISM: A lemma-based fuzzy index based on trigrams
- VSM: A vector space model index based on lemmatas



Source: Feiyu Xu, 2002



Source: Feiyu Xu, 2002

Scalability of the Framework

- Adaptation to other domains
  - Domain specific templates
  - Domain Concept hierarchy
  - Domain specific template filler rules
  - Domain specific generation grammars
- Extension to other languages
  - Natural language generation tool requires less effort for the development of a grammar rule set in a language
  - Information extraction requires available language specific resources
  - Document translation is dependent on the machine translation system

Source: Feiyu Xu, 2002

Evaluation of the MIETTA System

- ❑ The standard relevance assessment model used in ad hoc and routing forums of TREC is difficult to apply to the complete MIETTA system because of
  - ✶ Broad variety of search strategies
  - ✶ Heterogenous data sources
- ❑ MIETTA is evaluated as technically “excellent” by EU
- ❑ Two projects are derived from MIETTA
  - ✶ Natural science foundation of China Project in SJTU
  - ✶ EU project of MIETTA to transfer the idea into product in XtraMind in Saarbrücken

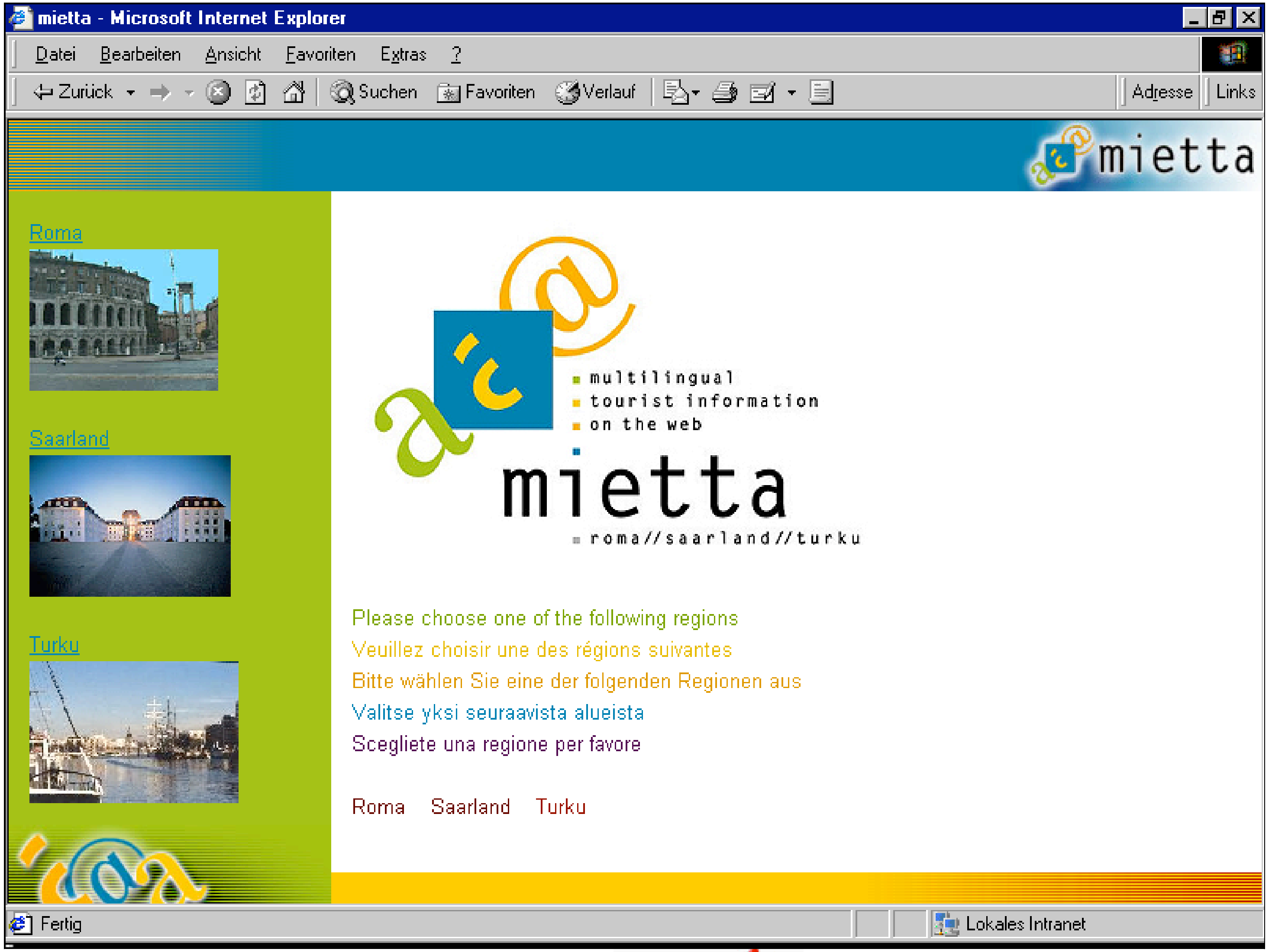
Source: Feiyu Xu, 2002

Conclusion: Innovative Technical Features

- Integration of different multilingual and crosslingual search technologies
- Combination of IE and multilingual generation
- Integration of DB and text document access
- Intelligent User Interface
- XML for advanced information management
- Localisation technologies for user interface and multilingual generation
- Highly suitable as a domain-specific information system and internet portal

Source: Feiyu Xu, 2002

MIETTA Start Page: Choose Region



mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf Adresse Links
mietta
Roma
Saarland
Turku
multilingual
tourist information
on the web
mietta
roma//saarland//turku
Fertig
Lokales Intranet

Please choose one of the following regions

Veuillez choisir une des régions suivantes

Bitte wählen Sie eine der folgenden Regionen aus

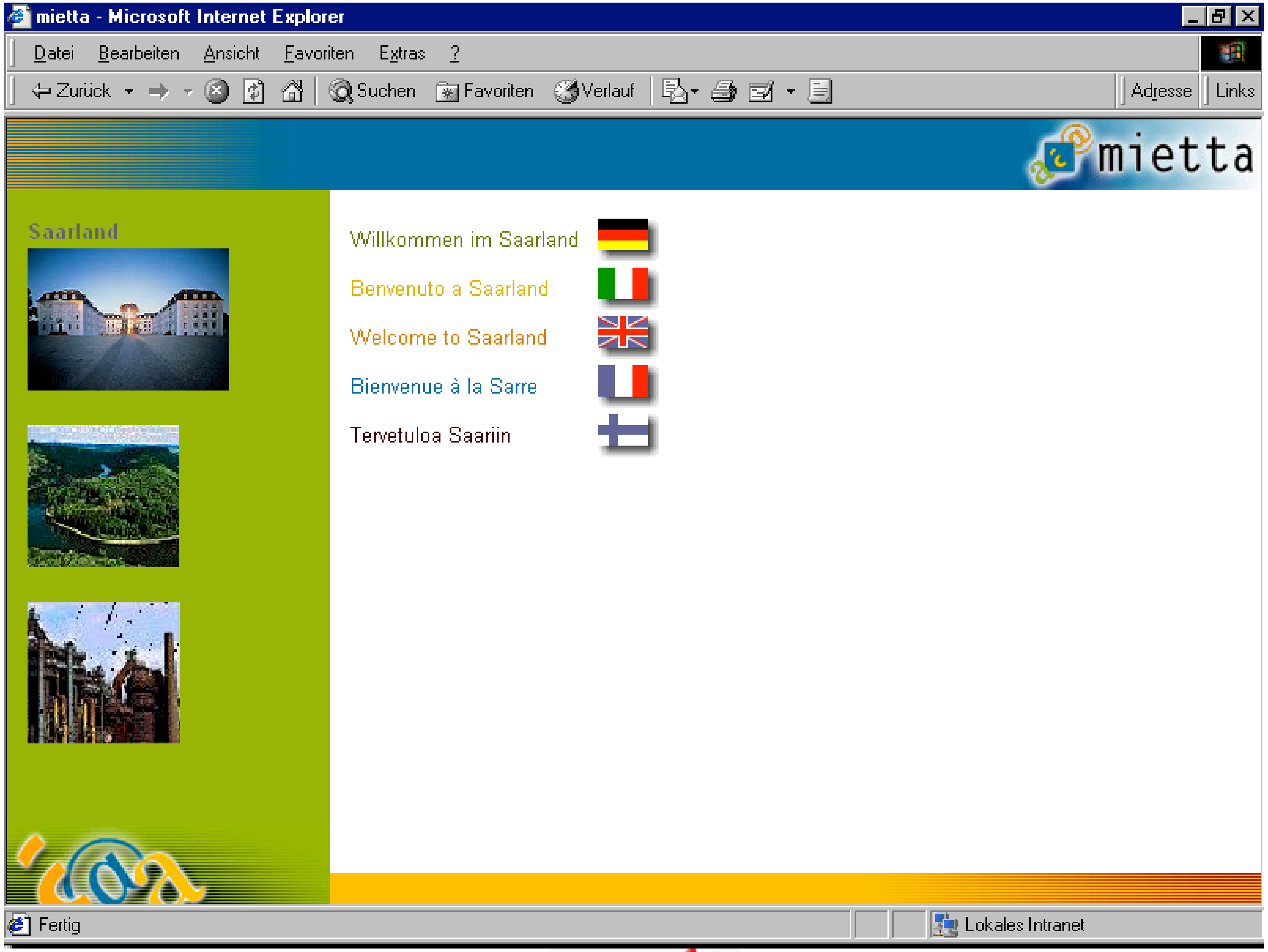
Valitse yksi seuraavista alueista

Scegliete una regione per favore

Roma Saarland Turku

Source: Feiyu Xu, 2002

Choose Language



mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf Adresse Links
mietta
Saarland

Willkommen im Saarland

Benvenuto a Saarland

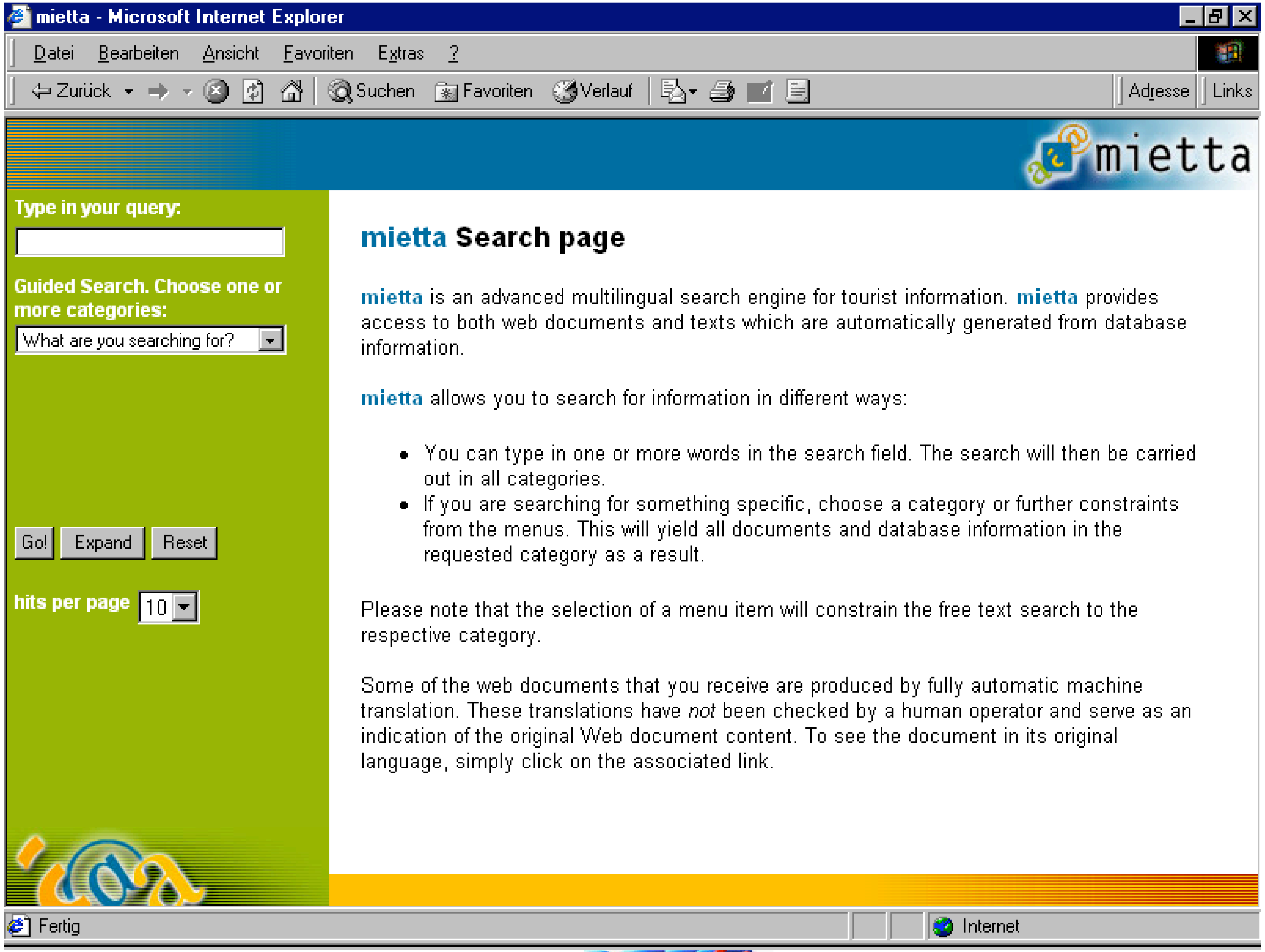
Welcome to Saarland

Bienvenue à la Sarre

Tervetuloa Saariin

Source: Feiyu Xu, 2002

MIETTA Search Menu


mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf Adresse Links
mietta
Type in your query:
Guided Search. Choose one or more categories:
What are you searching for?
Go! Expand Reset
hits per page 10
Fertig
Internet

mietta Search page

mietta is an advanced multilingual search engine for tourist information. mietta provides access to both web documents and texts which are automatically generated from database information.

mietta allows you to search for information in different ways:

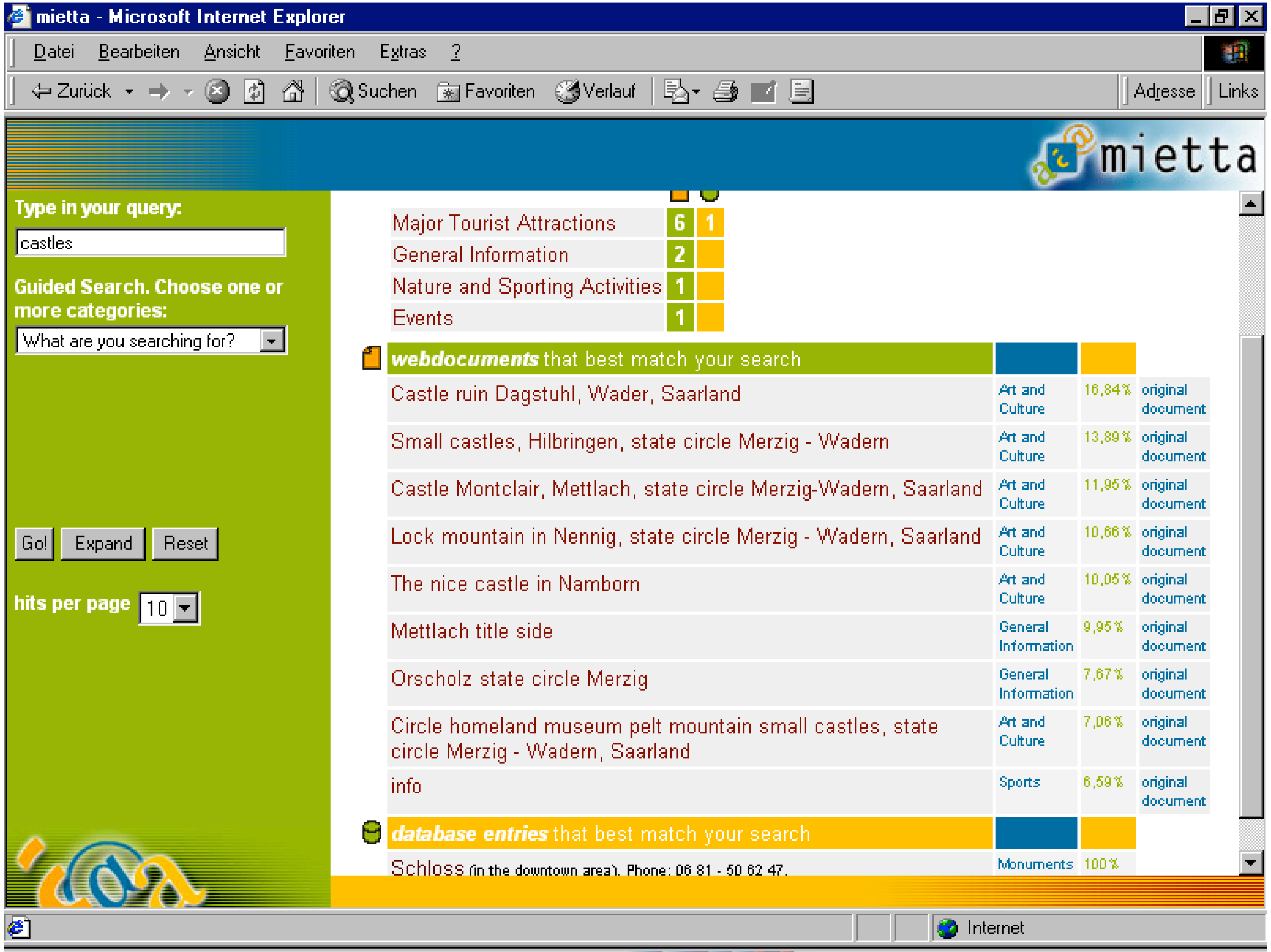
- You can type in one or more words in the search field. The search will then be carried out in all categories.
- If you are searching for something specific, choose a category or further constraints from the menus. This will yield all documents and database information in the requested category as a result.

Please note that the selection of a menu item will constrain the free text search to the respective category.

Some of the web documents that you receive are produced by fully automatic machine translation. These translations have *not* been checked by a human operator and serve as an indication of the original Web document content. To see the document in its original language, simply click on the associated link.

Source: Feiyu Xu, 2002

MIETTA Free Text Retrieval



mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf Adresse Links
mietta
Go! Expand Reset
Internet

Type in your query: castles

Guided Search. Choose one or more categories: What are you searching for?

hits per page 10

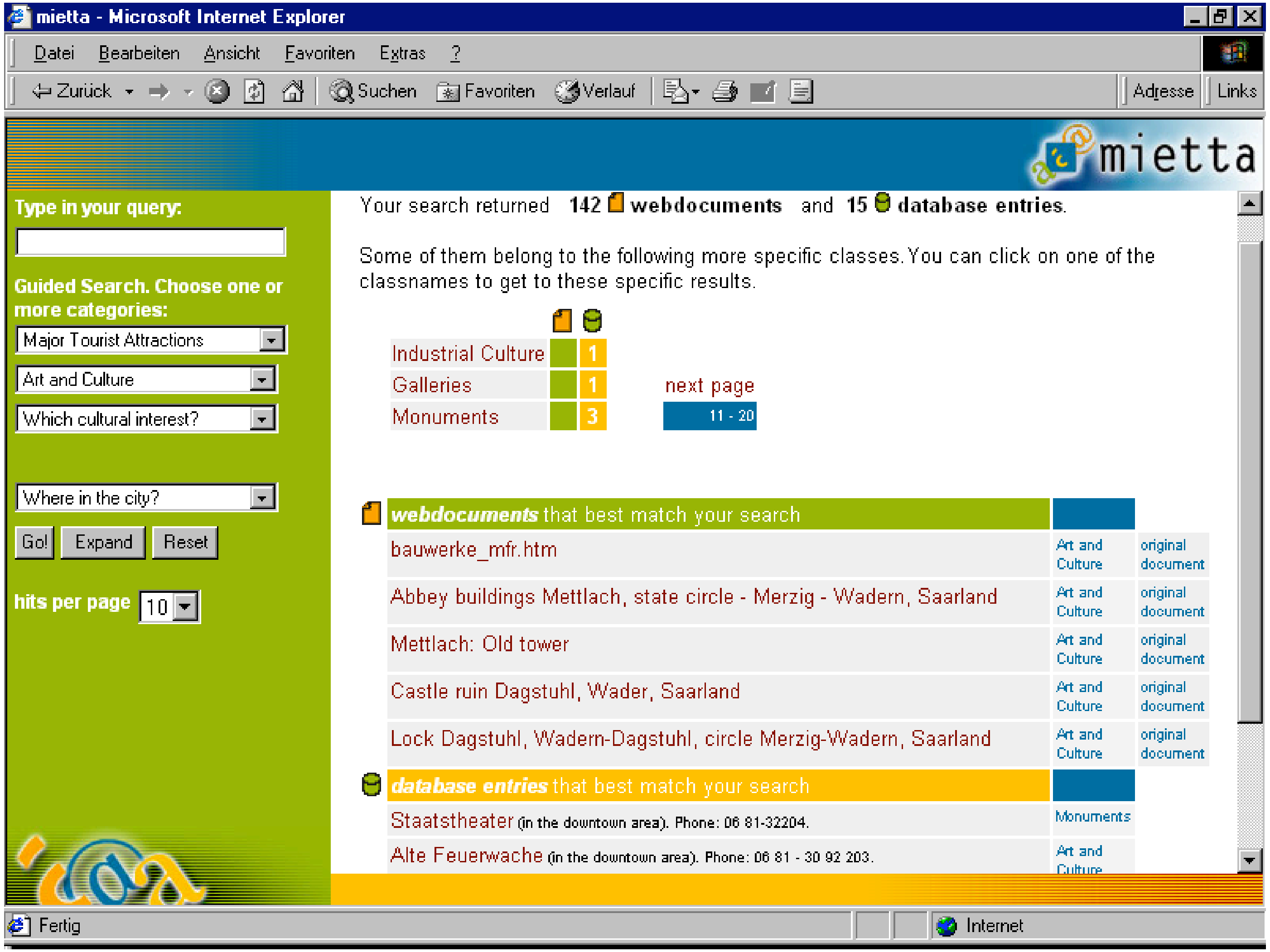
Major Tourist Attractions	6	1
General Information	2	
Nature and Sporting Activities	1	
Events	1	

webdocuments that best match your search			
Castle ruin Dagstuhl, Wader, Saarland	Art and Culture	16,84%	original document
Small castles, Hilbringen, state circle Merzig - Wadern	Art and Culture	13,89%	original document
Castle Montclair, Mettlach, state circle Merzig-Wadern, Saarland	Art and Culture	11,95%	original document
Lock mountain in Nennig, state circle Merzig - Wadern, Saarland	Art and Culture	10,66%	original document
The nice castle in Namborn	Art and Culture	10,05%	original document
Mettlach title side	General Information	9,95%	original document
Orscholz state circle Merzig	General Information	7,67%	original document
Circle homeland museum pelt mountain small castles, state circle Merzig - Wadern, Saarland	Art and Culture	7,06%	original document
info	Sports	6,59%	original document

database entries that best match your search		
Schloss (in the downtown area). Phone: 06 81 - 50 62 47.	Monuments	100%

Source: Feiyu Xu, 2002

MIETTA Class-based Navigation


mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück
Suchen
Favoriten
Verlauf
Adresse
Links
mietta
Go!
Expand
Reset
Fertig
Internet

Type in your query:

Guided Search. Choose one or more categories:

Major Tourist Attractions

Art and Culture

Which cultural interest?

Where in the city?

hits per page 10

Your search returned 142 **webdocuments** and 15 **database entries.**

Some of them belong to the following more specific classes. You can click on one of the classnames to get to these specific results.

Industrial Culture		1
Galleries		1
Monuments		3

next page

11 - 20

webdocuments that best match your search

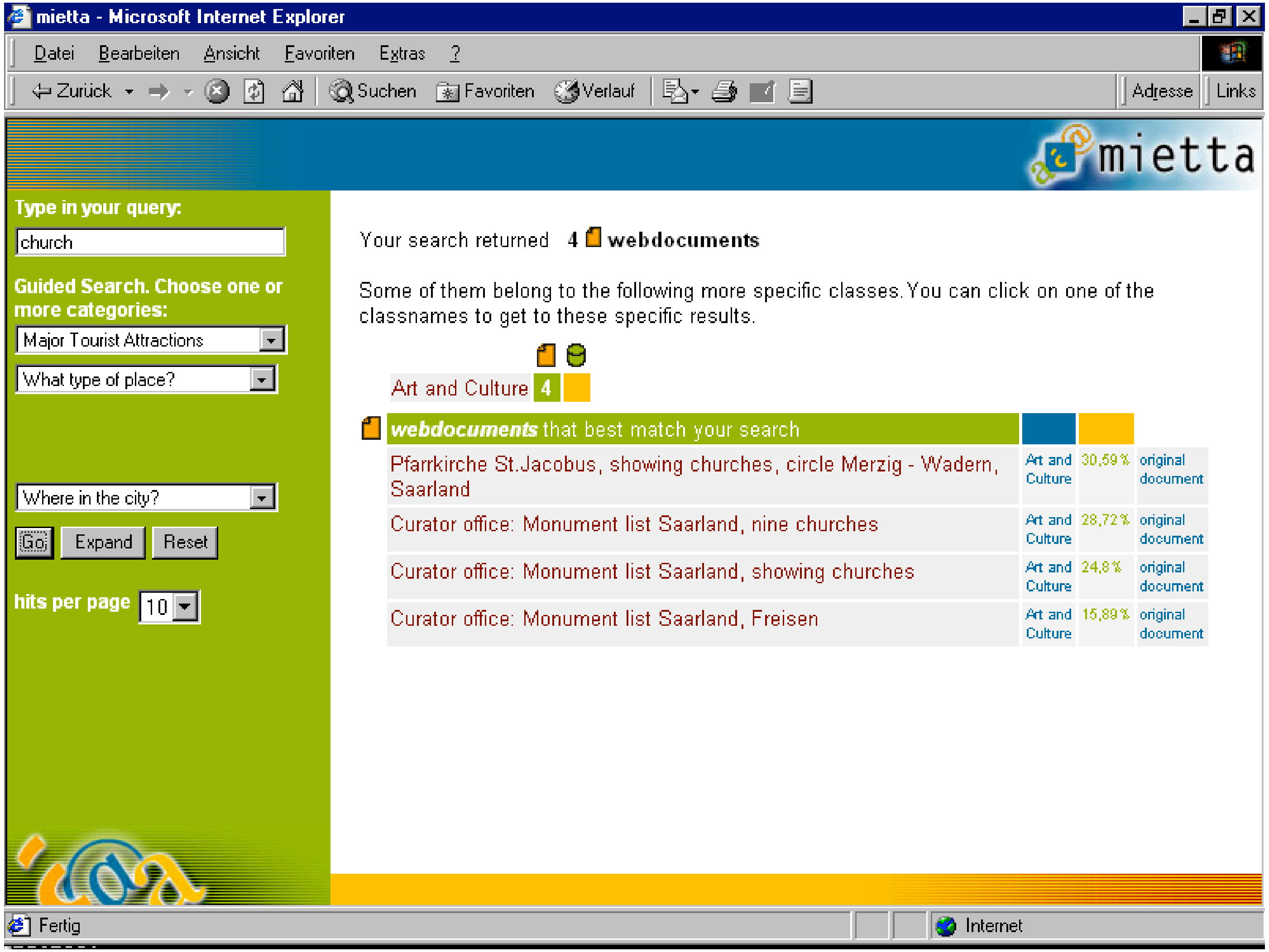
bauwerke_mfr.htm	Art and Culture	original document
Abbey buildings Mettlach, state circle - Merzig - Wadern, Saarland	Art and Culture	original document
Mettlach: Old tower	Art and Culture	original document
Castle ruin Dagstuhl, Wader, Saarland	Art and Culture	original document
Lock Dagstuhl, Wadern-Dagstuhl, circle Merzig-Wadern, Saarland	Art and Culture	original document

database entries that best match your search

Staatstheater (in the downtown area). Phone: 06 81-32204.	Monuments
Alte Feuerwache (in the downtown area). Phone: 06 81 - 30 92 203.	Art and Culture

Source: Feiyu Xu, 2002

MIETTA Class-based Navigation with Free Text


mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf Adresse Links
mietta
Go Expand Reset
Fertig
Internet

Type in your query: church

Guided Search. Choose one or more categories:

Major Tourist Attractions

What type of place?

Where in the city?

hits per page 10

Your search returned 4 webdocuments

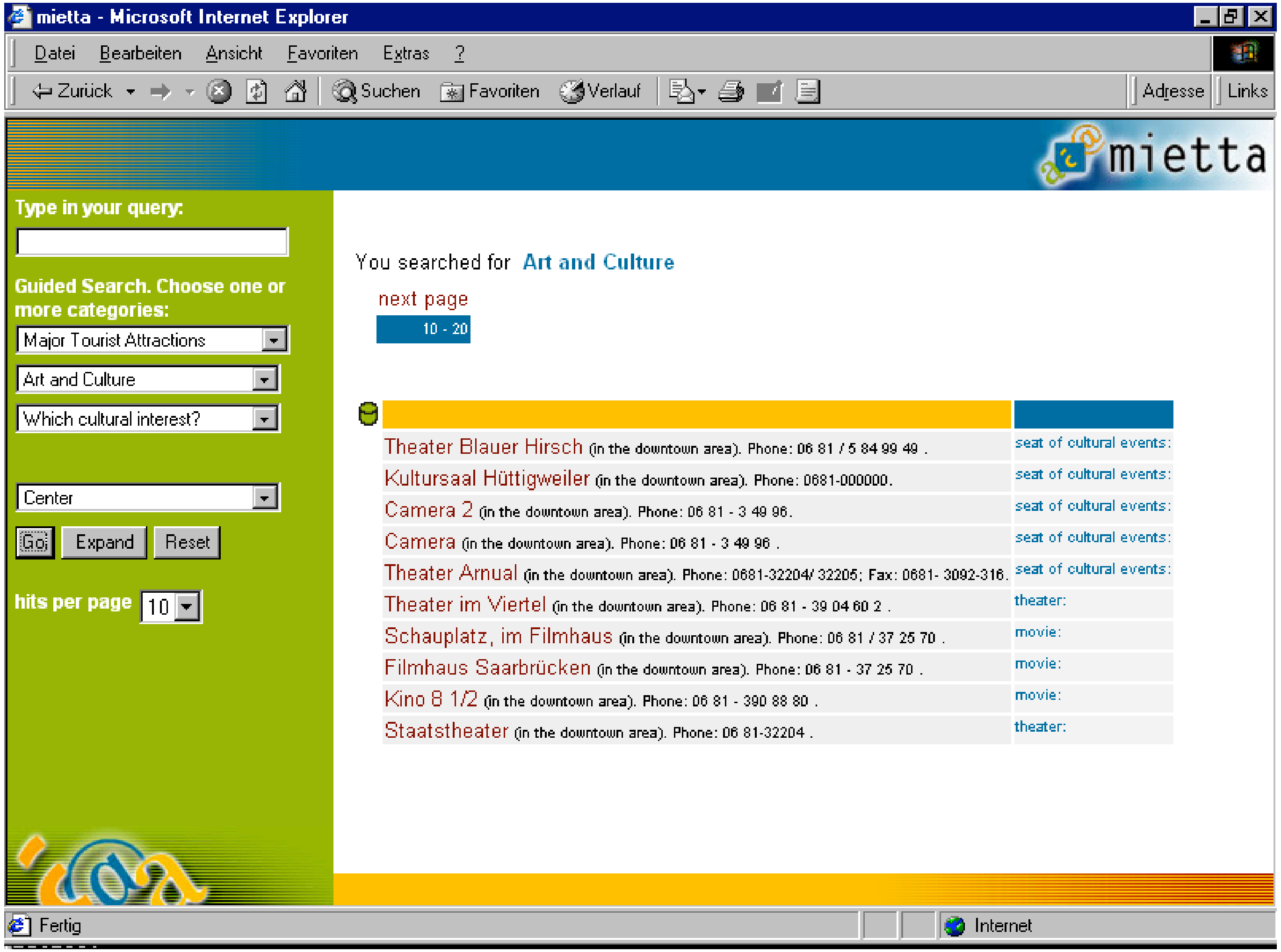
Some of them belong to the following more specific classes. You can click on one of the classnames to get to these specific results.

Art and Culture	4	

webdocuments that best match your search			
Pfarrkirche St.Jacobus, showing churches, circle Merzig - Wadern, Saarland	Art and Culture	30,59 %	original document
Curator office: Monument list Saarland, nine churches	Art and Culture	28,72 %	original document
Curator office: Monument list Saarland, showing churches	Art and Culture	24,8 %	original document
Curator office: Monument list Saarland, Freisen	Art and Culture	15,89 %	original document

Source: Feiyu Xu, 2002

MIETTA Form based Query


mietta - Microsoft Internet Explorer
Datei Bearbeiten Ansicht Favoriten Extras ?
Zurück Suchen Favoriten Verlauf
Adresse Links
mietta
Fertig
Internet

Type in your query:

Guided Search. Choose one or more categories:

Major Tourist Attractions

Art and Culture

Which cultural interest?

Center

Go! Expand Reset

hits per page 10

You searched for Art and Culture

next page

10 - 20

Theater Blauer Hirsch (in the downtown area). Phone: 06 81 / 5 84 99 49 .	seat of cultural events:
Kultursaal Hüttigweiler (in the downtown area). Phone: 0681-000000.	seat of cultural events:
Camera 2 (in the downtown area). Phone: 06 81 - 3 49 96.	seat of cultural events:
Camera (in the downtown area). Phone: 06 81 - 3 49 96 .	seat of cultural events:
Theater Arnual (in the downtown area). Phone: 0681-32204/ 32205; Fax: 0681- 3092-316.	seat of cultural events:
Theater im Viertel (in the downtown area). Phone: 06 81 - 39 04 60 2 .	theater:
Schauplatz, im Filmhaus (in the downtown area). Phone: 06 81 / 37 25 70 .	movie:
Filmhaus Saarbrücken (in the downtown area). Phone: 06 81 - 37 25 70 .	movie:
Kino 8 1/2 (in the downtown area). Phone: 06 81 - 390 88 80 .	movie:
Staatstheater (in the downtown area). Phone: 06 81-32204 .	theater:

Source: Feiyu Xu, 2002

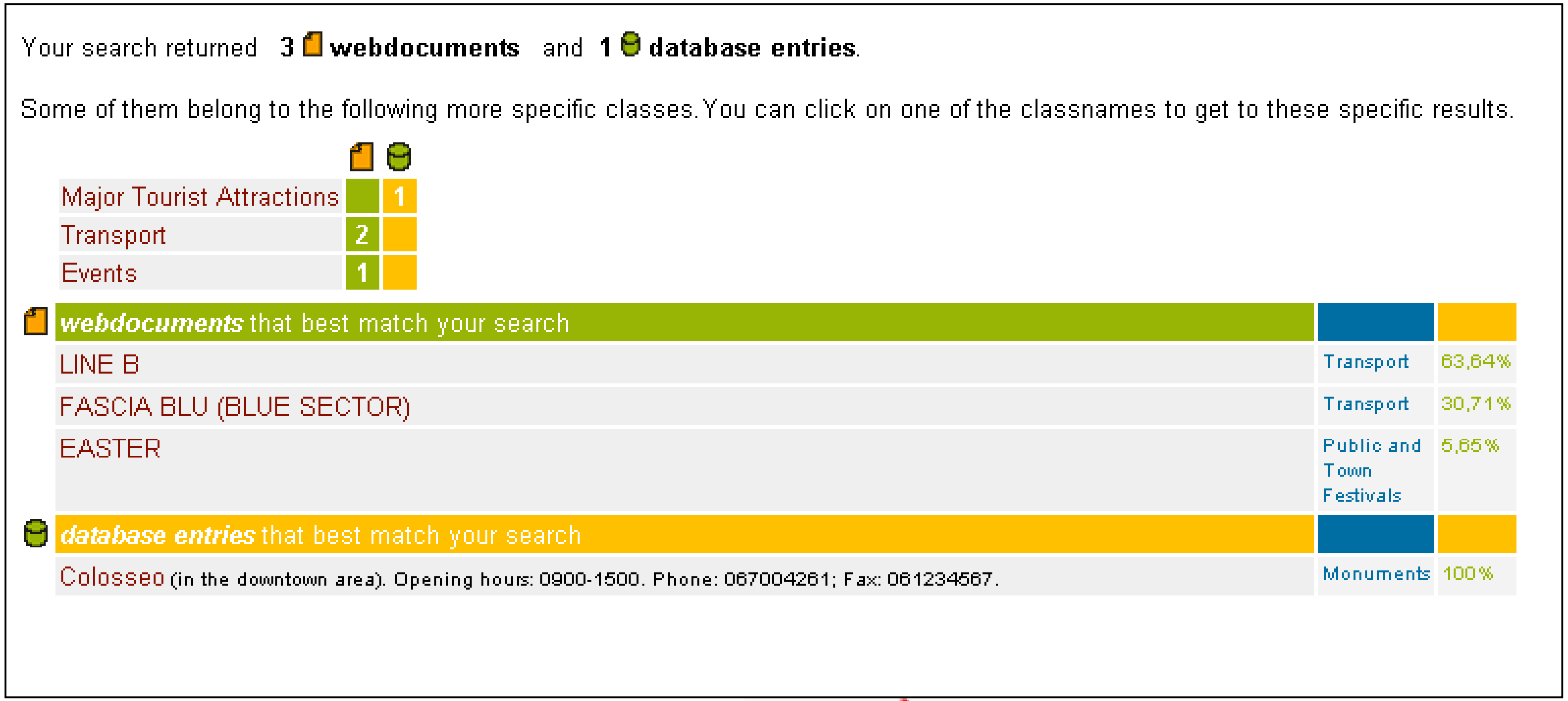
Online Text Generation

English	The theater Staatstheater is located in Schillerplatz 1, 66111 Saarbrücken (in the downtown area). Phone: 06 81-32204 .
Finnish	Teatteri Staatstheater sijaitsee osoitteessa Schillerplatz 1, 66111 Saarbrücken (keskustan alueella). Puhelin: 06 81-32204.
French	Le théâtre Staatstheater se trouve Schillerplatz 1, 66111 Saarbrücken (dans la zone du centre). Téléphone: 06 81-32204 .
German	Das Theater Staatstheater befindet sich in der Schillerplatz 1, 66111 Saarbrücken (im Stadtzentrum). Phone: 06 81-32204 .
Italian	Il teatro Staatstheater si trova in Schillerplatz 1, 66111 Saarbrücken (nella zona del centro). Telefono: 06 81-32204.

Source: Feiyu Xu, 2002

Result Presentation

- Result contains both database entries and documents
- All information is presented in uniform format
  - Classified
  - Ordered according to the relevance



Your search returned **3** 📄 **webdocuments** and **1** 🛢 **database entries**.

Some of them belong to the following more specific classes. You can click on one of the classnames to get to these specific results.

	📄	🛢
Major Tourist Attractions		1
Transport	2	
Events	1	

📄	***webdocuments*** that best match your search		
	LINE B	Transport	63,64%
	FASCIA BLU (BLUE SECTOR)	Transport	30,71%
	EASTER	Public and Town Festivals	5,65%
🛢	***database entries*** that best match your search		
	Colosseo (in the downtown area). Opening hours: 0900-1500. Phone: 067004261; Fax: 061234567.	Monuments	100%

Source: Feiyu Xu, 2002