

## Hot or cold: matching images



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*Finding text documents in large collections is something that everyone is familiar with. Finding images or video fragments requires another approach.*

*How to find a picture that does not have an obvious name or an extensive text annotation? What are you going to type in? Mila Boldavera wants to observe user's reactions to a suggested set of pictures and based on that present new alternatives. In this way the interaction converges to the desired picture.*

*A query from the user could be any level of abstraction: from 'Give me an image of Madonna' to 'Find me a joyful puppy'. The system becomes smarter in time, and is able to link human emotions with images, for example.*

"Using a search engine like Google, you can of course find plenty of images but there you have a one-on-one match between the search query and the file name. You can also search for the text describing a picture. In a way, this is still textual information that you are trying to find. What we now want to do is to search for picture characteristics instead. The user enters a query, he or she in turn sees a number of examples of pictures 'coming close' according to the way the system understands the query. The user can then answer simple questions with 'not OK', 'close', 'OK'. New proposals from the system will follow, and we expect to find a suitable picture in few steps. Searching for file names is too simple, in our view: increasingly, we see that digital pictures are stored using numbers that don't say anything about the content.

Imagine someone looking for pictures visualizing 'train delay' in some kind of way. A straightforward example will be a number of people desperately waiting on a railway platform. But someone waiting in the rain, obviously too late for his own wedding, is an example too. In time, the system recognizes these combinations. Illustrations will not only be described by characteristics as colour or shapes of objects in an image, but also using more abstract content like 'depressed', 'joyful' or 'scary'. The feedback that users give continuously, while searching, provides the system with new information that allows the system to recognize those abstract notions in multimedia. We do not just focus on images. Any type of media, including text, could be used 'on the way to the target'.

Of course, you don't want to have to scroll through thirty screens filled with images before you find something that gets even close. In that case the user will soon say: 'OK, this is nice, but not for me'. So the interactive search process must be really fast. That's why we choose a probabilistic approach: at each step we evaluate the probability that one picture might 'fit' the user's

### Examples of current projects:

- Secure Content Management (with Philips)
- ECHO: European Chronicles On-line (EU / FP5)
- MUMIS: Multimedia Indexing and Searching Environment (EU / FP5)
- SUMMER: Secure Multimedia Retrieval (Ministry of Economic Affairs)
- GRAAL: Guidelines Regarding Architecture Alignment (TI)



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need, while the other doesn't. After several search actions, a picture gets more and more vital information attached to it. Quantity is translated into quality, in this case.

I often compare my search system to a road map. The user tries to find his or her own way, and uses implicit or explicit information that other travellers provide. If you drive your car somewhere in Germany and you are lost, maybe following cars with yellow Dutch license plates will give you the first correct directions. While you're on your way, you will see new indicators.

In my home country Russia I worked in the area of databases as well, as a mathematician. I co-developed and maintained a production database for a shop selling thousands of articles per day. But soon my task became only 'maintenance', not 'development'. I wanted to do more than just that. When I read this CTIT project description, I was really challenged. My very first impression was: 'This is so complicated! This is not possible!'. It seems to be, however!

As Internet is becoming a very large community, I see an excellent future for these kinds of techniques. With that many users, you build intelligent database search engines in short time. Currently we are using test databases and semi-automatic queries, but we are already working on a user interface to test it on 'real users'. You may find some unwanted results in the beginning, but the system will learn from the users, and it will improve faster and faster, that's for sure."