

Experimental Image Retrieval System*

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An experimental Image Retrieval System (EIRS) for fast access based on graphic content to images kept in a conventional database (DB) is under research and development in IIT of BAS. At the present stage, the system can be considered above all as instrumental software for experimenting of three techniques for image search, namely: (i) by a two-dimensional wavelet transform, (ii) by a two-dimensional Fourier transform and (iii) by a heuristic decomposition of the images to contextual contour parts. The search content is the input image itself or a sketch of it. The most essential image data are automatically extracted and arranged in a key string of a fixed length. The fast access is performed on this key data using conventional index access methods of the given DB management system. For the time being, the images the EIRS operates with should be graphic images, gray scale or true color and not very noisy. The system is tested on a DB of about 4000 images of trademarks.

Each of the three techniques mentioned above considers an appropriate preliminary normalization of processed images – by size, by orientation, and by intensity, as well as a special post-processing algorithm assuring fault-tolerance against the possible noise in the images. The heuristic decomposition technique is at the most advanced phase of development and it is used to produce the illustrations herein, cf. Figs.1, 2 and 3. A comparative analysis shows that this technique simplifies the necessary normalization but it is more sensitive to larger noise while both other techniques are more robust to noise but they need sophisticated preliminary normalization. That's why the current work is directed to improve and finalize the three techniques either in competition among them or in their combination in reaching the final aim – a fast and fault-tolerant method for content based image retrieval in a conventional DB of images.

On the other hand, EIRS can be considered also a system for image recognition by means of a DB of standard images, i.e. classes of recognition. In this sense, each new

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image entered into DB either defines a center of a new recognition class or hits an already existing class, and what will happen depends on the fault-tolerance level currently defined for the DB.

Initially the EIRS has been planned as an extension of a technology, called COVERIS (and developed at the same institute), i.e. as a sub-system for preliminary identification of the necessary standard before calling the essential COVERIS (for precise verification of the input replica of the chosen graphic standard).

The recent advance of the EIRS development assures that the system can be successfully implemented as an image search engine for a conventional DB of images, for instance, in information and image retrieval systems for marks, trademarks, hallmarks, postmarks, etc. Although the system is still away from recognizing pictures of art or snapshots of nature, it will not have problems with other more or less sophisticated graphics like banknotes, official forms, fingerprints, signatures, isolated hieroglyphs, etc. The essential graphics content for recognition should not be very noisy-illuminated, or damaged by large “artificial” noise (artifacts). The improvement of the EIRS methods efficiency against such kind of noise will be a subject of near future work as it is considered important for potential users, e.g. from philately, numismatics, bank expertise, forensic expertise, etc. The developer team is looking for appropriate collaboration with interested parties either in the above-described direction for the EIRS or in another of mutual interest.

Three figures follow to illustrate the EIRS in operation.



Fig. 1. EIRS: the image search engine (start menu)

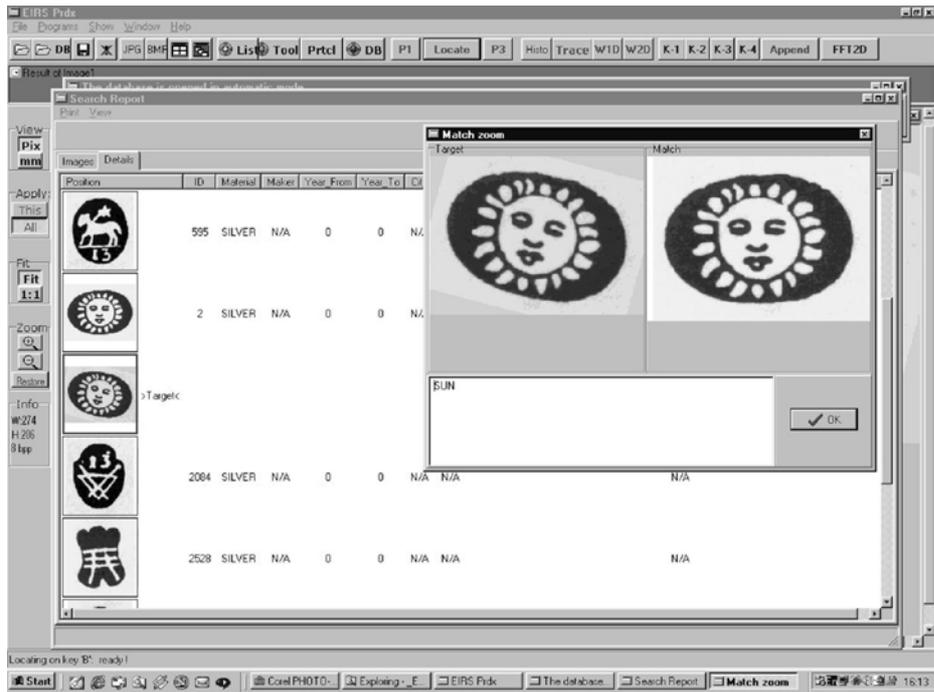


Fig. 2. EIRS: the image search engine.
Retrieved images are ordered by their similarity to the input target



Fig. 3. EIRS: the image search engine.
The target is preliminary rotated and scaled to demonstrate the search method invariance