One Approach for Increasing the Efficiency of Algorithms for Metadata Extraction from Static Images

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Abstract - **The current work presents an approach for increasing the efficiency of algorithms for extraction of data from static images aiming at increasing the volume and content of the generated metadata and providing the opportunity for searching by content in large libraries of static images.**

Keywords-**Efficiency, processing, static images, algorithms.**

I. INTRODUCTION

Extraction of metadata from static images with different parameters and properties is an important information process which gives the opportunity for quick theme search in large libraries of images. The parameters and properties of the image are a function of the source for input. The difference between the image parameters and algorithm requirements for processing leads to a limited volume and content of the generated metadata.

Automated search in multiple static images imposes the application of algorithms for metadata extraction and carrying out the search itself in the multitude of the generated metadata. Practice imposes processing of static images represented in different formats, resolution and sizes [1], [2], [6].

The efficiency of a certain algorithm for metadata processing and extraction from a static image is defined by a number of quality characteristics of the representation of the video information generating significant metadata [2], [3].

Let's assume we can always "deliver" for a selected algorithm for image processing and metadata extraction the photograph with the necessary resolution and quality. In this case the generating of the metadata will be reliable because the necessary quality of the input information has been supplied. But creation of digital images is not a determined process [4], [5]. A clear discrepancy is seen between the specific requirements regarding the input information, ensuring the efficiency of a certain algorithm for format processing and the properties of the real input information which is to be processed. This discrepancy leads to the necessity of developing an intermediate functional layer that will ensure the concordance between the primary formats and the "successful" formats, specific to each processing algorithm. In this way the efficiency of the algorithm itself is ensured on a level of restrictions regarding the processed image and also on the concordance stage the images for which it is impossible to provide the minimum input restrictions for a certain algorithm are rejected.

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II. LAYOUT

The current work represents an approach for increasing the efficiency of algorithms for metadata extraction from static images through the following sequence of stages:

Stage 1. Let the set of input parameters, through which an image is characterized for the *i*-th algorithm is called SIRA*i* (Set Image Recognition for Algorithm*i*). An analysis is carried out for the classification of the static image processing algorithms in terms of the set of input parameters for each of the included in the system *i*-th algorithm for the *j*-th image through SIRA*i*.

Stage 2. A processing is carried out and classification of the incoming stream of input static images in terms of SIRA*i* and the profile of the *j*-th input image is formed, which we define as PIP*j*.

Stage 3. A comparative analysis is performed for the efficiency of the forthcoming processing of the *j*-th image from the *n* processing algorithmsavailable in the system. Thus, the *j*-th image is analysed in terms of the possibility for processing of each *i*-th algorithm *(i=1, n).*

Stage 4. On basis of the analysis the type of transformational function F*p* (SIRA*i*, PIP*j*) is formed and, through it, derivative images of the basic image *j* are generated and we define its profile with PIP*ij*, meeting the requirements of the input information SIRA*i* for the *i*-th algorithm.

Stage 5. Processing of the PIP*ij* images from the corresponding *i*-th algorithm and extraction of metadata PMD*ij* for the derivative image PIP*ij*.

Stage 6. Recording the metadata in a database for the context of the image *j*, processed with the set of algorithms *i*, (*i*=1,*n*).

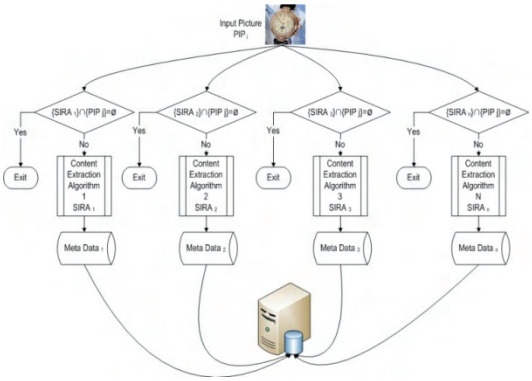

Fig.1. Architecture of a system for metadata extraction without the application of the approach for increasing the efficiency.

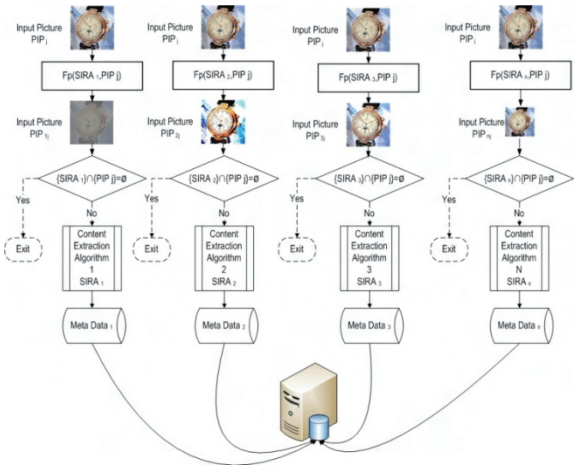

Fig.2. Architecture of a system for metadata extraction with the application of the approach for increasing the efficiency.

In Fig.1 and Fig.2 are the graphic representation of the necessity for increasing the efficiency of the algorithms for metadata extraction from static images. Fig.1 represents the architecture of a system for metadata extraction without the application of the approach for increasing the efficiency.

The check for compatibility of the *j*-th input static image in terms of the calls of the input information for the *i*-th algorithm. SIRA*i*∩PIP*j* is finding the intersection of the two sets of parameters. If this section is an empty set {ø}, the processing is discontinued and metadata extraction is not possible through the application of the *i*-th algorithm. The more different the two sets are, the less the probability for extraction of reliable metadata is possible. Fig.2 represents an improved version of the structural scheme for metadata extraction from static images. Through the function for preliminary preparation of the image F*p*(SIRA*i*,PIP*j*), the primary image with parameters PIP*j* is transformed into an image, which meets the requirement parameters of the processing algorithm. The result of the transformation application F*p*(SIRA*i*,PIP*j*) is the derivative image PIP*ij*, which is much closer, in terms of parameters, to the initially known input restrictions of the *i*-th algorithm. Thus the probability for the check to result into {ø} is minimal and extraction of metadata by the *i*-th algorithm is expected.

An example of practical realization.

Let's assume that algorithm Ak is an algorithm for recognition and reading of automobile license plates. For the current example we use an algorithm of Adaptive Recognition Hungary - CARMEN® Freeflow Number Plate Recognition Engine [5]. We apply the algorithm to the input image in Fig.3. The developers of the algorithm have defined SIRAк in the documentation in the following way: "The CARMEN® Freeflow offers general-purpose license plate reading from digital pictures of any tpye of sources. Whether it is a megapixel-size, 12bits/pixel high dynamic range, high resolution digital image or a 384x288 size colour CCTV video picture provided as input, (either from file or memory) CARMEN® provides ballanced reading of car plates." [5]. It is evident from Fig.3 that the image is 24 bits/pixel high dynamic range and a resolution of 3072x2340. The result: the license plate of the automobile is not recognized and read due to the discrepancy of the profile of the j-th input image PIPj in terms of SIRAк. If we apply, in accordance with Fig.2, an architecture for metadata extraction with the suggested approach for increasing the efficiency of the image PIPj (Fig.3), we form the derivative j-th image, suitable for processing with the algorithm PIPiк (Fig.4). For PIPiк we only change the resolution parameter from 3072x2340 to 460x365. The result is a 100% recognized license plate. Thus, without changing the content of the image, and only through a change of micro-parameters, such as resolution and number of pixels in representing the colour, a higher efficiency of metadata extraction is ensured.

The example given shows the necessity of looking into the problems of compatibility of the input graphic information with the algorithms for metadata extraction and the development of approaches for increasing the efficiency through specific micro-processing.

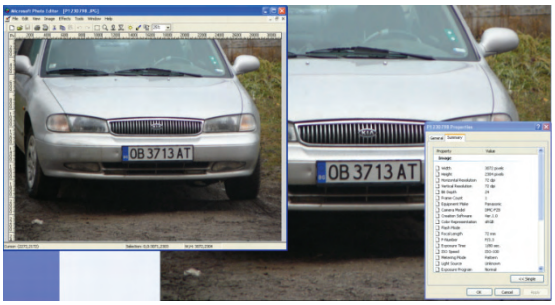

Fig.3. Input image – PIPj

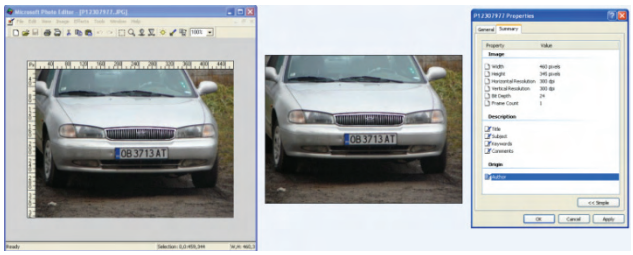

Fig.4. Derivative image PIPjk

III. Conclusion

The application of this approach for increasing the efficiency of the algorithms for metadata extraction from static images will ensure a more complete usage of the possibilities for generating content and classification of the static images through metadata, as well as performing quick multi-parametric searches in the classified array of images.

The presented approach is open, it allows the introduction of automation and dynamic complement of the set of algorithms and expanding the volume and content of the static image extracted metadata. Consequently the future work will be further development of the transformational function F*p*

and achievement of higher efficiency of the metadata extraction algorithms.

An experiment with the practical realization will be provided in the future in order to prove the application of the algorithm in different areas. Also comparison with similar approaches will be realized.

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