A Research paper on E-marketing through Visual Search

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***Abstract*—There are many product comparison web sites currently. They use text as information. This paper gives an insight about the distinct visual search engine for product images in order to establish a pristine visually locating products through "Content-based Image Retrieval (CBIR)" technology. It discusses the exceptional technical challenges, their solutions and experimental results of the design and implementation of this system. Today's era of marketing world is about visual now. Due to the wide access to mass communication devices, with extended visuals enhancements, made visual content a vital thing for any publisher, on all media channels.**

***Keywords*— Visual Search, marketing engage, content-based image retrieval, MPEG-7, visual content, product comparison, feature combination.**

I.INTRODUCTION

We know that human perception is mostly visual. Over 90% of the daily processed information comes from visual analysis. The written language started and probably will end with pictures: drawings, hieroglyphs, icons, symbols. (Besides that the word of these days is "selfie"!) There are several factors that have made visual content so important in present days:

- It is easier to understand, even beyond the cultural and linguistic barriers.
- It is estimated that 95% of the B2B clients prefer short, visual, mobile optimized content . Users have now the shortest attention span of all times (probably the proper name for this era is the light-speed century!).
- Most people remember 80% of what they visualize and only 20% of what they read.
- Visual content is more likely to be shared across the various respective platform, between friends, family and business partners. It is eye-catching and has a significant effect on human emotions.

Content-based Image Retrieval (CBIR) has been an interesting topic in both academia and industry in recent years.

Through CBIR, we can at least partially realize the dream of naturally searching contents through sample images instead of abstract keywords. On the other hand, as in many other computer vision problems, CBIR is very challenging and full of open problems. While there is huge amount of literature on general image search, we have seen very little published work on domain-specific CBIR systems, which target particular categories of images. A good example is on-line productimages that accompany the text description of products. With the rapid growth of Internet advertisements, millions ofsuch product images are emerging. However, except for a brief white paper by e-Vision, there is no published workdedicated to product image search according to our knowledge. As an attempt to fill in this gap, this paper introduces avertical CBIR system for product images. We first present and analyse experimental results applying various state-of-the-art visual descriptors to product images. Then we introduce a number of techniques of constructing an accurate and efficient visual product image search system, including combination of multiple features, multi-stage search strategy, a novel client-side instantaneous user feedback mechanism, and also a dynamic weighting method to improve the search of low-quality images.

Lastly, the affordability of the needed hardware (by technological progress) and proliferation of the necessary software made the production of visual content much easier and cheaper. In conclusion, visual content is an important and emerging tool for modern marketing.

II. SYSTEM OVERVIEW

Figure 1 presents the architecture of the visual product image search system, which is composed of the back-end indexing system and front-end search system. Product images are collected from various vendors' web sites. Then a back-end system carries out a number of off-line processing steps on the crawled items. It first separates the product object from background through image segmentation. It then extracts a number of visual features as well as text features.

The front-end system executes the on-line searches based on a query image selected by the user. It also allow the user to refine the search results by adjusting various visual features.

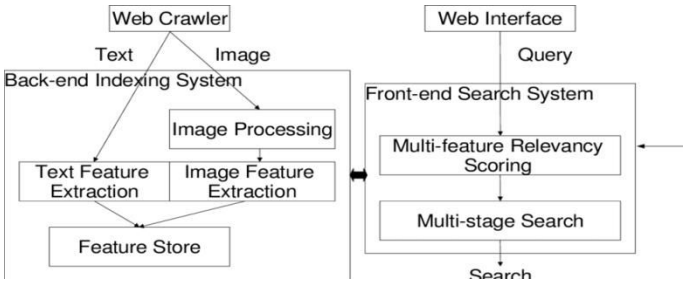

Fig.1. Architecture of the visual product image search system

III. EXTRACTION OF VISUAL FEATURES

The first question in CBIR is to decide on the set of characteristics that can be used to measure the relevancy between images. Although there is still work going on with regard to the extraction of new features or the improvement of existing features, a number of widely used features have already been established, even in the form of international standards. For example, MPEG-7 has systematically formulated a set of descriptors to be used in visual information retrieval [2]. Due to the proprietary nature of our features used in Like.com, we demonstrate our ideas with publicly available features instead in this paper. More specifically, we have experimented with a subset of MPEG-7 visual descriptors on product images. Those descriptors can be grouped into three categories:

1. **Shape descriptors:**

- Edge Histogram Descriptor (EHD): The image is divided into 4x4 blocks and the local-edge histogram is created for each block. By design, EHD captures both the external edges (object shape) and the internal edges (texture).
- Region Shape Descriptor (RSD): Complex 2D Angular Radial Transformation (ART) is applied to the bi-level foreground object mask and the normalized magnitudes of the coefficients are extracted.

2. **Texture descriptors:**

- Homogeneous Texture Descriptor (HTD): A band of Gabor filters are applied to the image and the mean energy and its deviation are computed for 30 frequency channels.

3. **Colour descriptors**

- Colour Structure Descriptor (CSD): It takes into account both the colour distribution of an image and the local spatial structure of the colour. A histogram of quantized colours is constructed based on the appearance of those colours in predefined structure elements.
- Colour Layout Descriptor (CLD): The image is first converted into 8x8 "icon," which is then transformed by 8x8 DCT in each colour channel. The coefficients are zigzag-scanned to build the descriptor.

IV. BENCHMARKING OF INDIVIDUAL VISUAL FEATURES

With the features selected, the next question is how well they perform in product image search. For each query image,

We select the nearest neighbours in the inventory using individual features and then measure the precision-recall curves based on manually labelled ground truth.

One interesting finding is that shape and texture features perform much better than colour features on product images. Figure 3(b) compares different features on a collection of men's watches images. Obviously, EHD, RSD, and HTD all Outperforms CSD. That is in sharp contrast to the result measured on Corel image set, where CSD's performance exceeds that of EHD and HTD by a large margin. This behaviour can be explained by the different natures of general photos and product images. In general photos, colours reveal a lot about the semantics of the content. For example, green usually indicates grass or tree, blue is often associated with sky and sea, and each animal has its typical colours. Product images are quite different. Since a product is a man-made object, its basic design characteristics are preserved in its shape andtexture. Colour is only secondary in the design process and is often diversified to cater for individual's personal preference. The following figure shows products of the same basic design but of different colours.

Fig. 2. Items of the same design but of different colours

V.TYPES OF VISUAL CONTENT

There are three major types of visual content:

1) Illustrations, as any message conveyed by a static visual composition; this can comprised of drawings, photos and, as a newer development, memes. In all of these the main part is the

picture, accompanied by one or more pieces of text, all with great responsibilities in terms of marketing.
2) Comics, as collections of images and text, structured in a certain order and with a vivid storyline. A special, modern, kind consists of info graphics, which present large amounts of information in a graphical structure, sometimes with a visual "story" from the beginning to the end.
3) Videos, moving images in form of clips, short films which can give an idea or convey a certain message, preferably both. Important subtypes are vines (looping videos up to 6 seconds long) and gifs (looping slideshows of images, packed in a single file).
From the marketing point of view, all of these have benefits:

- Illustrations are short, easy to comprehend (usually in seconds) and as simple as production process.
- Comics are good storytellers and more easily remembered.
- Videos are influential through the dynamic of movement and good conveyers of human emotions.

Using imagery of all sorts, companies can:

- Prove their expertise in the field;
- Develop a visual demonstration of the product;
- Present testimonials from current users;
- Tell little success stories, with the product as the main character;
- Transmit installation instructions and how-to manuals;
- Organize training sessions for the professionals.

For the content consumer or, in other words, the so-much-wanted client of the publisher, marketing engagement is raised through visual content:

1. Visual information is processed much faster than the one presented in the form of text.
2. Almost half of the viewers (46%) say the website design is the primary criteria for establishing the credibility of the site (according to a Stanford Persuasive Technology Lab with 2,440 participants).
3. Visual content is inspiring, with ideas on how to use the products, and improves social engagement. Visitors stay longer if the message is presented with compelling visuals.

From the publisher point of view, visual content is a crucial marketing tool:

1. The time needed for the comprehension of a visual ad is sensibly shorter than the one necessary for a message consisting mainly of text.
2. Visual ads are more effective in convincing an audience to make a certain decision (43% more, according to a 3M-sponsored study at the University of Minnesota School of Management).
3. Visual content conveys emotions more easily and rapidly: very useful as long as time is either not available (in case of highway ads, for example) or very expensive (for television commercials).
4. 85% of viewers prefer to purchase a product after watching a product video (source: Internet Retailer).
5. Through visual content, the brand is "humanized" and easier to relate with.
6. As a consequence of the broad understanding of a visual message, marketing costs for multinational companies are kept at lower levels.

VI. CONCLUSIONS

Basically in this paper, we apply CBIR techniques to product image search. The major contributions are as follows:

1. We prove the feasibility of using state-of-the-art visual descriptors for product image search, through experiments.
2. The relative performance of different visual features is analysed for product image search and is compared with that of general image search.
3. A number of techniques, such as the combination of multiple features and multi-stage search strategy, are introduced to improve search relevancy while maintaining search speed.
4. A new client-side instantaneous user feedback mechanism is proposed to give the user greater control in the search process.
5. A dynamic feature weighting method is designed to improve the search results when the query image's quality is low.

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REFERENCES

1. B. S. Manjunath (Editor), Philippe Salembier (Editor), Thomas Sikora (Editor), *Introduction to MPEG-7*, (2002).
2. D. Heesch, "The NN-k technique for image searching and browsing," *Ph. D. Thesis, Imperial College London*, (2005).
3. Y. Rui, Thomas S. Huang, and S. Mehrotra, "Relevance feedback techniques in interactive

content-based image retrieval," *SPIE Conference on Storage and Retrieval for Image and Video Databases*, 25-36 (1998).

4. R. A. Jacobs, M. I. Jordan, "Adaptive mixtures of local experts," *Neural Computation* 3, 79-87.
5. T. Deselaers, D. Keysers, and H. Ney, "Features for image retrieval: A quantitative comparison," *26th DAGM Symposium*, (2004).
6. T. Liu, "Fast nonparametric machine learning algorithms for high-dimensional massive data and applications," *Ph. D. Thesis, CMU*, (2006).
7. https://www.researchgate.net/publication/258325682_Visual_search_engine_for_product_images
8. https://www.researchgate.net/publication/290084483_Marketing_Engagement_Through_Visual_Content
9. King, Cindy. *Social Media Marketing Predictions for 2015.* Available at: www.socialmediaexaminer.com. Accessed on: 01 Jan.2015
10. Schoenfeld, Adam. *The Impact of Facebook Timeline for Brands*. Available at: www.simplymeasured.com. Accessed on: 21 March 2015
11. Taylor, Glenn. *B2B Content Preferences Survey.* Available at: www.demandgenreport.com. Accessed on: 11 June 2014