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AIS Electronic Library (AISeL)

Winter 12-8-2019

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(Work in Progress)

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ABSTRACT

Digital visual information plays a very important role in E-Commerce (EC). Their usage brings forth many novel research topics for digital visual information processing skills and software. Some issues of application analysis of image/video information processing techniques suitable for EC are described in the paper. Visual design for goods or services trading, image retrieval based on visual contents, applications of images to the trade safety on the Internet, 3-dimensional display, virtual reality for goods browsing, inquiry based on image and video contents, trade safety and copyright protection of digital works based on digital watermarking are mainly discussed which are considered as the technological solutions that could enhance EC.

Keywords: Electronic commerce, visual information, plane design, goods exhibition, visual retrieval, trade safety, digital works.

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INTRODUCTION

Nowadays, shopping or marketing is made easier with the Internet than in shopping centers or supermarkets. It can stimulate consumption by boosting trade volume, and reducing the corresponding cost. The e-commerce market continues to grow steadily. For example, according to data from the US Commerce Department and US Census, "in the first quarter of 2019, the share of e-commerce in total U.S. retail sales was 10.7 percent, 9.8 percent up from the corresponding quarter in the previous year. As of that quarter, retail e-commerce sales in the United States amounted to almost 146.2 billion U.S. dollars." (Statista,2019). In China, there are 74.8 percent (i.e., 63.882 millions) users shopping on webs according to the census conducted by China Internet Network Information Center (CNNIC), August 2019. From June 2016 to June 2019, users of online food delivery increased from 14.627 million to 41.744 million. In the first half of 2019, retail e-commerce sales amounted to ￥5.48 trillion, while in 2017, retail e-commerce sales were ￥3.82 trillion (CNNIC, 2019). Since the history of E-commerce is relatively short compared to that of traditional business methods, it still has some problems to be solved. For example, B2C websites lack enough information for buyers, especially detailed images or vivid pictures of the goods to be sold. Security procedure is a more serious factor to be considered. Another problem is related to the copyright of digital image and video works called digital works. Of course, there will be new problems and challenges in the future.

Visual information can be understood easily by a wide range of people, regardless of their educational backgrounds or lifestyles, except for blind persons of course. Broadly speaking, visual information mainly means image information, including images, graphics, animation, video, which belongs to multimedia information., Their processing technologies also include visual surveillance, human-computer interfaces, 3-D video, etc. (BU Electrical & Computer Engineering, 2017). One example is images used in advertisements for products in E-commerce websites. They can be treated as references or mimic reflection of real entity, which is more expressive in showing itself than popular character explanation, especially for residents in rural regions of China and other developing countries. Furthermore, trademarks file to protect the interests of manufactures is another typical use. With the rapid development of computer and telecommunication technologies especially very large scale integrated (VLSI) circuits, hardware integration and miniaturization, liability increases while their prices decrease. Equipment used in visual information collection, transition, storage and display is easier to operate. Recent years have seen more innovations in the application of internet techniques, software tools, visual operating systems and convenient multimedia information interfaces, which has resulted in the steady increase in the use of image and graphics software tools. Therefore, visual information resources extend over a broad domain of life. Besides entrepreneurs and customers, investors and administrators also need them. In the area of usage of image information in EC, where interactive visualization interfaces are used for revealing structures, and navigating an increasingly large and complex amount of data and information, customers demand quick and correct querying, accessing, and information retrieval. However, Nisar & Prabhakar (2017) pointed out that "e-commerce still faces challenges compared with traditional offline retailers since customers cannot feel and try the products, and may end up choosing the products that they do not want"(P.135). Visual information technology will not be a help to EC if the users cannot use it easily and efficiently. Some issues of the application of visual information to EC are discussed in the following sections, which are considered as the technological solutions that may enhance EC.

IMAGES USED FOR GOODS OR SERVICES TRADING

Technologies of image processing and virtual reality (VR) can give the consumers a direct view of goods and a virtual browsing effect. All consumers want a clear look at goods before buying them. When customers visit some websites, usually they want a full view of the product, from all angles. VR modeling language (VRML) is required to construct an exhibiting

hall and goods shelf so that people can see the goods they are interested in in the same way as if they were in ordinary shops. In order to achieve this effect, some software techniques using 3-dimensional image and digitalization are used. 3-dimensional modeling and the production of images and graphical software systems have the ability with good quality. Their reproduction methods give us a vision of an almost realistic realm.

With image processing and VR techniques, personal body movement has the principal role of controlling browsing. The representation changes with the manipulator's action. VR techniques can create a world where the user can get in and move freely. Goods' appearance could be observed from different directions, thus trading in this world avoids some blindness. Geographical information systems combined with 3-dimensional graphics and image navigating presentation skill allows buyers to search for goods rapidly and see them in detail. The following implementation stages are the basic requirements, i.e., model building and indoor scenes that existed or to be constructed; deploying colors with models and its variations; adding illuminations; imposing background scene and colors. Thus, customers can arrive at a user-friendly screen where browsing, selecting, and cashing out are available. Besides selling tickets or offering discounts through its website, a company needs to show images and videos of its facilities, set up online games that relate to and increase its offerings over the Internet (Entrepreneur, 2018). On the other hand, customers want to browse service effects such as home textiles exhibition, fitting and hairstyle, etc. over the Internet. Dealers are trying to use some specialized image software to show the real effects for some online services, as shown in Figure 1, which could be used in EC websites. Visual information processing software used for online services is under way nowadays.
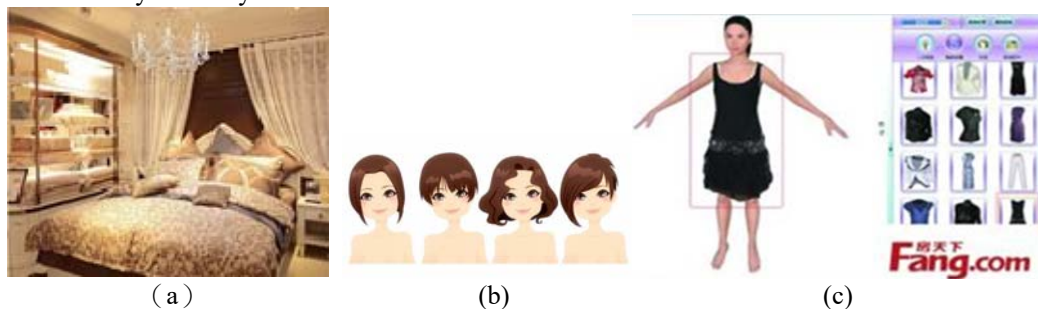

（a）   (b)   (c)

Figure 1 Some applications showing goods exhibition and service effects for (a) home textiles exhibition, (b) hairstyle and (c) fitting

IMAGE PROCESSING TECHNOLOGY FOR E-COMMERCE

Visual Design Used For E-Commerce

Essencially, e-commerce is the buying and selling of goods (or services) on the internet so that the e-commerce platform design for the sellers or business are imortant to thier selling activities. As we all know, the plane design has a broad application in all walks of life and its techniques are essential to design and innovation, involving architecture, advertising, publication, model, etc., especially in the EC environment. Some common image processing design software, such as Adobe Photoshop can modify image, model and form style specification etc.. In fact, there are more than fifty image processing softwares on the internet. Graphic design software in e-commerce design, for example, CorelCAD, Flash, etc. are excellent two and 3-dimensional drawing and design tools which can achieve our goals.

Plane design is necessary to support goods data analysis of EC websites. Who bought your goods? Whom your things are more popular with? What do they like? What about their professional income level? All of these are based on the data statistics that can be targeted to serve their customers with more graphical explanation. The visual design procedures are most significant to connect sellers with would-be buyers who use the Internet to browse their targets.

Instead of converting to real objects, e-commerce websites mainly rely on various electronic advertising screens, such as computer /pad/ mobile phone/TV, etc. Further, the design of some buttons should be very exquisite, which involves the knowledge of experience and emphasizes the interaction between customers and the equipment.

Retrieval Based On Visual Contents In EC

Image retrieval based on visual information can facilitate the customers to know the commodity at distance through communication networks, thus extending the seller's market space. Undoubtedly, researches on the technologies of image and video extraction, processing, rearrangement, organization of formats and displaying impulse the application of visual information retrieval technologies that gradually enter the market as its maturing. With many different kinds of goods available at various websites, buyers want to gain a quick knowledge of the pertinent information about their models and specifications. If retrieval skills allow buyers to go down through interesting scenes to their targets, it would be typically useful in the shopping process. Theoretically, contents-based retrieval extends the concept of the traditional searching mode which is based on text message or expression formula. If websites were facilitated both the content-based and text-based approach, they would be superior to querying with single text-based mode. Also it improves interaction with customers' feedback.

APPLICATIONS OF IMAGE RECOGNITION FOR TRADE SAFETY

After the buyers select satisfactory goods, payments are due to the sellers. Therefore, ensuring the trading security, especially of the online transactions, is the next essential task for EC. The main concern of customers while buying goods from the online markets is the same safety and reliability as ordinary market trading. It usually involves two aspects: the genuineness of advertised products, and the safety of personal payment.

Currently, the conventional processing methods include using an algorithm of encrypting and deciphering such as DES and RSA, digital signatures depending on the certificates issued by some reliable organizations. They are acquired and recognized before data exchanging. From a theoretical point of view, these measures could meet the requirements for safety and validity to some extent. However, with the rapid evolution of EC, there appear a lot of hidden safety and reliability issues in practice. For example, the data on a credit card and the sensitive information could be embezzled occasionally. According to a report released in (CNNIC, 2017), there have been discovered more than 40.3% shopping frauds out of all online frauds in China. Because encrypting and deciphering algorithms have some shortcomings themselves, they somewhat hinder the further promotion of EC until they overcome the above weaknesses. The alternative considerations are taken in the user-proof scheme in case of illegal accessing happened. Automatic face recognition has a great potential in security system access control, video surveillance, face photos matching for law enforcement and duplicate ID card detection. The biometrics-based algorithms involve verifying the identity of a specific person based on behavioral or physiological aspects of activities that occur on a computing device. This is mainly because of its flexibility and simplicity to use besides its safety. The end users can log in by pressing your finger or swiping your face without even spending much time to remember long and difficult passwords. Microsoft's Hello and apple's Face ID are two popular applications that the future of authentication lies in biometrics. Currently, ten different biometrical features i.e. DNA, face, fingerprint, hand geometry, hand vein, iris, retinal pattern, signature, voice-print, and facial thermogram, are under intensive investigation. These are inherently more reliable than traditional authentication methods such as passwords and PIN numbers. Each of the biometric-based techniques has various advantages and disadvantages (Rani & Saurabh, 2014). Properties comparisons among several biometrical features used in practice that are listed in Table 1.

Of course, people cannot just rely on biometric features, otherwise there will be confronted with the problems of password verification systems again. Moreover, in the case of biometric authentication, if users' fingerprints or facial features are stolen, there is no way to use longer such system for authentication. More recently, Kittur & Pais (2017) investigated verification of digital signatures for the purpose.

Table 1: depicts the properties rank of several biometrical features used in real world applications.

Rank	Exactness	Convenience	Cost	Integration Level
1	Deoxyribonucleic Acid(DNA)	Face	Signature	Finger-print
2	Iris	Signature	Finger-print	Face
3	Retinal pattern	Finger print	Face	Signature
4	Finger-print	Iris	Iris	
5	Face	Retinal pattern	Retinal pattern	Iris and Retinal pattern
6	Signature	DNA	DNA	DNA

PROTECTIONS OF COPYRIGHTS OF DIGITAL WORKS
Copyrights Of Digital Works And Digital Watermarking
With the progress in design and development of new input devices in computer, various forms of information with the original format such as articles, images, speeches, etc. can be easily input and output in the form of binary codes. However, when there is a need to the original form of information, they could be reformed again using the corresponding technique. Digital works include digital content of online books, graphics, films and TV videos, photos, paints (Chen & Liao, 2011) and computer games, virtual items purchased within computer games, computer software, mobile phone apps, etc. (Businesscompanion, 2015). Usually, they are transmitted or shared on websites, and, ovbiously, exposed to unauthorized attacks such as forgery, plagiarism, and tampering (Halbheer, Stahl, Koenigsberg, et el., 2014). So, it is obvious that ownership of digital contents is an important issue in information management systems. The main reason for the engagement of users with the E-commerce technology depends on safety system level, safety code and safety perfectness. Protection of intellectual property of digital contents has become crucial in the widespread and rapidly growing use of digital media.

To solve such problems, digital watermarking has received much attention from academia and industry researchers for addressing the copy tracking, copyright protection, and content authentication recent years. Digital watermarking is the process "that embeds data called watermark into a multimedia object (such as text, audio, image and video) such that watermark can be detected or extracted later for affording an assertion about the watermarked object" (Jane, Elbaşi & İlk, 2014. P.750). However, it is not enough to merely hide information within digital works. How to justify the copyright claim without revealing any secret information and prevent the owner from deception is a central issue in the ownership disputes. Researchers have proposed some feasible schemes of proving ownership, in which performance has improved. Asymmetric watermarking schemes, zero-knowledge watermark detection and so on are studied (Chang, Tsai & Yen, 2016;Ansari & Pant, 2017). For digital watermarking, a number of different characteristics of the watermarking process and the watermark are desirable.

Anti-Counterfeiting Trademark Image

A trademark is a pattern formed by combining letters, numbers, graphics, text, colors and three identifying characteristics in commodity packaging and service marks.It is a microcosm tailored to the image of an enterprise or the commodities it produces and manages at the very beginning, which can show the name of the enterprise or commodity, the geographical location of the enterprise and even the enterprise culture. As commodities from all walks of life appear in the market one after another and are constantly upgraded and optimized, the competition on brands is also increasingly fierce. In order to consolidate or win a larger market share and prevent competitors from imitating themselves, many high-quality old brands and emerging creative brands have optimized their trademarks.The appearance of digital watermarking anti-counterfeiting technology, to some extent, not only can make trademark copyright holders get better protection, but also can enhance users' trust and dependence on enterprise products, maintain users' market share and enterprise's economic image.

In brief, the making process of the digital watermark anti-counterfeiting trademark is the anti-fake information (product serial number, production date, origin or enterprise information, etc.) through the HASH function to calculate the HASH value, and the use of digital watermarking processing system will be embedded in the trademark in the electronic design manuscripts, after workers check can be put into print production (Zhu &Zhong, 2004). In the process of market circulation, when consumers or supervisory departments find suspected counterfeit products, they can verify the trademarks through specific trademark watermark detector, so as to distinguish genuine products from fake products.

Watermarking Of Videos

Video image data has a strong correlation, meaning that there exist a large amount of redundant information. To reduce the redundant data from video files, the data compression technology is used to remove the correlation between data). Currently, the most important codec standards of video streaming are H.264, H.265 and HEVC. H.265 is the new video coding standard developed by ITUT-T VCEG based on H.264(Dutta & Gupta, 2017. As for compressed domain processing, Hartung and Girod (1998) pointed out that even though many applications for watermarking of compressed video, it is desirable property if uncompressed video could compatibly be watermarked without having to encode it first, as shown in Figure 2.
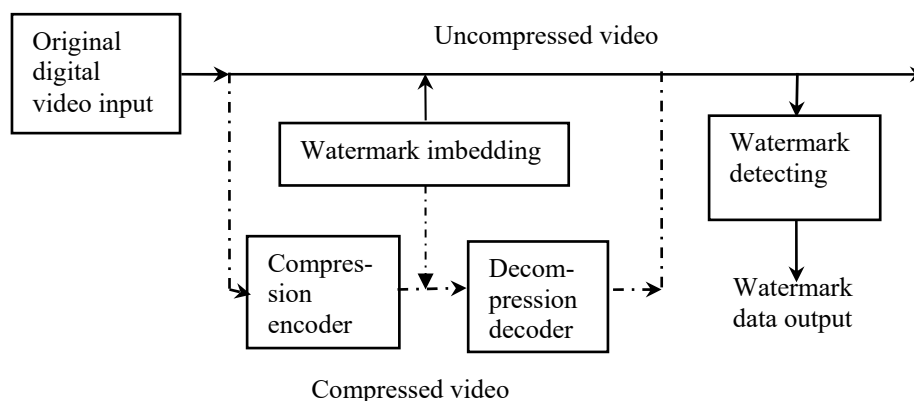

Figure 2. Diagram of watermarking in the uncoded and coded domain of videos.

The watermark signals are designed to embed in some areas of video frames to benefit the video stream server, including decoding, processing and re-encoding. In order to get a better effect in watermark embedding for copyright protection, some other researchers use the characteristics of the human visual system as well as the inherent characteristics of a video in the frequency domain, with the help of some mathematical transformations and the latest multimedia communication technology (Subramanyam & Emmanuel,2014; Selvam, Balachandran, Iye, et.al., 2017; Al-Haj, Farfoura & Mohammad, 2017).

CONCLUSION

The information technology revolution is not only changing the production and operation mode in modern industries and tertiary industries, but also changing the traditional commercial modes in cities and rural regions. In this paper, visualization, i.e. the application of image and video together with artistic character graphics to EC is discussed. As long as many websites use the above information in the services, individuals will get more profit from these advanced information technologies.

Therefore, digital visual information plays a very important role in E-Commerce, tourism and restaurant, hotel, etc. Moreover, their usage brings forth many novel research topics for digital visual information processing skills and software. More attention should be paid to the research of more image techniques such as multimedia, Human–Computer Interaction, AI and so on in the EC field in order to ensure the healthy and rapid development of the art. Our further concerns in this field are to promote more application of images and videos in agricultural E-commerce and better interaction with customers' feedback.

ACKNOWLEDGMENT

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