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Multi-faceted assessment of trademark similarity

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ABSTRACT

Trademarks are intellectual property assets with potentially high reputational value. Their infringement may lead to lost revenue, lower profits and damages to brand reputation. A test normally conducted to check whether a trademark is highly likely to infringe other existing, already registered, trademarks is called a likelihood of confusion test. One of the most influential factors in this test is establishing similarity in appearance, meaning or sound. However, even though the trademark registration process suggests a multi-faceted similarity assessment, relevant research in expert systems mainly focuses on computing individual aspects of similarity between trademarks. Therefore, this paper contributes to the knowledge in this field by proposing a method, which, similar to the way people perceive trademarks, blends together the three fundamental aspects of trademark similarity and produces an aggregated score based on the individual visual, semantic and phonetic assessments. In particular, semantic similarity is a new aspect, which has not been considered by other researchers in approaches aimed at providing decision support in trademark similarity assessment. Another specific scientific contribution of this paper is the innovative integration, using a fuzzy engine, of three independent assessments, which collectively provide a more balanced and human-centered view on potential infringement problems. In addition, the paper introduces the concept of degree of similarity since the line between similar and dissimilar trademarks is not always easy to define especially when dealing with blending three very different assessments. The work described in the paper is evaluated using a database comprising 1400 trademarks compiled from a collection of real legal cases of trademark disputes. The evaluation involved two experiments. The first experiment employed information retrieval measures to test the classification accuracy of the proposed method while the second used human collective opinion to examine correlations between the trademark scoring/rating and the ranking of the proposed method, and human judgment. In the first experiment, the proposed method improved the F-score, precision and accuracy of classification by 12.5%, 35% and 8.3%, respectively, against the best score computed using individual similarity. In the second experiment, the proposed method produced a perfect positive Spearman rank correlation score of 1.00 in the ranking task and a pairwise Pearson correlation score of 0.92 in the rating task. The test of significance conducted on both scores rejected the null hypotheses of the experiment and showed that both scores correlated well with collective human judgment. The combined overall assessment could add value to existing support systems and be beneficial for both trademark examiners and trademark applicants. The method could be further used in addressing recent cyberspace phenomena related to trademark infringement such as customer hijacking and cybersquatting.

1. Introduction

Trademarks are valuable intellectual property (IP) assets that identify the commercial source or origin of products or services. They are visual signs in the form of logos or brand names that allow goods or services to be easily recognized and distinguished by consumers. Similar to other intangible company assets, trademarks can be subject to legal protection. Trademark registration through an IP office provides legal protection for companies and individuals on registered marks in the jurisdiction(s) that the registration office covers. It therefore provides legal certainty and underpins the right of the trademark owner.

Trademark infringement is a form of IP crime that may lead to lost revenue, lower profits and additional costs, such as the legal fees necessary to enforce a trademark. In addition, trademark infringement is time-consuming when enforcing rights and, perhaps

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more importantly, can lead to severe damage of brand reputation. Recent statistics show that trademark infringement has become a serious economic and legal issue. For example, the United States International Trade Commission, as reported by the Chairman of the Joint Economic Committee, stated that the number of investigated infringement cases rose from the year 2010 to 2011 by 23.2%. A total of 3400 trademark infringement cases were filed in the US District Courts in 2012, which excluded a presumably even larger number of cases where settlements were reached prior to the filing of cases (Scott, 2013). Some of the reported cases involve new cybercrime phenomena such as customer hijacking and cybersquatting (Scott, 2013). In another investigation conducted by the US International Trade Commission in 2011, the average annual increase of trademark litigation cases concerning US-based companies from 2002–2011 was 39.8% (US International Trade Commission, 2011). Despite these alarming trademark infringement statistics, the number of newly registered trademarks together with the existing trademarks used in the market continues to grow (Dodell, 2013; Office for Harmonization in the Internal Market [OHIM], 2012). This trend, which has been observed worldwide, has recently created administrative problems for many trademark registration offices as the registration process has become more complex and lengthy.

The trademark registration process includes a trademark similarity examination (OHIM, 2014), which requires a multi-faceted similarity assessment. One of the steps involved is making sure that the trademark to be registered is not similar to any trademark that has already been registered, as the registration of trademarks that are found to be identical or similar to any existing trademarks and provide identical or similar goods or services may potentially be opposed, as indicated in Section 5 of the Trade Marks Act 1994 (Trade Marks Act, 1994). This is important in order to avoid infringements and protect the rights of existing registered trademarks.

The current practice of examining trademark similarity generally involves a search to retrieve relevant trademarks from a very large trademark database on the basis of a specific type of similarity. For example, the Industrial Property Automation System (IPAS), a support system developed by the World Industrial Property Organization (WIPO), provides three trademark search options, namely a bibliography search based on the filing date and registration number, a phonetic search based on phonetic rules and common prefixes and suffixes, and a logo search based on the Vienna classification code for figurative trademarks (WIPO, 2014).

The research in this paper is motivated by the guidelines in the trademark examination manual, which require overall similarity assessment. From a theoretical point of view, the paper contributes to the body of knowledge in the area of intelligent human-centered decision support and in particular the use of fuzzy logic and semantics in complex evaluations and assessments related to infringement and the likelihood of confusion. Previous research has addressed some of these aspects to a certain degree. For example, the need to consider many facets or aspects in complex evaluations has been recognized by a number of researchers working in various domains. Many of them employ fuzzy logic, which is a particularly suitable reasoning technique in domains where the selection of the best alternative is highly complex and the judgement is based on subjective perceptions (Mardani, Jusoh, & Zavadskas, 2015). For example, a knowledge evaluation method aimed at estimating the quality of knowledge and its market value uses fuzzy logic to aggregate several aspects including knowledge complexity, marketable value, and the reputation of the knowledge supplier (Chen, 2011). Fuzzy numbers are also used to calculate the value of a patent and the chance of mitigation (Agliardi & Agliardi, 2011), which similar to quality of knowledge in the above example, are also parameters very difficult to measure objectively. Semantics and fuzzy logic are employed in group decision making (Gupta & Mohanty, 2016), consensus building (Li, Liu, & Li, 2017), opinion mining and knowledge management (Li, Liu, & Li, 2011).

Table 1
Different type of trademark similarity.

Trademark 1	Trademark 2	Similarity aspect
NEXT	NEST	Visual
MAGIC TIMES	MAGIC HOUR	Conceptual
SVIZZEROTALER	SWISS TALER	Phonetic

This paper offers an original approach to the problem of trademark infringement, which is based on multi-facet assessment and verified through human judgement. The proposed computational method for assessing trademark similarity employs multi-faceted evaluation of the three main aspects of trademark similarity: visual, semantic and phonetic. In particular, semantic similarity is a new aspect which has not been considered in any previous approaches aimed at developing decision support systems for trademark similarity assessment. Therefore, the specific scientific contribution of this paper is the innovative integration, using a fuzzy engine, of three independent assessments, which collectively provide a more balanced view on potential infringement problems. The combined overall assessment could add value to existing support systems and be beneficial for both trademark examiners and trademark applicants.

The rest of the paper is organized as follows: The next section provides an overview of existing trademark search systems and briefly discusses fuzzy logic, the inference concept employed in this research. The proposed computational method is introduced in Section 3. Section 4 describes the experimental setup and presents the results. A discussion is provided in Section 5. Section 6 concludes the study.

2. Related work

This section reviews related work in the scope of this study. It consists of two subsections. The first subsection reviews existing trademark search systems, and the second subsection briefly discusses the concept of fuzzy inference, which inspired the development of the proposed method for the multi-faceted assessment of trademark similarity.

2.1. Existing trademark search systems

Table 1 shows examples of trademarks with different types of similarity: visual, semantic and phonetic. The trademark pair NEXT and NEST possess some degree of visual similarity due to the total number of letters and the number of identical letters used. In addition, although NEXT is a figurative trademark, its style/font is similar to the typeface font of the trademark NEST, which contributes to the visual similarity between them. The second pair, MAGIC TIMES and MAGIC HOUR, are semantically similar due to the identical word that they share and the lexical relation between the non-identical words in the trademark text. The last pair, i.e. SVIZZEROTALER and SWISS TALER, are phonetically similar because although these trademarks are spelled differently, their pronunciation is similar.

Many trademarks share more than one type of similarity; however, despite the existing variety in the types of similarity, most of the research in this area is focused on retrieving trademarks based on their visual similarity using low-level features. Examples of such systems include TRADEMARK (Kato, Fujimura, & Shimogaki, 1990), STAR (Wu, Lam, Mehtre, Gao, & Narasimhalu, 1996) and ARTISAN (Eakins, Shields, & Boardman, 1996), which have been