Recommending Rating Values on Reviews for Designers

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INTRODUCTION

Nowadays, e-commerce Web sites host a large amount of online reviews. Rich information is provided in online reviews. Designers benefit from this information to gain customer requirements. However, there are a large number of online reviews. It makes designers difficult to digest reviews efficiently. In the past few years, many researchers in computer science study how to analyze online reviews. This is known as sentiment analysis. However, state-of-art algorithms fail to point out how to use these efforts in improving product design. Moreover, before discussing about how to utilize online reviews, the quality of online reviews should be concerned since the quality of these reviews is often inversely proportional to the size of its membership (Otterbacher, 2009). From the viewpoint of different product designers, without an evaluation guideline, a review is highly possible to be rated as a useless one according to his or her design requirements, although it is recommended by many other designers. For example, one review complains about the weight and size problem of iPad and some reasons are provided. It might highly be possible to be recommended. However, this one might be also deemed as useless by battery designers because they only care about reviews about battery problems. To a particular review, designers may have different understandings from own perspectives. How to recommend rating values of online reviews from a personal perspective of a product designer is an interesting question, and this is the major focus of this chapter.

In our latest research work, the helpfulness of online reviews was defined, evaluated and predicted (Liu et al., 2013). An exploratory study was conducted for a better understanding of consumers. In this exploratory study, the helpfulness of a particular review was evaluated by whether it is helpful for product design. Two questionnaires were then distributed to understand about why some reviews were rated as so. The prediction of helpfulness of online reviews was modeled as a regression problem. Also, one conclusion in this research is that the helpfulness of online reviews, from the perspective of general product designers, can be evaluated by domain-independent features only, without a significant loss if product features are neglected. Based on this work (Liu et al., 2013), this chapter concentrates on how to recommend rating values of online reviews for a product designer. It is a different research problem, compared with the previous one. The motivation of this chapter is to find high quality online reviews which meet the design requirements of different designers. Interesting phenomena from the exploratory study contribute to model the problem.

The contributions of this chapter are at least three folds. Firstly, a recommendation method for rating values of online reviews from a personal perspective of a product designer is suggested. The recommendation method takes account of

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the requirements of different product designers, rather than regarding the rating values of online reviews as the same single numerical value. Secondly, the recommendation is developed based on both a generic aspect and a personal one. Three categories of domain-independent features are utilized to model the helpfulness of online reviews in the generic aspect, while product features are utilized to model the preference in the personal aspect. Thirdly, 1,000 phone reviews were selected from Amazon.com and the proposed method is employed to recommend the rating values of online reviews. The effectiveness of the method is evaluated by comparing the real evaluations from designers, which demonstrates the possibility to recommend rating values of online reviews from a personal perspective of a product designer automatically.

BACKGROUND

Sentiment Analysis

Generally, existing research publications in sentiment analysis are categorized into several types, namely, sentiment identification, sentiment extraction, opinion retrieval, opinion spam detection, etc.

Hu and Liu (2004b) proposed a method to identify customer sentiments from online reviews. The basic idea is to identify a noun word and its nearest adjective which is often assumed as the opinion word. An iterative training method was proposed to boost the sentiment classification at the sentence level (Zagibalov & Carroll, 2008). The two categories of tasks in sentiment extraction are opinion target extraction and opinion holder extraction. An association mining algorithm was developed to generate a set of frequent nouns or noun phrases (Hu & Liu, 2004a). These nouns or noun phrases were regarded as possible opinion targets. A Maximum Entropy ranking algorithm was proposed to learn the syntactic features and find opinion holders (Kim & Hovy, 2005).The critical question of opinion retrieval is how to balance the topic relevance score and the opinion relevance score. A word-based model was proposed for opinion retrieval (Zhang & Ye, 2008). In this model, the Bayesian method was utilized to design a generic method to express the opinion relevance score, and then, the topic relevance score was linearly combined for opinion retrieval. Word-based models were argued that they failed to capture the associations between the opinions and the corresponding targets and, some topic-based models were proposed (Li et al., 2010). Spam activities are found to be widespread. Utilizing the fact that duplicate reviews are almost certainly spam reviews, a spam detection model was built to analyze harmful reviews with untruthful opinions (Jindal & Liu, 2008).Three different methods, namely, genre identification, psycholinguistic deception detection and text categorization, were compared in order to find fictitious reviews (Ott et al., 2011). There also exist some studies to identify irony customer reviews (Reyes & Rosso, 2012).

Online Reviews for Product Design

Although the value of online reviews is widely accepted, it just starts to attract researchers in the design area.

An integrated text mining system, where online reviews were integrated with the domain knowledge, was reported on knowledge discovery and management in product design (Liu, Lu, & Loh, 2007). Similarly, an unsupervised, domain-independent method was also developed to generate a product specific ontology for engineering characteristics from customer reviews (Lee, 2007). Also, a graphical model was also adopted to extract the relationship between competing products from customer reviews (Xu et al., 2011). By analyzing the topic structure of online reviews, some models were proposed to discover important topics in customer needs (Zhan, Loh, & Liu, 2009). To explore the relationship between the customer reviews and the review ratings, a system was seen to be developed using the rough set theory, the inductive rule learning, and several information retrieval methods (Chung & Tseng, 2012).