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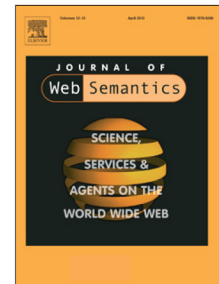
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Towards a Sales Assistant using a Product Knowledge Graph

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Abstract

The phenomenal growth in the consumer electronics industry over the last decade is mainly due to rapid advances in integration technologies. The market is ever evolving with new products made available on a frequent basis. However, typically, the average consumer tends to have insufficient knowledge of the features and functions of an electronic device. Although most manufacturers provide product specifications, they are often difficult for consumers to understand and it is hard for customers to grasp the details of a product. This study introduces the concept of a product knowledge graph, which is constructed by transforming a set of data from a product management system and external data. This study overcomes the technical barriers for customers with the use of knowledge graph technologies. To construct large-scale product knowledge, an ontology model is designed and a platform for knowledge extraction and transformation is also developed. Then, a sales assistant called *God of Sales* is demonstrated. This study provides a novel approach to explaining product features and functions in a comprehensive manner with semantic recommendations.

Keywords: Product knowledge, Knowledge graph, Knowledge base, Ontology

1. Introduction

In the last decade, we have witnessed a sharp increase in the availability and use of electronic devices such as smart phones, televisions, video game consoles, refrigerators, and computers [10]. According to the Consumer Electronics Association (CEA), total industry revenues would grow 2% to \$211.3 billion in 2014 and another 1.2% in 2015 [19]. This implies that electronic devices have become an integral part of our daily life.

However, in parallel with the increased use of electronic devices, there has been a shift toward a poorer understanding of device technical characteristics. Recently, many electronic products tend to combine functionalities. For example, smartphones have complemented some of the functionalities of digital cameras, camcorders, and GPS navigation devices. The problem that arises is that an average customer may find it difficult to understand various technical characteristics of electronic devices although most manufacturers provide well-defined product specifications.

Consider the simple question: Can I watch a movie on TV that is downloaded to a smartphone? To obtain the right answer, we need to understand the technical

details of the smartphone and the TV along with their capabilities. For example, both devices are enabled to support either mobile or wired connectivity. In fact, MHL and HDMI are essential for communication between mobile phones and TVs. From a customer perspective, there are some barriers to understanding this technology although a product specification may provide some hints such as “MHL support.” However, customers should understand: 1) what is MHL, 2) the functions and capabilities of MHL, or 3) the details of MHL (e.g., each version may have different capabilities such as MHL 1.0 versus MHL 2.0). The greater the amount of technical background a consumer needs, the more difficult it is to understand a certain device. This study introduces a solution for this problem using Semantic Web and knowledge graph technologies.

The remainder of this paper is structured as follows: Section 2 discusses retail assistants and some ontology vocabularies that represent product domains. Section 3 introduces knowledge graphs and discusses a product knowledge model with a formal model. Section 4 describes knowledge graph transformation, which uses linked data technologies. In Section 5 and Section 6, *God of Sales* (GoS) is demonstrated and discusses the

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