

An ontology-based approach to model qualitative world knowledge extracted from product reviews for use in QA systems

Thomas Huber

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General idea

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Related work

Summary

- ▶ For a category of products find out which specific features each **individual** product has and how good the feature is *for that specific product*
- ▶ Store the information in an RDF ontology
- ▶ Use the stored information to answer queries about specific products such as: *Which drills are best for wood?*

- ▶ The reviews needed will be scraped by me from Amazon.com
- ▶ The product category will be *drills*
- ▶ Technical products / machines have a lot of features and generally a lot of reviews
- ▶ I am aiming for a few hundred specific products to get nice results, but the system would work with less or more reviews

Ontology building

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- ▶ The extracted information (which specific product has which feature and the score for that feature) will be modeled in RDF
- ▶ `:someDrill :hasFeature :someFeature .`
- ▶ `:someFeature :hasLabel "charger" .`
- ▶ `:someFeature :hasScore 3.0^^xsd:double .`
- ▶ The model will be extended with WordNet definitions

Ontology building - Example

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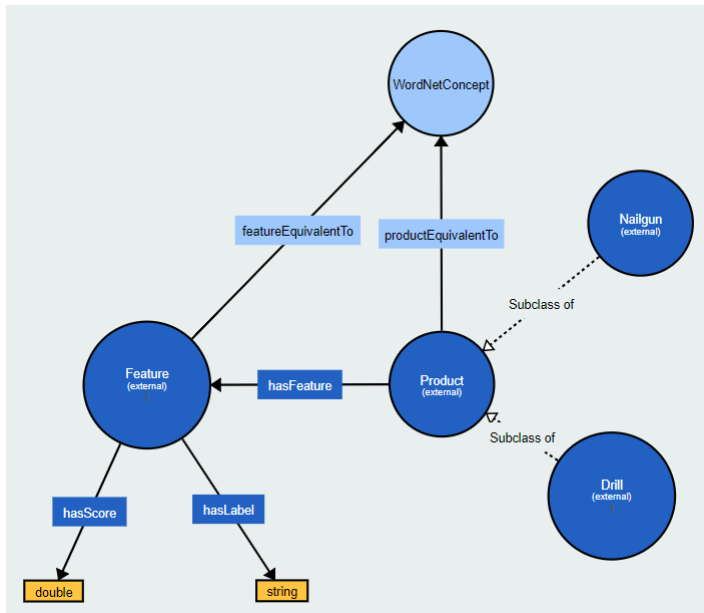
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- ▶ **Which drills make the cleanest holes?**
- ▶ *make_holes* is the action
- ▶ *drill* is the category of products
- ▶ use a graph similar to the WordNetGraph described in "Recognizing and Justifying Text Entailment through Distributional Navigation on Definition Graphs" [Silva et al.(2018)Silva, Freitas, and Handschuh] to find everything that can make holes or be used to make them
- ▶ search a path between the extracted features and *make_holes* and then check which specific products have a high score for features that have a path

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- ▶ "Effective Collaboration in Product Development via a Common Sharable Ontology"
[Mostefai et al.(2005)Mostefai, Bouras, and Batouche]
An ontology over individual parts of a product as part of product development. Could be extended by my data to find out which individual parts belong to features the users do not like to replace or improve them.

Related work II

- ▶ Informed Recommender: Basing Recommendations on Consumer Product Reviews [Aciar et al.(2007)Aciar, Zhang, Simoff, and Debenham]
- ▶ This system processes reviews of individual products and uses sentiment analysis and machine learning to find out which features the users like and dislike
- ▶ Uses the extracted information to recommend products, but does not make use of text entailment to answer queries
- ▶ The features have to be defined by hand and for each category training their classifier is required
- ▶ However it takes into account the skill level of the reviewer to adjust the score
- ▶ As future work, the skill level consideration part of this system could be incorporated into my system to adjust the scoring

Related work II

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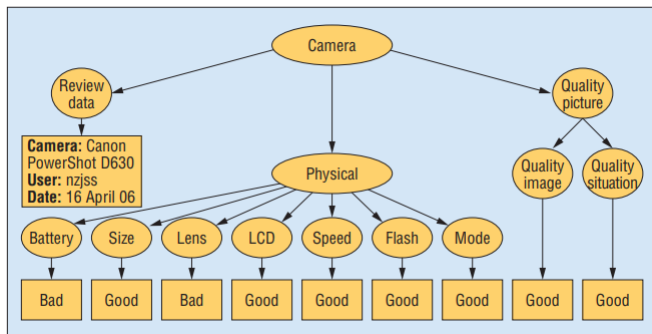


Figure: Taken from [Acıar et al.(2007)Acıar, Zhang, Simoff, and Debenham]

Related work III

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- ▶ "Using WordNet-based Context Vectors to Estimate the Semantic Relatedness of Concepts"
[Patwardhan and Pedersen(2006)]
- ▶ Uses WordNet definitions to find relatedness between concepts
- ▶ Can be used to augment queries: For example, "drill" and "saw" might have a high relatedness, if drills are good for a certain recommendation, saws might be too.
- ▶ Possibly useful in the future when more than one category is added to the system

- ▶ "Recognizing and Justifying Text Entailment through Distributional Navigation on Definition Graphs" [Silva et al.(2018)Silva, Freitas, and Handschuh]
- ▶ The definition graphs can be used to find relevant product categories when the category is not clear: "What is best to make a hole in wood?"
- ▶ Things that can cut holes would be scissors, drills or saws, but only drills are good here
- ▶ → Find a path between "make_hole" and product categories containing "wood" in the path
- ▶ Theorem: **Product X** has a high score for **some feature**.
- ▶ Hypothesis: **Product X** can be used to cut holes in wood.

- ▶ I will build an ontology containing product specific qualitative knowledge about certain features.
- ▶ The ontology will be augmented with WordNet definitions to allow question answering in the context of recommending products.
- ▶ "What is best to make a hole in wood?"
- ▶ With text entailment and WordNetGraphs from [Silva et al.(2018)Silva, Freitas, and Handschuh] we can find that drills can do this, but not which drills specifically.
- ▶ Using my ontology specific products can be identified as being particularly good for certain, specific tasks.

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2018.