

Few researchers [24, 17] have proposed the use of ontology to establish similarity between products in terms of their contents, primarily to alleviate the cold start problem. A person is said to be well dressed, when the visual properties of the dress chosen, blend well with the visual properties of her personality in context of an occasion. Fashion ontology needs to capture the relations between different classes of garments, user personalities and occasions of wear. The recommendation system is aimed at delivering complement garments to the user by making use of ontology driven approach.

3. DESIGN METHODOLOGY

The Ontology-based Recommender System Framework is shown in figure 1. This framework considers certain manual parameters and assists users in suggesting appropriate outfits based on probabilistic reasoning schemes. The study targets e-commerce users, with specific demographics and fashion apparels divided into different gender categories.

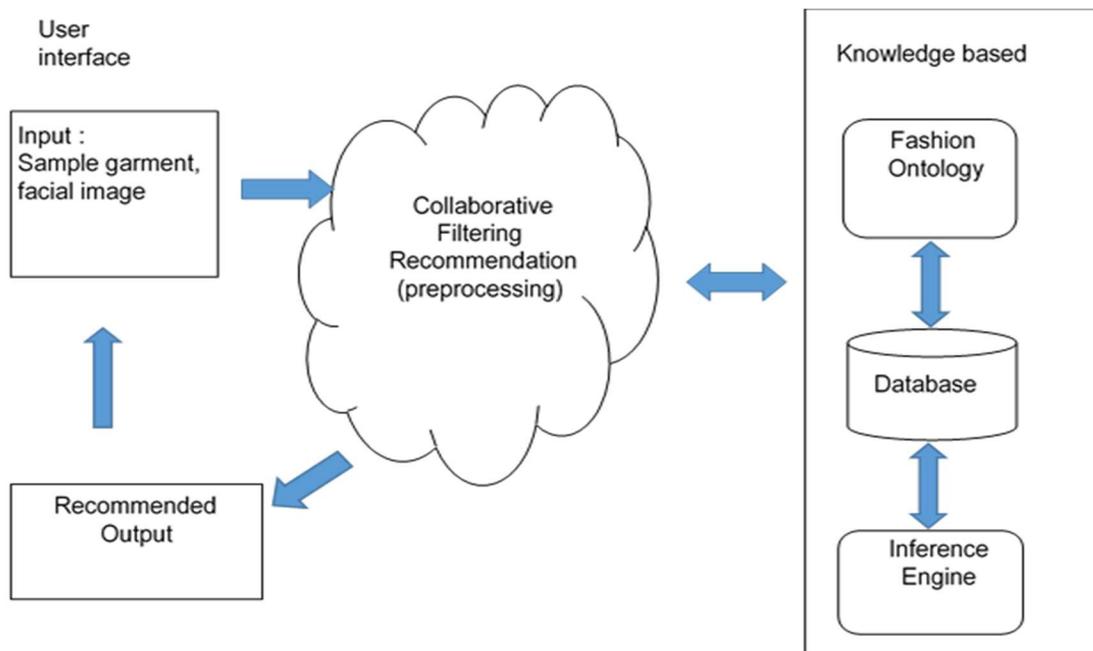


Fig.1 : Ontology-Driven Collaborative Filtering Recommender Framework

The framework consists of the following parts:

- i. User interface: Initially the system gathers the following inputs from the user - an image of a same garment and user facial image. These inputs are collectively considered to identify the context and to determine the user's color, season, traits that are passed to the next phase for reasoning. Recommended Output: The complement garments that best pairs up with the input garment and visual personality.
- ii. The Web-based system: Here, the collaborative filtering algorithm is employed on the preprocessed input.
- iii. Recommendation Engine: This module of the system framework is responsible for reasoning and recommendation. In this phase, the media attributes of garments were extracted such as color, pattern which helps in recognizing the kind of a garment.

The recommendation engine for facilitating recommendation further utilizes these media features.

- a) Knowledge Base: To represent the knowledge corresponding to the garment domain, an ontology has been constructed using OWL.
- b) Reasoning and Inference: The image features and user attributes were mapped to the ontology concepts. The belief corresponding to the concepts then propagates in the Bayesian method that helps in recognizing the concept.

The fashion ontology is modeled using the Ontology Web Language (OWL) and is visualized in the ontograf in figure 2.

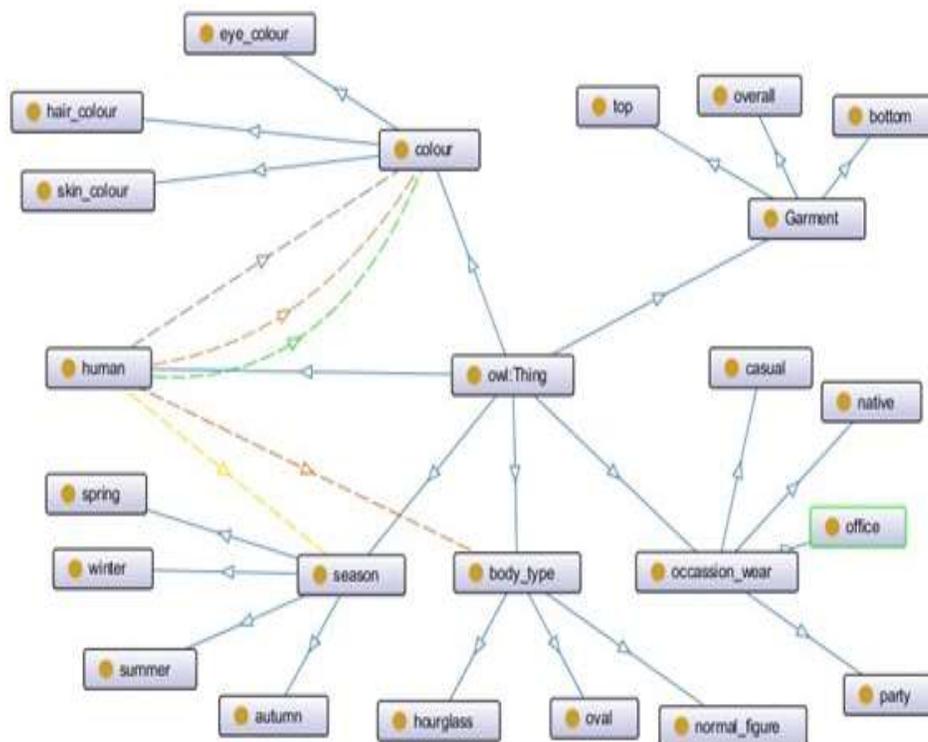


Figure 2: Fashion Ontology

4. ONTOLOGICAL REASONING FOR FASHION RECOMMENDATION

Upon running the Protégé Editor and loading the Ontology, Axiom Metrics and Classes in the fashion ontology are used for reasoning with the “reasoner” in the development tool. The following Plugins were installed in the Protégé to increase the features of the design environment:

VOWL (Visual Notation for OWL Ontologies): This is a plugin that is used to visualize the ontology and outlines classes and subclasses.

Pellet: This is an OWL-DL “reasoner” that can be used to run queries and carry out inferences.

Figure 3 shows the concepts or entities creation in the fashion ontology.

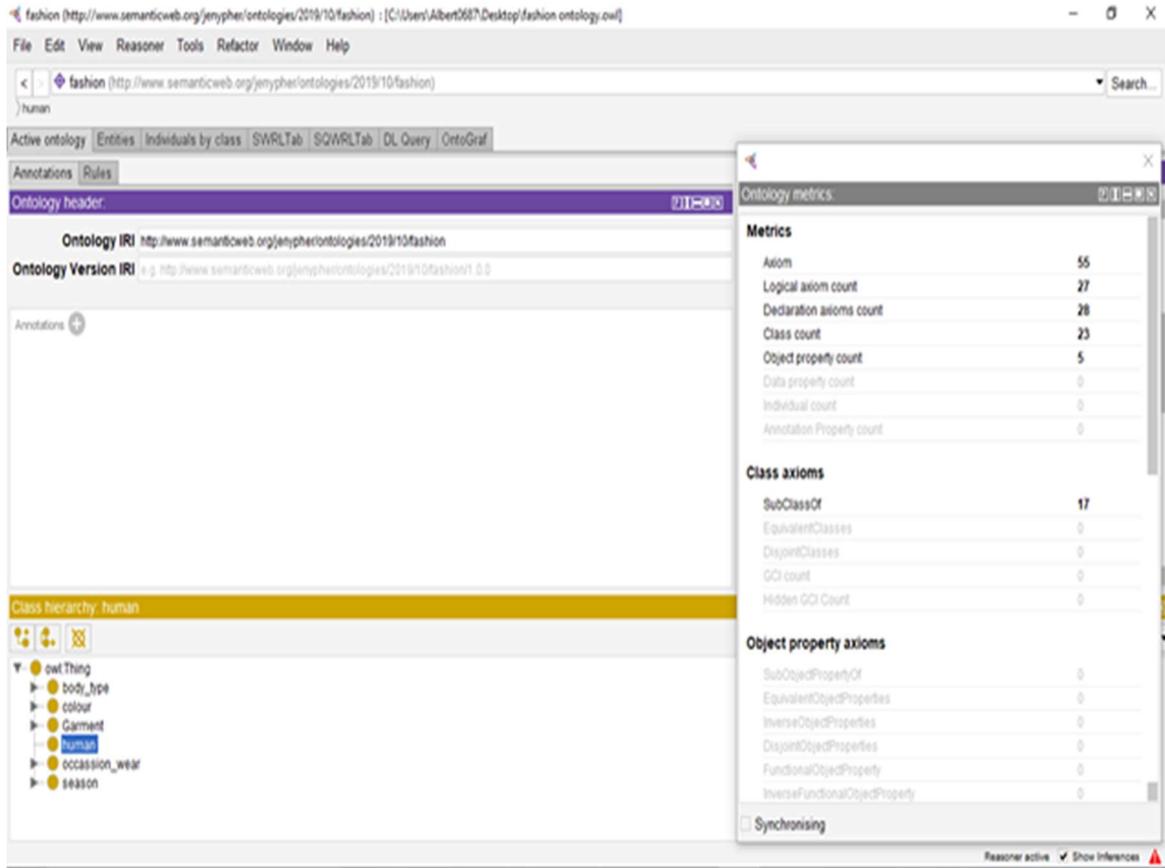


Figure 3: Building Entities in Fashion Ontology

Attributes:

- Garment (top, bottom, overall)
- Body type (oval, normal figure, hourglass)
- Color (eye color, skin color, hair color)
- Occasion wear (party, office, casual, native)
- Season (summer, winter, spring and autumn)

Relationship: “Is a”, “Has” or “Feature of”.

The fashion ontology classes are built under the “OWL Thing” base class. Some of the classes have subclasses and some instances as shown in figure 4 and 5. The properties (attributes) of an instance used for reasoning in the ontology include season, color (hair color, skin color, eye color) and body as shown in the Object Property display in figure 6.

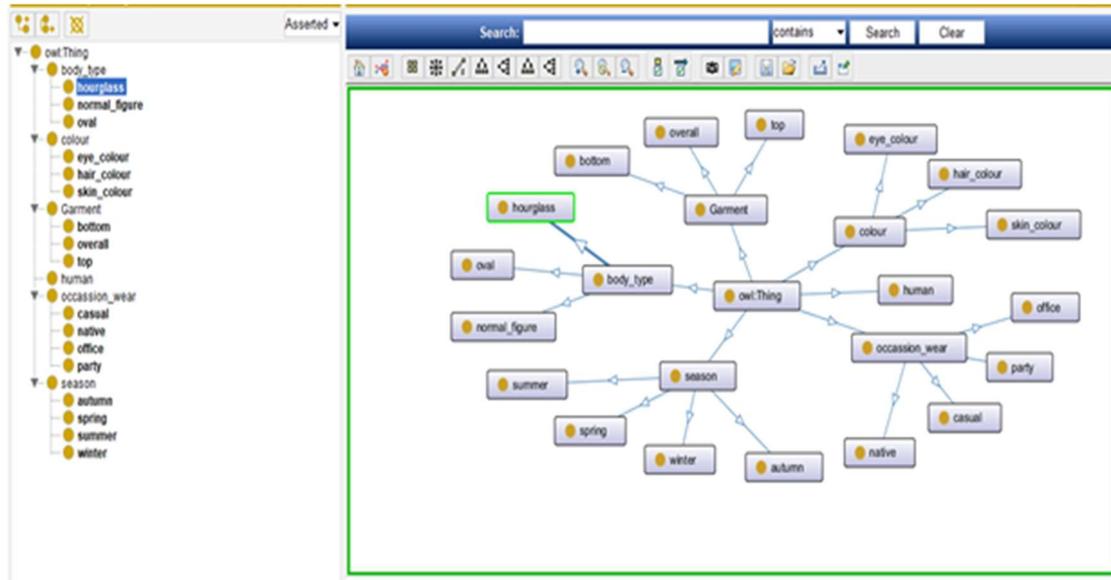


Figure 4: Classes and Subclasses in Fashion Ontology

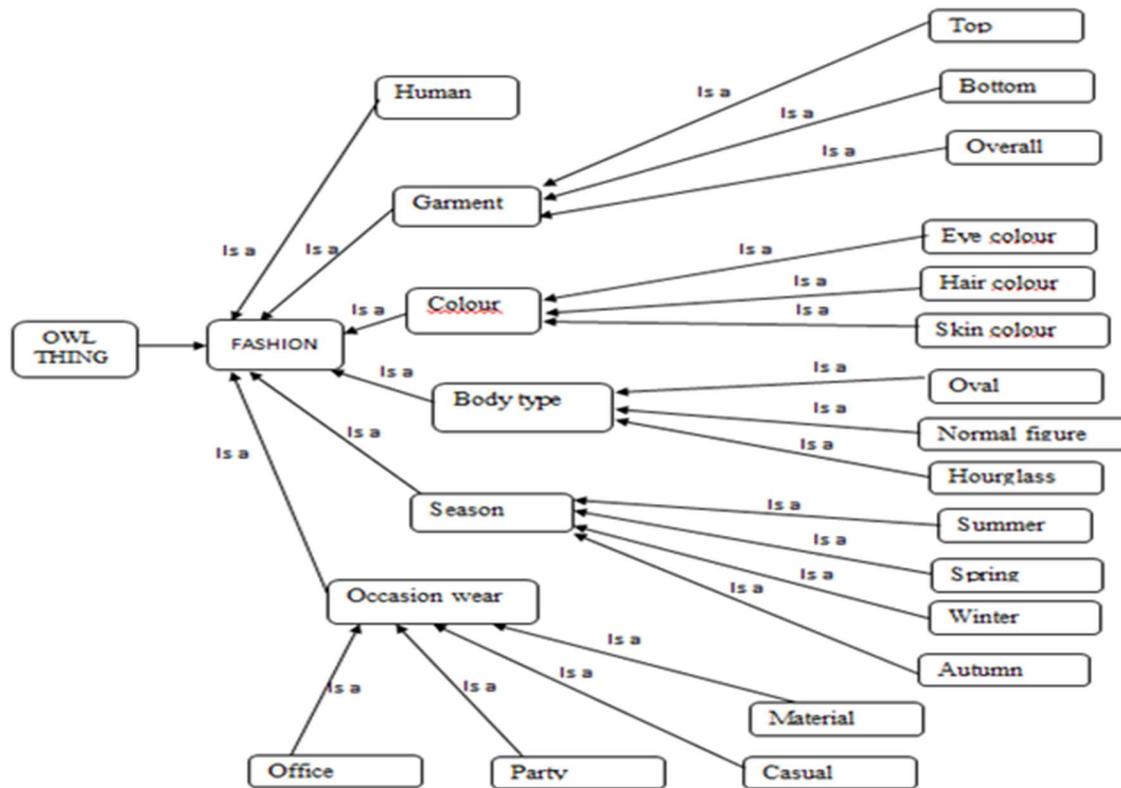


Figure 5: Classes and Subclasses of Fashion Ontology

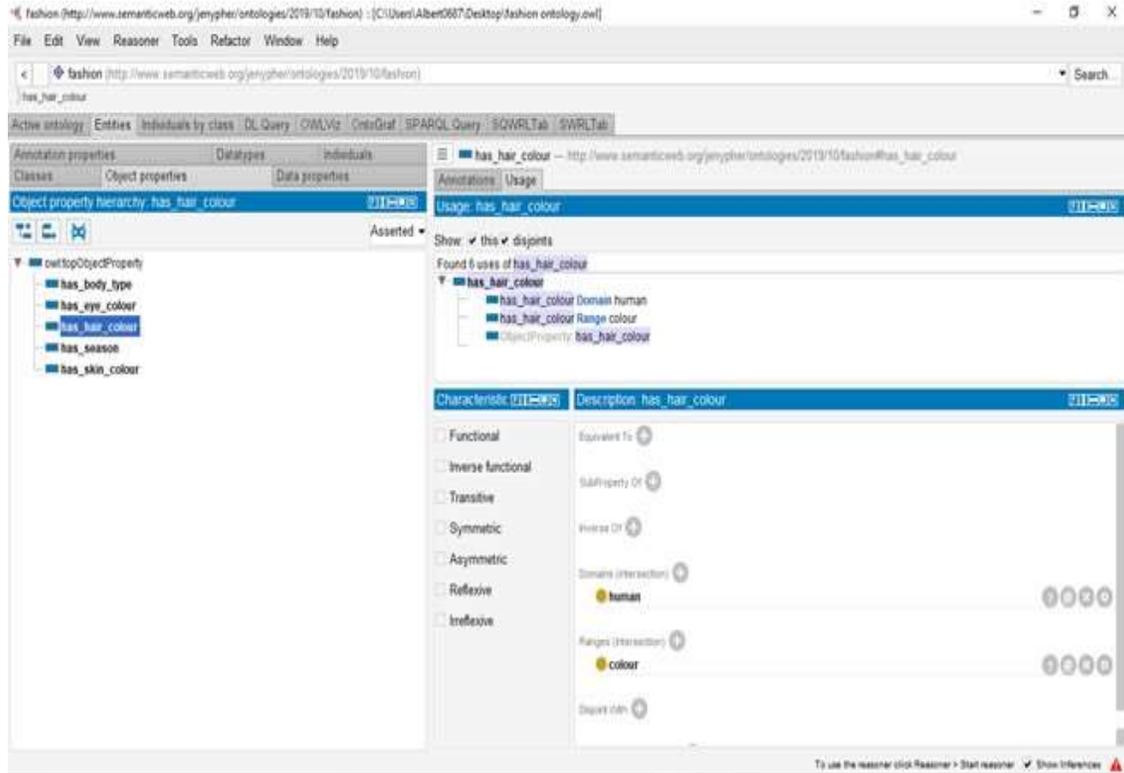


Figure 6: Object Property Display

5. CONCLUSION

This work presents a framework for recommending apparels to users based on their preferences. This framework is based on the users' input. To realize this task, fashion ontology was created to provide domain knowledge required for reasoning and recommendation of users' garments. The adoption of the system has great implications for the fashion industry as it would assist customers in suggesting appropriate outfits based on probabilistic reasoning schemes. Although the fashion industry is as old as the existence of humans, such a selection system would assist in showcasing suitable outfits thereby further promoting the industry. The system developers on the other hand stand to benefit from the handshake to one of the lucrative industries in the world.

6. FUTURE WORK

As future research, a plug-in of the ontology-driven fashion recommender system will be developed. This will be integrated into selected functional fashion systems under study. An evaluation of effects on the fashion sites with and without the plug-in over set duration will be carried out.

