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An Abstract
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Building an Ontology for Health Dialogs with Virtual Agents
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Virtual Health Agents (VHA) are human-like autonomous intelligent agents built using artificial intelligence techniques, specifically designed to deliver health interventions that assist patients. By asking the patient questions about their lifestyle, they can infer whether the individual at risk, and if so, provide them with potential plans to choose from in order to change. Virtual health agents promise to revolutionize the way healthcare is delivered and provide access to health interventions for the underserved population.

VHAs interact with users using a variety of modalities; they (1) sense their user's emotions via computer vision, and spoken utterances via speech recognition; (2) make decisions and adapt to the user in real-time during conversations about heath; and finally (3) speak or converse while displaying appropriate nonverbal behavior (e.g. facial expressions, gestures). One way to implement decision-making skills in VHAs is using an Ontology, which is a Knowledge Representation (KR) scheme, a subtopic of Artificial Intelligence (AI).

The goal of my research thesis is to implement an ontology that enhances the patient's interaction with an existing VHA developed at the Affective Social Computing Laboratory. My system will enable the VHA to reflect on the patients' answers and to infer some aspects of the patient's behaviors from their answers. I will then integrate and evaluate the performance of my module in terms of accuracy and user's acceptance.

This ontology is being developed for the VHA (described in [6]) that was developed for the alcohol consumption domain. According to [4], excessive alcohol consumption is a serious public health issue in the United States, being the 3rd leading lifestyle-related cause of dealth. Lisetti et al. [3] mention that computer based interventions (CBIs) have the advantages of *increasing accessibility* due to them being available via the internet, *increasing cost-effectiveness*, *increasing self-disclosure* as patients tend to report more information to a computer interviewer than a human one, and *tailoring information* for each user due to stored user profiles. They also explain that despite these advantages and the fact that current CBIs are effective for individuals who complete them, high drop-out rates due to their users' low level of engagement during the text-based interaction they provide, limit their long-term adoption and impact. VHAs, on the other hand, deliver these CBIs in a more interactive way and are known to increase users' engagement due to their ability to converse in natural language while displaying appropriate non-verbal behavior congruent with verbal utterances. They were found by Lisetti et al. [3] to improve users' acceptance of CBIs in terms of users' attitude, perceived enjoyment, perceived usefulness, and trust.

According to [6], not many health-behavior change dialog systems exist that use speech as an input modality. In addition, there did not exist a spoken dialog system for the alcohol consumption domain when they started out. Integrating an ontology of concepts with it will help in making the implementation of the reflections within the system more automated. Moreover, it will promote re-usability of components within the system via development of

ontologies of the components themselves [1]. Ontologies have other advantages such as giving a formal description of concepts in a domain through consensus of experts and facilitating exchange of information among systems by describing the kinds of data entities that can be exchanged, independent of the names they are given in their respective systems [1].

I will be using OWL API to build the ontology using the Protégé ontology editor and the HermiT, FaCT++, Pellet and Konclude Description Logics (DL) reasoners. HermiT, FaCT++ and Pellet are available as plug-ins in Protégé, while Konclude reasoner [5] is not. Although not available as a plug-in, Konclude will be essential to use because it is currently the best and most expressive DL reasoner. I will either use it via the OWLlink server [2] or the command line instead of via Protégé. In addition, I will be using a word stemmer, for example WordNet, in order to have access to synonyms of words facilitating me not only in paraphrasing as a form of reflection towards the client, but tying in the words that the client uses with concepts in the ontology. The ontology shall be available on the Semantic Web, which will facilitate in its integration with the existing VHA.

References

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