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Towards a Formal Representation of Processes and Objects Regarding the Delivery of Telehealth Services: The Telehealth Ontology (TEON)

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Abstract

This study introduces ontological aspects concerning the Telehealth Ontology (TEON), an ontology that represents formal-ontological content concerning the delivery of telehealth services. TEON formally represents the main services, actors and other entity types relevant to telehealth service delivery. TEON uses the upper level ontology BioTopLite2 and reuses content from the Ontology for Biomedical Investigations (OBI). The services embedded in telehealth services are considered as essential as the common services provided by the health-related practices. We envision TEON as a service to support the development of telehealth systems. TEON might also enable the integration of heterogeneous telehealth systems, and provide a base to automatize the processing of telehealth-related content.

Keywords:

Telehealth; Biological Ontology; Health Services.

Introduction

The lack of communication between telehealth systems creates (mostly) repetitive data, without any standardisation of the key concept meanings. We therefore recommend the use of ontologies and/or terminologies as a way to enrich the descriptions and content of telehealth-related systems and applications with domain-specific, controlled terms. According to this requirement, the aim of this study is to introduce ontological aspects concerning the Telehealth Ontology (TEON).

Methods

TEON was created using Description Logics (DL) [1], and implemented using the Web Ontology Language v2 (OWL2), built and edited via Protégé v5. TEON expands the upper domain ontology BioTopLite2 (BTL2) [2] and reuses content from the Ontology of Biomedical Investigations (OBI) [3], e.g., the class service that has TelehealthService as a subclass. TEON is available at http://www.nutes.ufpe.br/teon.

Results

TEON formulates classes and axioms to represent the delivery of telehealth services. It includes the description of actors, synchronicity profiles, health teams, and specific processes. Actor is a term related to the bearer of roles during the delivery of services. From telehealth services, there are three main roles: **requestor** (*RequestorRole*); **teleconsultant** (*TeleconsultantRole*); and **manager** (*ManagerRole*).

To express the synchronous profile of services, we took the notion of *PointInTime* and *TimeInterval* from BTL2. When processes are synchronous, their time interval and interval boundaries coincide. Otherwise they are asynchronous.

The notion of service, taken from OBI, describes them as "*planned processes in which two different entities are bearers of consumer and provider roles*" [3]. Telehealth services are delivered for different healthcare specialties such as telecardiology, teledermatology and telepsychiatry. These services are constrained by how they are delivered, e.g., via teleconsultation, second opinion, telediagnosis, among others.

Conclusion

In the current study, we described the formal description of the telehealth services domain in the Telehealth Ontology (TEON). Services that instantiate TelehealthService can be considered to have similar characteristics as common health care services. In addition, the roles played by the actors, the temporal dimensions (synchronicity and asynchronicity), are represented. As an ontology, we envision TEON's use as the formal background to guide the development of telehealth applications and systems. Ontology use in the telehealth domain might overcome the lack of consensus surrounding the terminology and subtleties about what is a service and what is telehealth practice.

References

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