Applying UML Connectors for Arranging Medical Archetypes into a Knowledge Base

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Introduction

The semantics of archetype data fields can be defined by linking these to the registers through an "ontology section" [1,2]. However, a generally accepted method to semantically connect different archetypes is still missing and cannot be resolved within the archetype model. Development of a higher level model that will enable semantic linking of archetypes can advance the application of archetype based EHR systems. To develop the information model it is necessary to define the relationships that the model will support.

Materials and Methods

Existing types of UML connectors' were analyzed to assess which of them can be applied to link different archetypes or archetype data fields in order to set up semantically meaningful relations. The examples of weaknesses and advantages of ISO 13606 models were studied.

Results

The following UML connectors were analyzed concerning their ability/potential to organize an archetyped knowledge base: abstraction, aggregation, composition, association, directed association, dependency and generalization (Figure 1).

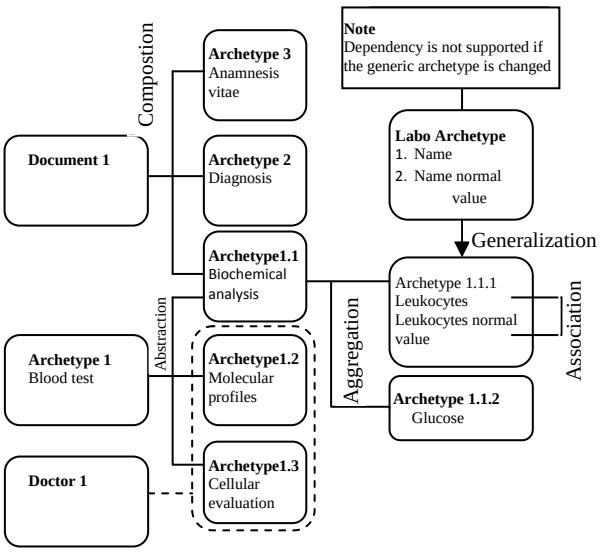

Figure 1- Application of UML connectors in an archetype repository

Archetypes can be combined to fulfill different needs. For example each doctor can use his/her own set of archetypes, or archetypes with different level of abstraction, e.g. blood test can be more or less detailed for different specialists.

Discussion

Connecting archetypes within a domain model will expand the application of archetype based electronic health records. The methods to connect archetypes that are available in the ISO 13606 archetype model are neither sufficient nor consistent. This can be advanced by implementing a higher level information model. The model must support at least the relationships that are defined in UML. The information model complementing the archetype layer must be able to provide different semantics for connectors. For example connector "Association" may have different meanings such as [value]-[normal interval], [primary diagnosis-secondary diagnosis]. Figure 1 shows the hierarchy of concepts, however, relationships between concepts of one level may exist. These relationships can be even more complex.

Conclusion

The UML connectors were analyzed for their ability to be applied in the implementation of a higher level model that will establish relationships between archetypes. The introduced information model allows semantic connection of different archetypes or archetype data fields. The implemented web-application shows a high potential for the developed models and specifications. The relationships are at the moment static. Further research will advance the model to enable dynamic definition of the relationships and inference rules.

References

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