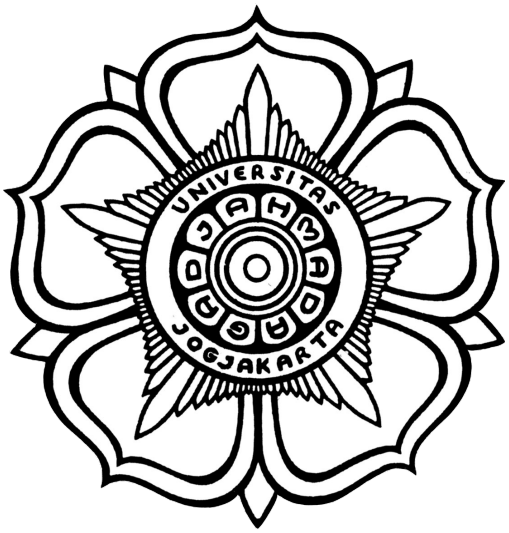
SOFTWARE ENGINEERING PROJECT (CSA)

FINAL EXAM



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1. **Describe your software design in detail.**

   The software relies on visual FHIR as a graphical tool to convey the content of FHIR; it allows for the visualisation of browsing, profiling, and extensions defining. The outline of system architecture is as follows: FHIR specification, Visual FHIR, and Clinical Context of Use. User interaction takes place in Visual FHIR, where users can perform visualised browsing, profiling, and extension defining.

   For the visualisation of FHIR resources browsing, the software parsed the schemas of the FHIR resources. It obtains the Uniform Resource Identifiers (URIs) by following "$ref". The elements of each schema file are found by parsing "properties". Functions d3.layout.tree and d3.svg.diagonal are used to construct a collapsible tree graph of the schema. JQuery is used to support interactive functions.

   To visualise FHIR profiles and extensions browsing, the Structure of StructureDefinition file is parsed to obtain elements under "snapshot" nodes. The relations between nodes in the tree is found by parsing the node property "path". The graph is constructed using function d3.layout.tree and d3.svg.diagonal and the relation graph is created using d3.layout.force. Similarly, JQuery is used to support interactive functions.

   For the visualisation of FHIR profiles and extensions creation, the software focuses on basic functions, such as changing cardinality, removing elements useless to the case context, and adding use case extensions. HAPI FHIR API is implemented to ensure that user defined profiles and extensions conform to the FHIR specification.

2. **Describe your software prototype evaluation in detail.**

   To determine the utility of our software, we compared it to the model from the previous study, using the same evaluation metrics; metrics that assess interactive mechanism and cognitive complexity .Interactive mechanism includes the following criteria: speed of response, navigation and manipulation, and user orientation. Cognitive complexity includes: content expressiveness, learning easiness, and supported display types.

3. **Write a summary of your project.**

Introduction

The FHIR specification is relatively difficult to understand and utilise due to complex semantic representation and structure definition. "An Interactive Visualization Tool for HL7 FHIR Specification Browsing and Profiling" was developed as a result. The intention was to provide tooling support in model browsing and interactive authoring for FHIR models to help FHIR users better understand and utilise the specification. It seeks to provide more interactive features to complement the HL7 HTML-based browsing.

However, the current implementation of the product has some limitations; more advanced features, such as profiling and authoring are yet to be implemented completely. In addition, according to the product evaluation, there is a limitation regarding user orientation. In this project, we will attempt to improve on the user-friendliness by providing more information to help guide users to better understand FHIR models.

Methods

The tools used in this project are as follows: FHIR, JavaScript, Data Driven Documents, HAPI FHIR API, and JQuery. Data Driven Documents and JQuery are JavaScript libraries used for visualising FHIR concepts as graphs and support interactive functions respectively. HAPI FHIR is used to validate user-defined FHIR profiles and extensions.

We have only managed to recreate the module to visualise FHIR resources browsing. Our model works by parsing the FHIR schema file (in the form of JSON, XML, or RDF) to find URIs by following the "$ref" element, and "properties" to find the elements of each schema file. Then, we implemented functions d3.layout.tree and d3.svg.diagonal to construct a tree representation of the schema. The tree is interactive; clicking on a node expands/collapses the subtree, clicking on a node name displays description/definition of each FHIR element. These interactive functions are supported by JQuery.

Results

We found that our version of FHIR resource browsing visualisation is less interactive than the previous implementation. It is somewhat less reactive when nodes are expanded or collapsed. It gives a somewhat sluggish reaction when the tree is dragged around. In addition, the elements displayed when a node name is clicked are not always correct.

Discussion

We had difficulties finding related resources to help us implement the software. The original source code itself is outdated and therefore cannot be run directly.

References

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2. "Introduction to FHIR Resources," healthit.gov. https://www.healthit.gov/sites/default/files/page/2021-04/Intro%20to%20FHIR%20Resources%20Fact%20 Sheet.pdf (accessed Nov. 08, 2022).
3. M. Ruten, "FHIR Profiles and Implementation Guides," fire.ly. https://fire.ly/blog/fhir-profiles-and-implementation-guides (accessed Nov. 08, 2022).
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