An Ontology-based Semantic Design of the Survey Questionnaires

Alexander V. Borodin, Yulia V. Zavyalova



Petrozavodsk State University Institute of Mathematics and Information Technologies Computer Science Department



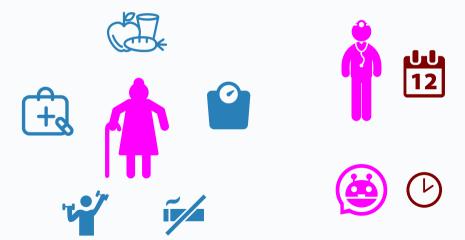
Academia-to-Industry Competence Incubator Open Innovations Association FRUCT (Finnish-Russian University Cooperation in Telecommunications)

19th FRUCT conference, November 7-11, Jyväskylä, Finland

This research is financially supported by the Ministry of Education and Science of the Russian Federation within project # 14.574.21.0060 (RFMEFI57414X0060) of Federal Target Program "Research and development on priority directions of scientific-technological complex of Russia for 2014–2020". The study is also financially supported by Russian Foundation for Basic Research project # 16-07-01289.

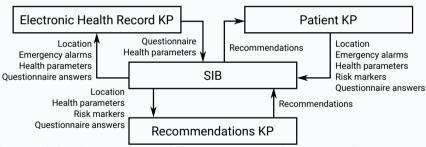
Motivation. A system for hypertension management in remote patients

Use of personalized digital assistant may increase the adherence to the treatment among remote hypertensive patients



Motivation. A system for hypertension management (cont.)

The system is developed on the top of Smart-M3 platform. Therefore, the data should be represented in ontology-based machine-processible form



A crucial part of the data is obtained from the patient by means of questionnaires...

Goals

Develop the ontological representation of custom questionnaires, taking into account

- the most of the variety of question types and possibilities of combining them;
- different options of visual representation of questions of specified type;
- files can be attached to the answers;
- answer scoring;
- question sequencing and branching.

Benefits of semantic representation of questionnaires and responses

- Possibility of linking of the specified answers with the problem domain ontology entities for further knowledge reasoning.
- Possibility of creating hooks for certain answers be means of notification mechanism provided by the smart space platform.
- Possibility of constructing personalized questionnaires from the questions obtained from different, and even, distributed sources based on the previous knowledge about the responder needs.
- Possibility of reconstructing questionnaires dynamically based on the continuous analysis of the accumulated response.

Pen-and-paper questionnaires are composed of questions of different types

If the sentence below contains a spelling error,
correct the error by writing the word as it should
appear; if there is no error, write N.

It is no exageration to say that the students' insights into historical processes and social conditions were impressive.

(a) Open-ended question

Have you been prescribed any medication to lower your blood pressure?

- 1. Yes
- 2. No.
- 3. I do not know
- (d) Dichotomous question

How much money you have spent to acquire the services of excursion during your stay in our hotel?

- Less than \$ 50.
- 2. From 51 to \$ 100.
- 3. From 101 to \$ 150.
- 4 More than \$ 150
- (g) Interval scale question

Do you have to pay fees for consultation and/or drugs at the facility that you regularly go to for the treatment of your hypertension? (Please mark only one option)

- Paid nothing
- 2. Paid part 3. Paid fully
- 4. Paid (I do not know if part or fully)
- 5. I do not know
- (b) Nominal scale question with single selection

The software solved my needs

StronglyAgree Agree Undecided Disagree StronglyDisagree

3

(e) Likert scale question

Order these cities by population size:

- A. Genoa
- R Palermo C. Rome
- D. Turin
- F. Milan
- 1. 2. 3. 4. 5.
- (h) Sequencing question

Have you had any complications from your hypertension?

- 1. No
- 2. renal disease
- stroke
- 4. retinopathy cardiovascular
- 6. other
- 7. I do not know
- (c) Nominal scale question with multiple selection

Would you say our website is:

Very Attractive Very Unattractive

(f) Likert scale question

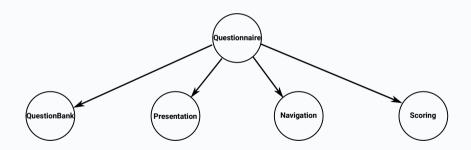
Match each term with its definition

- 1. Deposition
- 2. Frosion
- 3. Lithification 4. Weathering
- A. The chemical alteration and breakdown of rock
- B. The conversion of sediment to rock
- C. The dropping of sediment into a long-term reservoir D. The picking up and carrying away of sediment

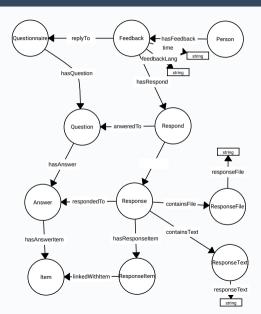
1. 2. 3. 4.

(i) Matching guestion

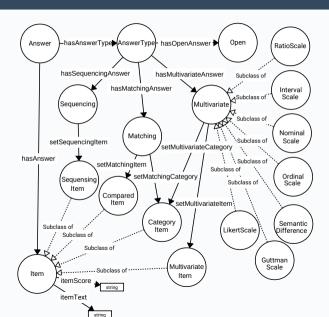
Top-level entities of the questionnaire ontology



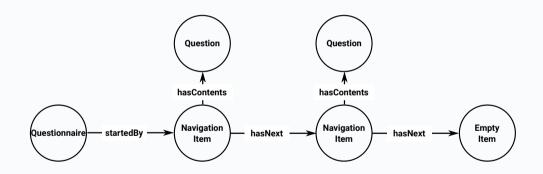
Responses are linked with questions and selected answers



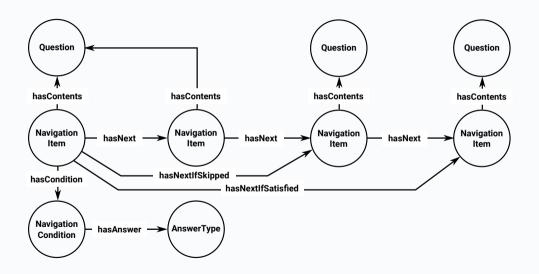
Answer types



Modelling a sequence of questions with no branching



Modelling a sequence of questions with conditional branching and skipping



Conclusion

- 1. The ontology part has been developed for representing the questionnaires in SIB semantic storage.
- 2. The ontology (in simplified form) has been used in the prototype of the smart space-based service intended for assistance in medical emergencies.
- Within the service for assistance in medical emergencies the mobile app has been developed to provide the patients with the questionnaire-based health state audit (initially for Android OS, then, during the Sailfish hackaton, — for Sailfish OS).

Contact information

Thank you for your attention!



aborod@petrsu.ru



borxander



linkedin.com/in/aborod



vk.com/aborod