Enhancing MedThaiSAGE: Decision Support System using Rich Visualization on SAGE 2

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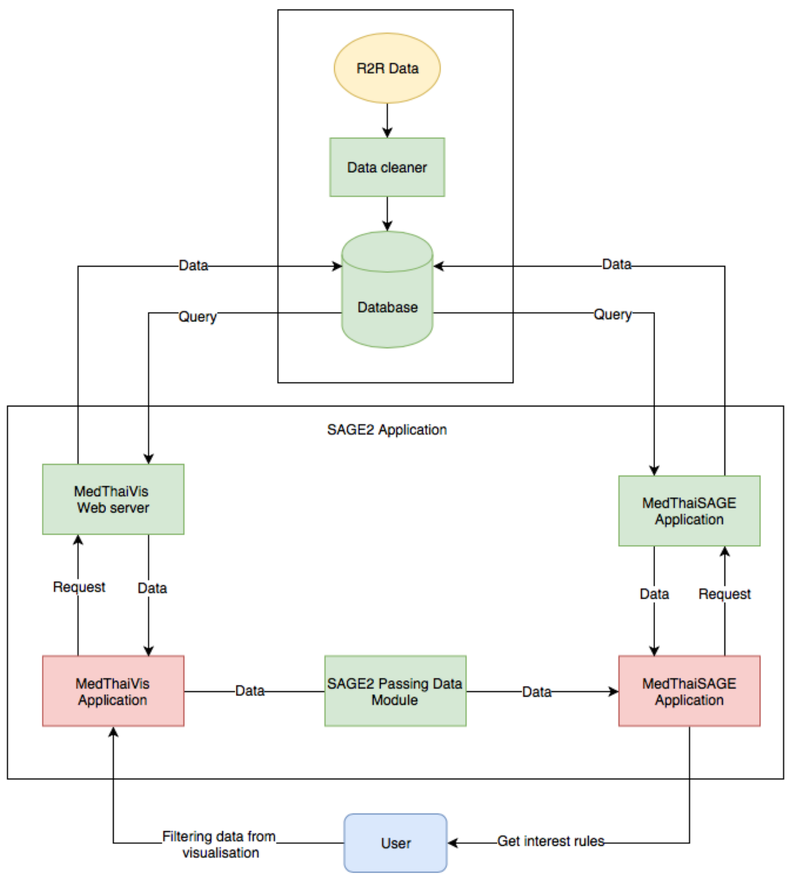
Abstract

For several years, the Routine to Research (R2R) Organization has gathered medical research project data in Thailand and transformed it into a valuable knowledge resource to improve healthcare services and help healthcare policy makers to construct policies. However, the large amount of historical data creates a challenge to understand this information. To address this problem, MedThaiVis has been proposed to serve as a tool to visualize this complex data. In addition, MedThaiVis has been extended to operate on complex data in Scalable Amplified Group Environment (SAGE2), called Extended MedThaiVis. This platform can help users to understand the data, gain insights into the complex data, and provide a better comprehensive view for exploration. SAGE2 is the platform that allows us to execute a visualization on scalable, high-resolution, display walls.

Furthermore, MedThaiSAGE has been developed as a Decision Support System based on Association Rules, which is exploited to help healthcare policy makers to see the relevant set of rules and help in developing policy. However, these two applications perform independently. Therefore, we proposed and implemented an approach to integrate these two applications in order to enhance their capability. Integration of Extended MedThaiVis and MedThaiSAGE overcame three main issues: (1) data integration, (2) communication and cooperative workflow between the two applications, and (3) fully support on SAGE2. In conclusion, our approach can help users to explore overview and insights of R2R data and increase the capability of healthcare policy makers.

System Architecture



- Data structure was redesigned so it can be used for both applications. Data were cleaned using Python and put in an MySQL database.
- Each application has their own web server provided by Express NodeJS. When the application needs to display data, it sends a request to the web server to retrieve data from the MySQL database, manage those data, and send the data in the form of JSON format to the application.
- The workflow between Extended MedThaiVis and MedThaiSAGE was integrated using the Passing Data Module adapted from the built-in function of SAGE2 Applications.
- The user interaction begins by opening the visualization application, which then opens the decision support application automatically. The user explores data with the visualizations and once identified data of interest, can send this data to the decision support application to derive interesting rules about that data.

Background

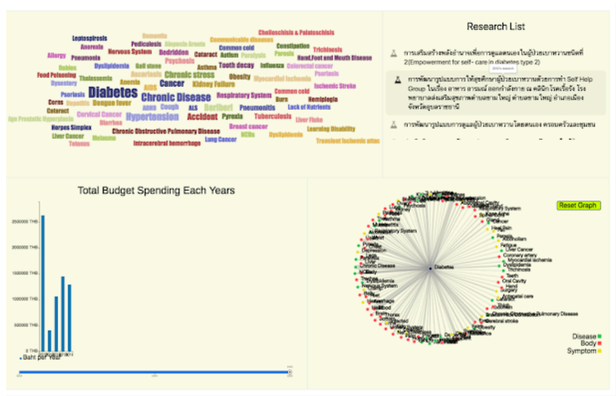
1 Routine to Research Data

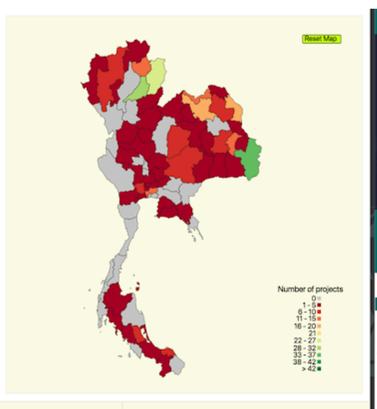
Routine to Research Thailand (R2R) [1] is a collaborative project with many health care departments with the goal of improving medical research in Thailand.

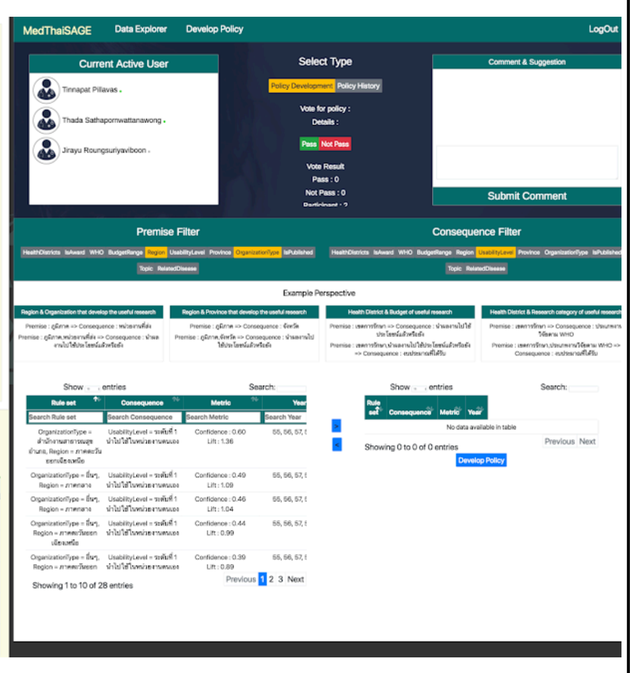
Data are from employees in the medical field, which is transformed from routine work knowledge into a valuable knowledge resource, so the users can apply this information to improve health care services.

2 SAGE2

Scalable Amplified Group Environment (SAGE2) [5] is open-source middleware that provides a system for a collaborative working environment. Implementing the visualization on Scalable Resolution Shared Displays (SRSD) can give a better view of information. With high resolution, SAGE2 can be used for collaboratively working on data in different visualizations including statistics, images, and graphs. In addition, SAGE2 has built-in functions to send and retrieve a data between two application in real-time.







3 Extended MedThaiVis

This is a successor project from MedThaiVis [2], which is web-based application for searching medical research in Thailand [3]. It takes advantage of SRSD and SAGE2 to visualize complex data from R2R, thus providing a comprehensive view of large amounts of data for exploration. This is significantly different from traditional MedThaiVis based visualizations. The extended MedThaiVis database contains only some of the data that is used for display in the application.

4 MedThaiSAGE

MedThaiSAGE [4] is Decision Support System that helps the decision makers to identify and solve problems, complete decision process tasks, and make decisions. It provides interesting rules from R2R project data to help decision makers make informed decisions, but is limited with data visualizations.

Conclusions

This work improved the performance of a decision support system as part of the MedThaiSAGE application by combining the visualizations of Extended MedThaiVis application with a decision support system. This resulted in the creation of a workflow between two applications that can overcome the limitation of both applications by facilitating a clearer visualization and explanation of the medical research information.

Acknowledgements

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