

Rule Engine for executing and deploying the SAGE-based Guidelines

Jeong Ah Kim¹, Sun Tae Kim²

¹ Computer Education Department, Kwandong University, KOREA
clara@kd.ac.kr

²Dept. of Computer Engineering, Kangwon National University, KOREA
Istkiml@kangwon.ac.kr

Abstract. The only limitation of SAGE is that there is not available engine in public but SAGE has powerful knowledge representation formalism for interoperability. Also commercial rule engines are good candidate for SAGE engine. We suggested model translation technique for providing practical knowledge execution environment of SAGE.

Keywords: CDSS, SAGE, rule engine, guideline

1 Introduction

Many researchers have proved that computerized decision support system (CDSS) in clinical guideline can lead clinician's compliance with suggested best practices in patient care. Clinical guidelines are critical component, what defines evidence-based policies for managing health care in specific clinical circumstances. For developing the clinical guidelines, several different approaches for modeling the clinical guideline have been adopted. SAGE(Standard-based Sharable Active Guideline Environment) can be powerful knowledge representation and strong communication tools among the medical knowledge engineers. SAGE adopts the standards in terminologies and in data model for patient information. Also, SAGE made a approach to integrated the guideline-based decision with workflow. With these characteristics, SAGE-based guideline can be distributed and sharable across the different environments. The problem is that there is not publically available execution engine yet. Several researches reported commercially available rule engine system can be an execution engine for clinical knowledge [1, 2]. Commercial rule engines are already verified and stable. If we could find a way to use these in CDSS, it will be very powerful and useful. In this research, we suggested the approach to use commercial rule engine to execute and deploy SAGE knowledge translation.

2 Basic Requirements for applying rule engine to SAGE

It is very useful and practical approach to use commercial engine. Commercial engine is verified in real situation and SAGE has powerful knowledge representation in clinical domain. Only the problem is that the knowledge representation is different from that of commercial engine. To make the commercial rule engine as SAGE execution environment, 4 requirements should be implemented.

- follows the SAGE methodology: SAGE defined standard-based guideline development , execution, and deployment process. Each commercial engine has own utilities to support their process so that we customize the process to satisfy the SAGE process.

- realizes the SAGE architecture: SAGE guideline model defines the context of SAGE guideline decision-support system. In this architecture, SAGE engine and event listener are core components. Also, SAGE execution engine execute the guideline knowledge by interacting with clinical information system with an event listener.

- provides CDS service as web services: CDS is separate and independent components for knowledge services. Existing hospital information system (HIS) can be integrated with our CDS service with rule engine via Service-Oriented Architecture. Any platforms for HIS can access CDS service of rule engine and rule engine can access patient information stored in any kinds of data storage implementation strategies.

- satisfies two quality attributes-the availability and stability: the performance in very critical quality attribute to adopt the CDS service to physical care circumstance. To verify the suggested architecture and implemented component, we should evaluate the architecture in concerns of availability and stability in real service environments.

3 How to adopt existing rule engine as SAGE execution environment

Fig1. show the overview architecture of SAGE execution environment. . SAGE guideline can be modeled with XML or OWL. One way to translate the guideline element defined in OWL tag to model element of knowledge engine. The other way is using object model of SAGE. SAGE defined Knowledgebase object model so translation from properties of SAGE object model to properties of knowledge engine. Translation of SAGE knowledge is just mapping between SAGE object model and rule engine meta model.

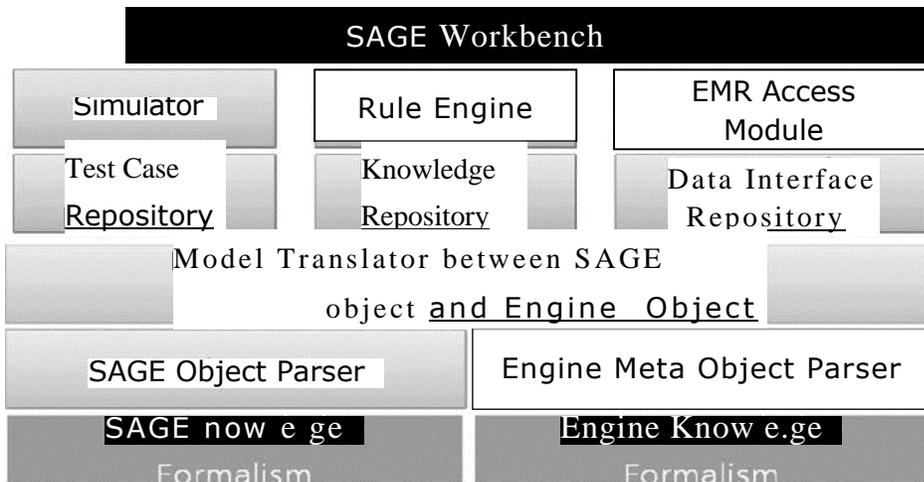


Figure 1. Architecture for SAGE execution environment

4 Discussion

In this paper, we propose an approach for adopting the rule engine as SAGE execution engine. For verifying the feasibility of this approach, we applied our architecture with one open source rule engine, BRAIN(Business Rule engine for Adaptable and Intelligent eNgine). To validate the proposed framework in terms of correctness. 4 different guidelines were tested, what have very wide spectrum in SAGE knowledge representation. We translated hypertension, lab alerting, sepsis, DDI(Drug Drug Interaction) knowledge representation written in SAGE into BRAIN knowledge format. These knowledge had over 400 rules in total and used almost elements of SAGE. In our evaluation, we verified the feasibility of model translation between different knowledge formalism and usability of commercial rule engine for SAGE.

References

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