Master Project Proposal Template

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Project details

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- **Project title:** Projecting Drools
- **Host organization:** Khonraad Software Engineering B.V.
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1 Project summary

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Drools is an open source production rule system for complex event processing, using an implementation of the Rete algorithm. It has it's own Domain Specific Language, which are written in Drools files. When there are many rule in an environment it can be difficult to reason about the rules and how they interact.

Although Drools is nearly 20 years old and has wide use, it does not have strong cross platform IDE support. This masters project will approach fixing this by creating a projectional editing IDE. There are two popular editing methods for language workbenches, these are free-form editing, where the user typically edits the source code, and projectional editing, where the user edits one or more projections of the persisted model[3]. Projectional editing could be seen as a method of bypassing the parser and programming directly into the Abstract Syntax Tree. In this project we will use the opensource language workbench MPS from JetBrains[6]. There is no existing implementation of the Drools language in MPS.

Khonraad Software Engineering's product, Khonraad, is a SaaS used by the Dutch local governments, implementing the Wvggz, Wzd and Wth laws. These laws deal with very sensitive details about mental health and domestic violence.

It goes without saying that this data must not be accessed by the wrong people. Drools is the Technology choice Khonraad made to govern this critical function. Thus, they would like to improve the reasonability of this code.

This project will attempt to answer the following research questions:

- **RQ1:** How can we apply projectional editing to Drools to increase reasoning?
- **RQ2:** Which refactorings will most benefit a Drools code clarity?

2 Problem analysis

The mental health care and coercion laws (Wvggz, Wzd, Wth) provides agencies the ability to intervene in domestic violence, psychiatric disorders and illnesses. Khonraad's system facilitates reporting and communication between municipalities, police, judiciary, lawyers, mental health care, and countless social care institutions. The system has 15,000 users and is available 24/7. Configuration and administration use complex matrices of compliance mechanisms, access user rights and communication settings. Because of the sensitivity of the personal data (medical, criminal), the security against data loss, preventing unlawful disclosure and guaranteeing availability (also in crisis situations) are crucial. Demonstration of the correctness of the, often changing, configuration is a major concern.

In the current situation, configuration is done in a business rule system (in a DSL from JBoss Drools). The DSL is a textual representation of the abstractions of the nested settings and must be compiled to see if it works. Projectional editors are editors in which a user edits the abstract syntax tree directly without using a parser. This potentially allows for an almost unlimited language composition and flexible notations.

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Here you present your analysis of the problem that your research will address. Also summarize existing scientific insight into the problem (result of your literature survey, see below). You may also touch on how this problem manifests itself at your host organization.

3 Research method

Gregor [4], gives "A Taxonomy of Theory Types in Information Systems Research". To answer our research questions we will conduct what she calls "Type V: Theory for Design and Action". The criteria for success of this type of research "include utility to a community of users, the novelty of the artefact, and the persuasiveness of claims that it is effective".

To do this we will apply projectional editing techniques, through the MPS language workbench to the Drools language. We have observed the difficulty with which developers are having to reason about and edit large collections of

Drools files. We hypothesize that developers can be presented with different views on their code that will allow them to better understand the code. The novelty of our approach will be to create new view types specific to the needs of a Drools programmer.

We will be relying on MPS as well as other open source components to work together with acceptable performance such that the user experience is acceptable. Figure 1 shows the JetBrains open source IDE for MPS. In this you create the Concepts, Generators, Type Systems, etc., that are necessary to define the language. You also create editors, which gives your language out of the box IDE support.

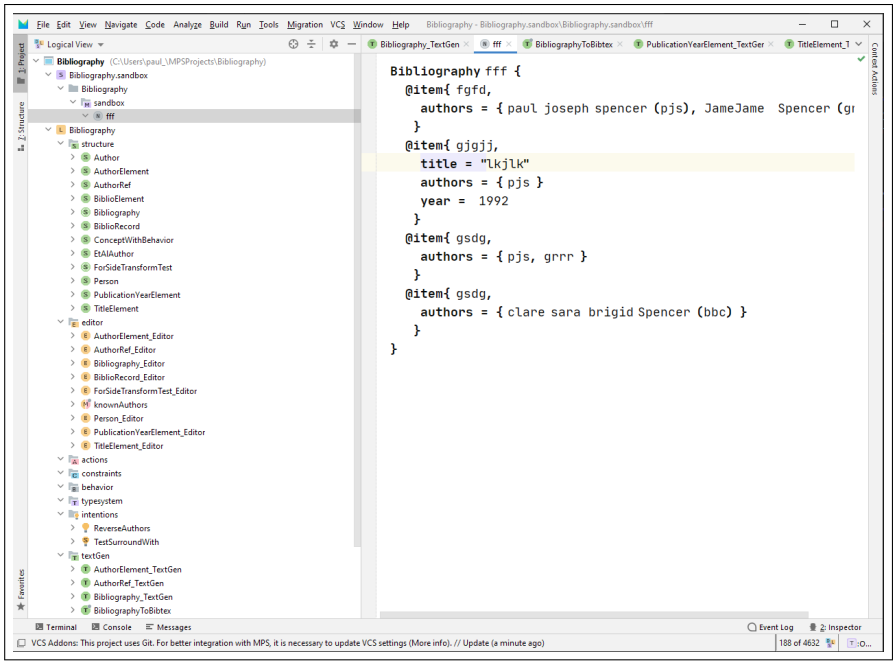

Figure 1: MPS IDE

The projection design, which will run in parallel to the Drools language modelling, will depend in part on the outcome of research carried out in the first period.

Whether our design is appropriate with regards to performance and functionality is a risk. Also the usefulness of the projections is a risk. This is where I expect to gain the biggest benefit of literature review and academic supervision.

The major tasks in this prototype development will be:

- Modelling the Drools language.
- Developing the alternative projections.

The prototype itself will be validated by working. However, if time permits, the hypothesis of the usefulness of the projections will be validated through developer use surveys.

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Present how you are going to find the answers to your research question. This section should cover:

- What will make the research difficult?
- What is the input you expect from the literature survey
- What sources will you use and how will you use / document them?
- What experiments / research will you do? What proof of concept will you make?
- What method will you use?

4 Expected results of the project

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We expect the following from this project:

- We will be able to model Drools in MPS.
- A suite of novel and useful projectional editors for the Drools language.
- We will reduce the thought to execution cycle for Drools Developers. resulting in a reduction of the "cognitive distance and representation impedance mismatch" [18] that they currently experience.

A happy side effects of this project is that the following open source products will become generally available:

- An improved Drools Editor plugin for those using the JetBrains IntelliJ community edition.
- An MPS implementation of drools that can be used for cross generation by other DSLs.

5 Required expertise for this project

DONE Table 1 shows our expected and actual expertise levels in the technologies and practices required to complete this project.

Skill	Required	Acquired	Notes
MPS	★★★★★	★★½☆☆	Currently taking various courses
Drools	★★★½☆	★★☆☆☆	The language is simple
Java	★★★★☆	★★★☆☆	15 years of C#, these are similar
Swing	★★★★☆	☆☆☆☆☆	never played with this
Language Design	★★★☆☆	★★☆☆☆	more for deconstructing Drools than creating a new language

Table 1: Expertise required.

6 Timeline

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This project consists of two main parts. First is modelling the Drools structure, behaviour, constraints, editors and generators. The second will be creating non-standard projections of the structure.

Time will be allocated as 20 hours of my work time per week will be dedicated to design and development of the software. Currently estimating 4-8 hours at the weekends to research and project writing. There is an added period of 4 weeks at the end to rewriting the thesis. This is shown in the Gantt Chart in figure 2

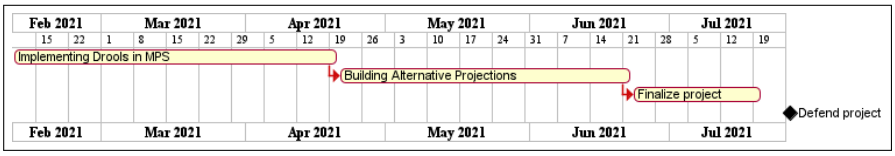

Figure 2: Predicted timeline.

7 Risks

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Table 2 shows the main risks we see to this project.

Description	Risk Level	contingency
Project goals are too ambitious	★★★☆☆	Reduce Drools implementation to a useful subset and reduce number of projections.
MPS is not as flexible as needed	★★☆☆☆	we're screwed, but the papers from mbeddr indicate low risk.
I'm a terrible MPS developer	★★★★★	currently taking training and reading lots of books.
Academic overlap	★★☆☆☆	Panic or ignore.

Table 2: Project Risk.

8 Literature survey

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To get an overview of the field we mainly looked at MPS and Drools based papers. For MPS we started with an expert recommendation and did some forward and backward snowballing. For Drools we were limited by a lack of access to papers behind paywalls, so we used a google scholar search and chose those that were open access. The Drools papers did not present any work on code visualization. The MPS papers and associated DSL papers covered some aspects of visual projectional editing, especially the papers relating to the produce mbeddr.

Table 3 summarizes the papers and books investigates in preparation for this project.

During our research we will keep a document database, using the Zotero Personal research assistant software [16]. Also we will create an annotated bibliography of the most relevant papers.

citations	Papers				
	Creating DSLs	How Drools works	Comparing Workbenches	How MPS works	Projectional Editing
[1]		⊕			
[2]			⊕	⊕	
[3]			⊕		
[5]					⊕
[7]		⊕			
[8]			⊕	⊕	
[9]		⊕			
[10]				⊕	
[11]				⊕	
[12]				⊕	
[13]		⊕			
[14]				⊕	
[15]	⊕			⊕	
[17]		⊕			
[19]				⊕	
[20]	⊕		⊕	⊕	
[21]	⊕				
[22]				⊕	⊕
[23]				⊕	
[24]					⊕
[25]				⊕	⊕
[26]	⊕		⊕	⊕	⊕
[27]				⊕	
[28]	⊕			⊕	

Table 3: Papers about the Drools, MPS and Language workbenches

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