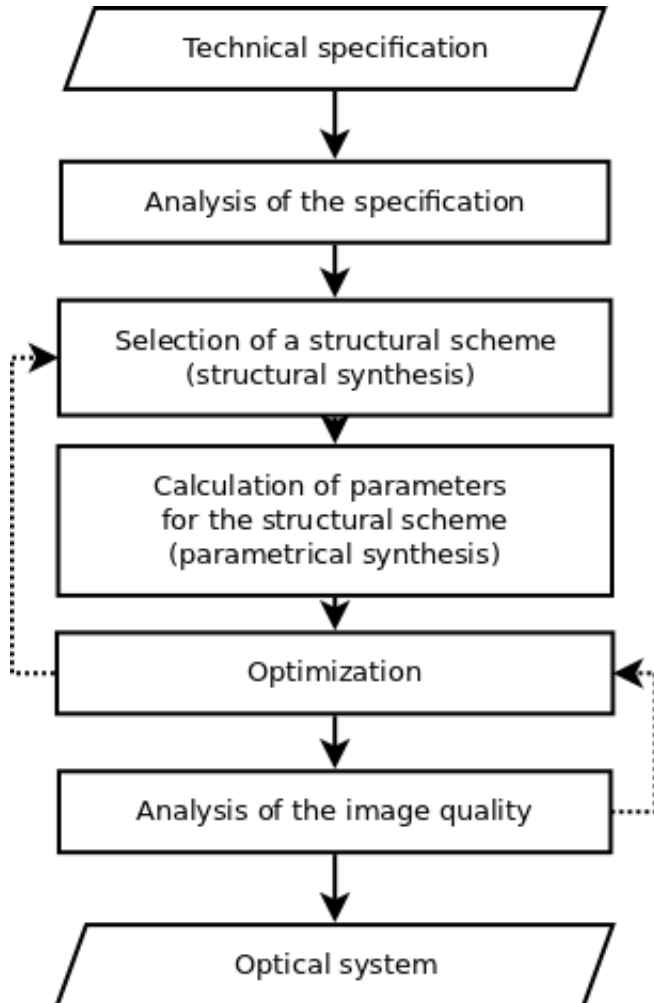


11th FRUCT conference in St.Petersburg

Using Drools rule-platform for the optical CAD web application development

Maxim Kolchin, Dmitry Mouromtsev

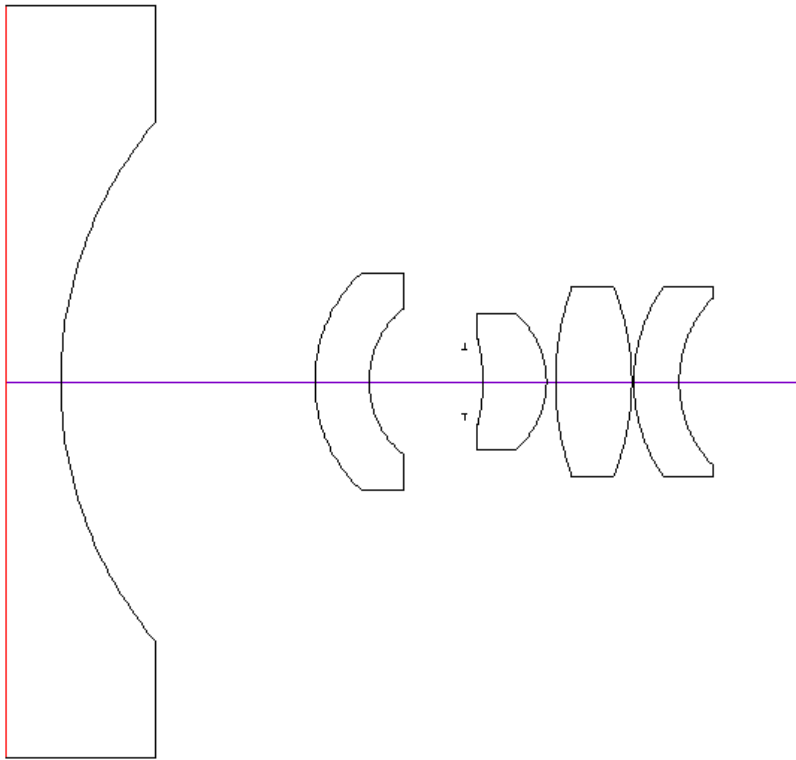
Introduction: the goal



Automation of optical structural synthesis

Structural synthesis is the key-step in the whole optical design process.

Introduction: the structural synthesis



Structural synthesis -
the procedure of choosing the
types, quantities and mutual
arrangement of optical
elements

Y1A1P + C1P2P + B2A2P + T2A3P + C3F3F

Introduction: existing approaches

- various catalogues (patents, technical literature etc),
- genetic algorithms,
- own experience,
- expert system - *this is our way*.

Introduction: our approach

Our approach based on rule-based design method of structural synthesis was proposed by M.Russinov and developed by I.Livshits.

great experience in optical design
+
expert system technology
=
automated structural synthesis

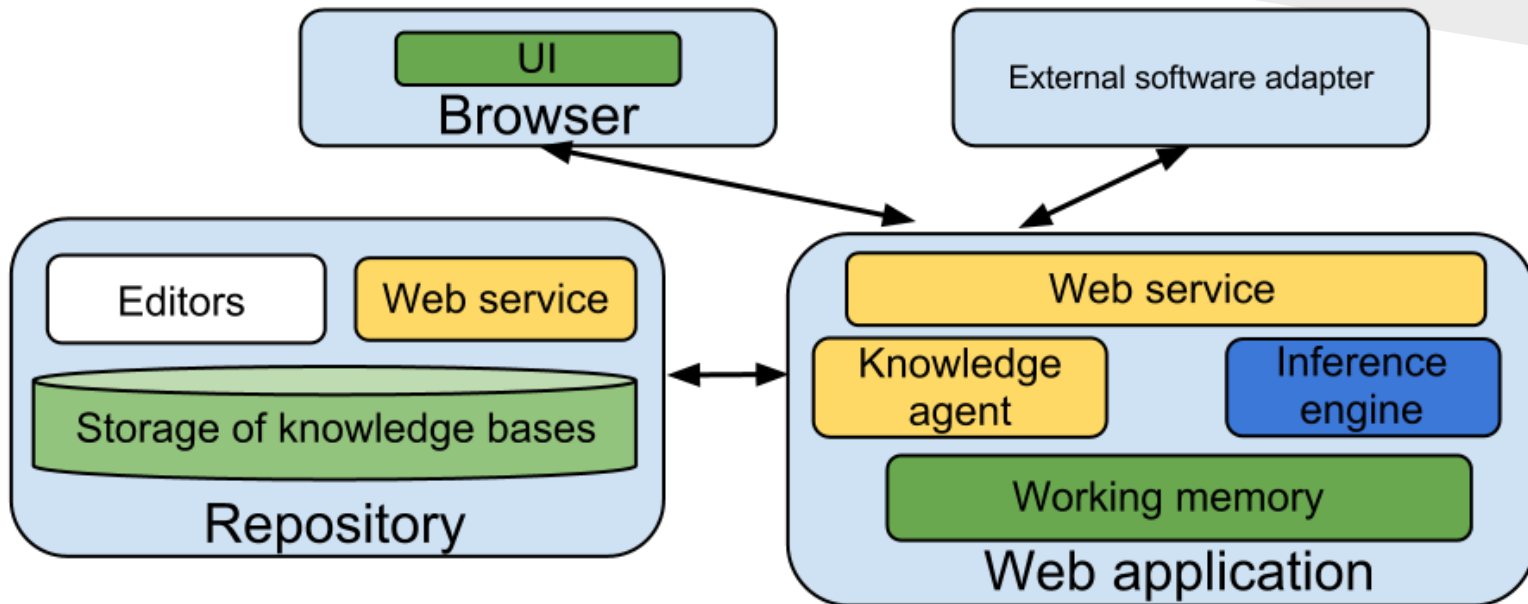
Implementation: selection of a rule-platform

Requirements:

- advanced knowledge representation language,
- the support of traditional programming languages,
- the forward chaining,
- tools for knowledge engineering,
- open-source license and an active community.

Rule-platforms: OpenRules, OpenL Tablets, Drools, CLIPS

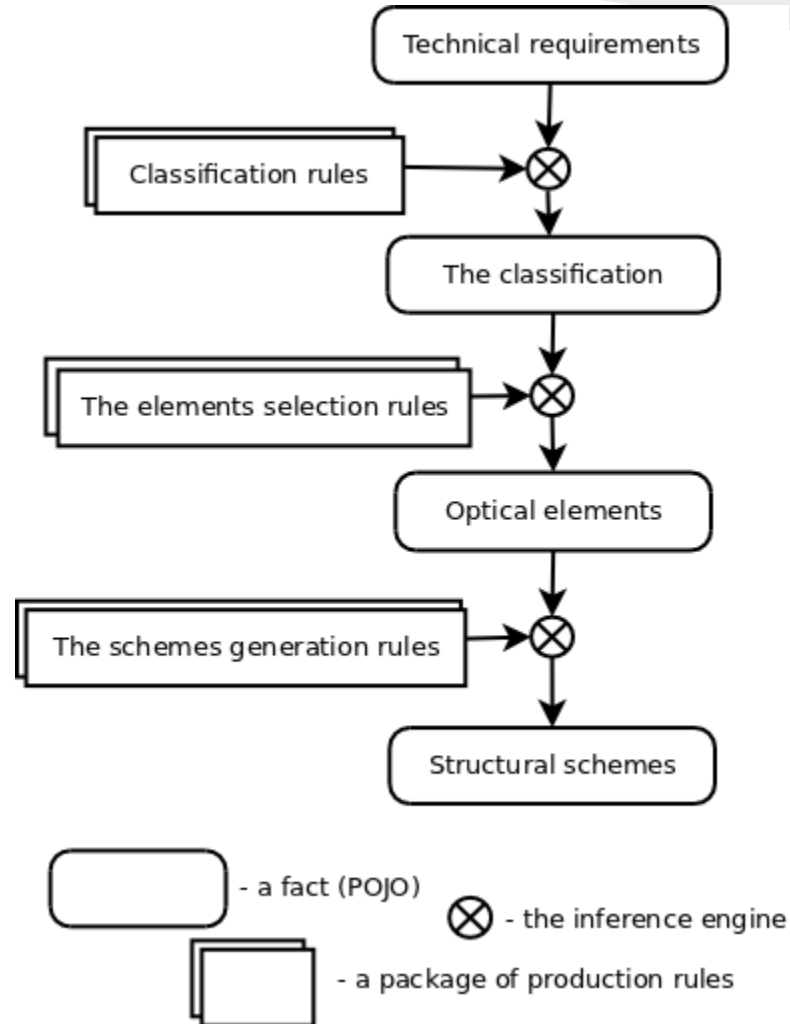
Implementation: overview of the system architecture



Here:

- Repository - Drools Guvnor,
- Web application - the server developed by us,
- Inference engine - Drools Expert.

Implementation: algorithm of the inference



Implementation: an example of the rules

The elements selection rule (using DSL language and Drools Guvnor):

WHEN

1. The system was classified with
2. - D equal to
3. - S equal to

THEN

1.

Insert an element	<input type="text" value="B1P1A"/>
-------------------	------------------------------------

/show

The same rule in DRL (Drools Rule Language):

```
rule "B1P1A"
  when
    Classification(d==1, s==2)
  then
    insert( ElementFactory.newElement( "B1P1A" ));
  end
```

Implementation: a screenshot of the UI

The screenshot shows a web browser window with the URL `guvnor.ailab.ifmo.ru/dashboard`. The page is divided into several sections:

Technical requirements

- aperture speed: 1.8
- angular field: 84 °
- focal length: 4.5 mm.
- back focal distance: 2 mm.
- image quality: GEOMETRIC
- entrance pupil position: FORWARD
- spectral range: 450 - 650 nm.

The lens classification...

...of optical characteristics. J - 1 W - 2 F - 0

...by purposes. L - 2 Q - 0

...according to design features. S - 0 D - 2

The complexity of the lens R - 7

Schematic circuits

#	Schema
0	Y1O1P + B2A3P + T3F3O
1	Y1O1P + B2A3P + T3F3I
2	Y1A1P + B2A3P + T3F3O
3	Y1A1P + B2A3P + T3F3I
4	Y1P1P + B2A3P + T3F3O
5	Y1P1P + B2A3P + T3F3I

Actions

Classify Synthesis Export

Conclusion:

- Developed notations for optical elements and structural schemes,
- Implemented a prototype of the system based on the rule-based design method of structural synthesis.

Q & A