Expert Tables in CoCoViLa

Pavel Grigorenko

MBJSDT seminar
29.10.2013

Intro

An Knowledge representation is the area of Artificial Intelligence concerned with how knowledge is represented and manipulated.

An expert system (a.k.a. Knowledge-based System) is a computer program that simulates the judgement of a human that has expert knowledge and experience in a particular field. Typically, such a system contains a knowledge base containing accumulated experience and a set of rules for applying the knowledge base to each particular situation that is described to the program.

Rule-based Approach

A Production Rule is a pair of the form

$$(condition, action)$$

with the meaning "If the *condition* is satisfied, then the *action* can (or must) be taken".

Two methods of execution:
- Forward Chaining – "data-driven"

- Backward Chaining – "goal-driven"

Example

when
an honest Politician exists
then
logically assert Hope
when
Hope exists
then
print "Hurrah!!! Democracy Lives"
when
Hope does not exist
then
print "Democracy is Doomed"

Textbook Example

if $h = 8$ **and** $s_{z\,adm}N = 5$ **and** $FGr = 1$ **and** $\sigma \leq 180$ **and** $IM = VK6$

then $s_{z\,adm} = 0.28$

if $h = 8$ **and** $s_{z\,adm}N = 5$ **and** $FGr = 1$ **and** $\sigma \leq 1800$ **and** $IM = VK6$

then $s_{z\,adm} = 0.24$

if $h=8$ **and** $s_{z\,adm}N=5$ **and** $FGr \leq=3$ **and** $\sigma \leq 180$ **and** $IM/=VK6$

then $s_{z\,adm} = 0.76$

...

$h = 8,\ s_{z\,adm}N = 5$

FGr	IM = VK6		IM ≠ VK6	
	$\sigma \leq 180$	$\sigma \leq 1800$	$\sigma \leq 180$	$\sigma \leq 1800$
1	0.28	0.24	0.38	0.32
≤ 3	0.56	0.48	0.76	0.64

Structural Decision Tables

Textbook Example cont'd

h = 8, $s_{z\,adm}N = 5$

FGr	IM = VK6		IM ≠ VK6	
	σ ≤ 180	σ ≤ 1800	σ ≤ 180	σ ≤ 1800
1	0.28	0.24	0.38	0.32
≤ 3	0.56	0.48	0.76	0.64

- Corresponding structural table

				X		X		σ ≤ 180
					X		X	σ ≤ 1800
h = 8	FGr = 1	FGr ≤ 3	$s_{z\,adm}N = 5$	X	X			IM = VK6
X	X		X	0.28	0.24	0.38	0.32	
X		X	X	0.56	0.48	0.76	0.64	

Implementation in CoCoViLa
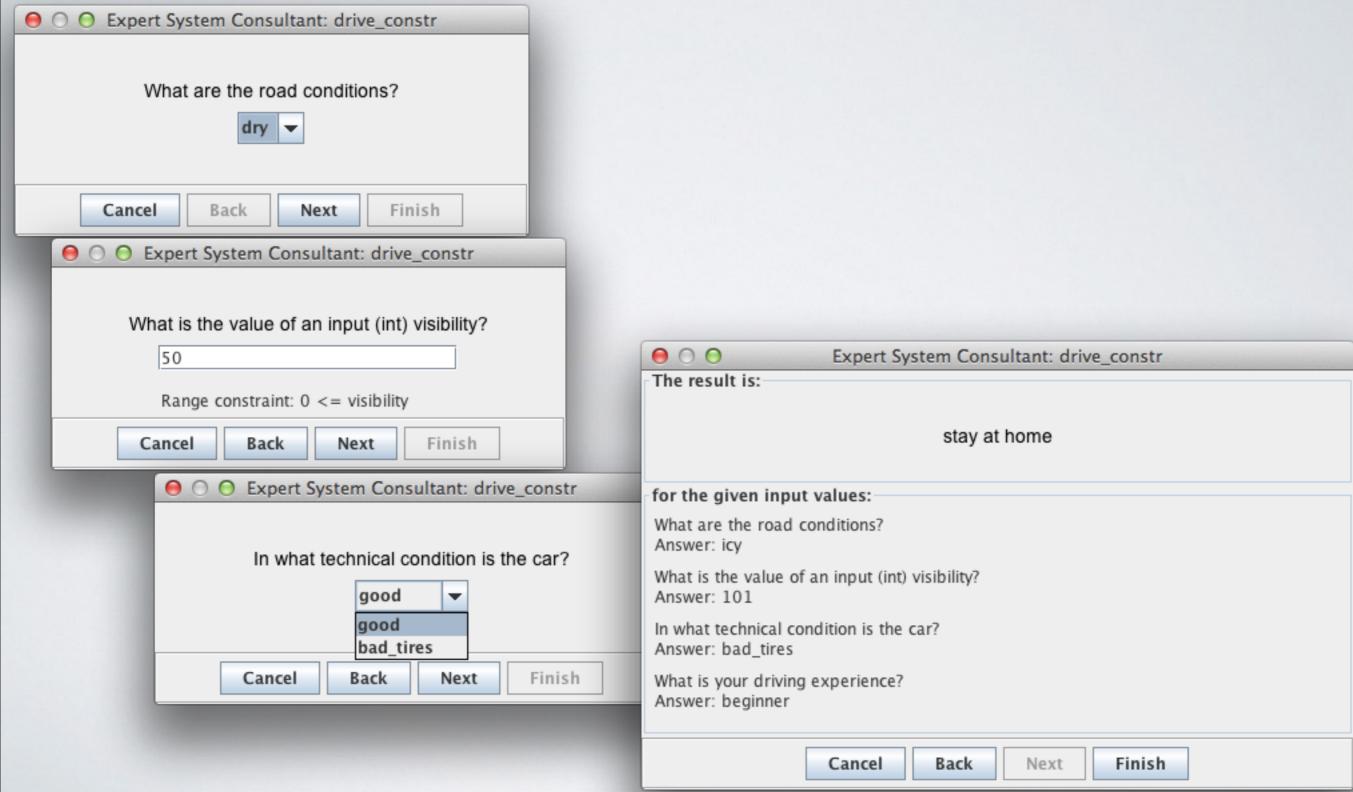
Calling from Specification

```
class TableTest {
    /*@ specification TableTest {
        int x, y, value;
        const String tableId = "test";
        tableId, x, y -> value{@table};
    }@*/
}
```

.tbl (=XML) format

```xml
<?xml version='1.0' encoding='utf-8'?>
<tables xmlns="cocovila"
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xsi:schemaLocation="cocovila file:./table.xsd"
        xmlns:cocovila="cocovila">
  <table id="smcomplex-gses">
    <input>
      <var id="mgn" type="String"/>
      ...
    </input>
    <output>
      <var id="ml" type="int"/>
    </output>
    <hrules>
      <rule var="mgn" cond="eq" value="User training">
        <entry id="0"/>
      </rule>
      ...
    </hrules>
    <vrules>...</vrules>
    <data>
      <row id="0">
        <cell id="0">0</cell>
      ...
```

Interactive Consultant

Thanks!