PSOA Prova: PSOA Translation of Pure Production Rules to the Prova Engine

Lukas Grätz[1] Harold Boley[2] Adrian Paschke[3]

Institut für Philosophie, Universität Leipzig, Germany
lukas[DT]graetz[AT]studserv.uni-leipzig.de

Faculty of Computer Science, University of New Brunswick, Fredericton, Canada
harold[DT]boley[AT]unb.ca

Fraunhofer FOKUS and Freie Universitaet Berlin, Germany
adrian[DT]paschke[AT]fokus.fraunhofer.de

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Use Case: Royal Family

- How did Prince William become a successor?
- How to represent successorship with KR?

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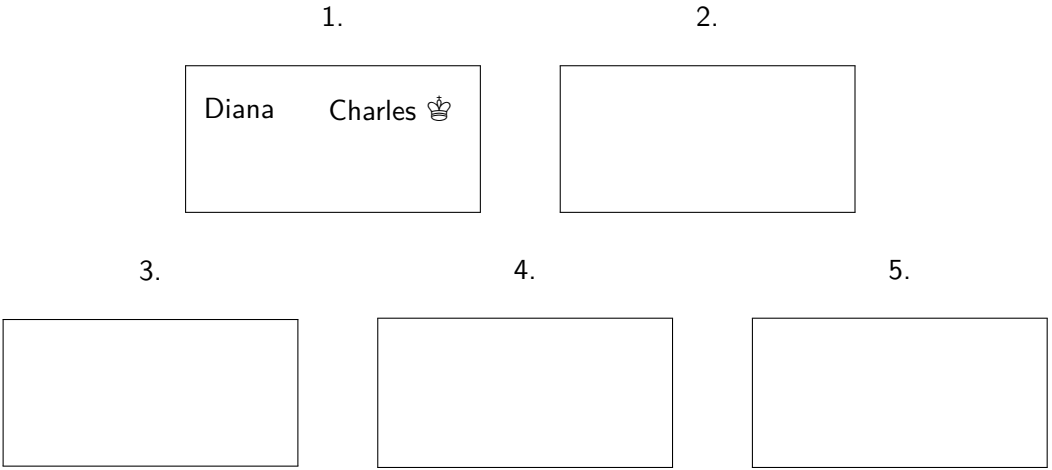
- How did Prince William become a successor?

  ☞ *Succession to the Crown Act*

- How to represent successorship with KR?

  ☞ Our challenge

Royal Family



Royal Family

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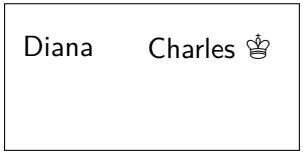

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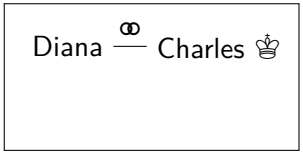

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4.

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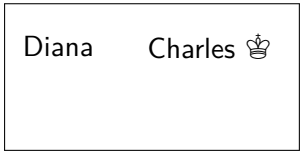

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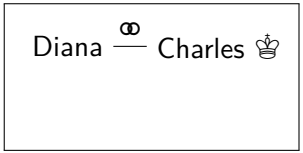

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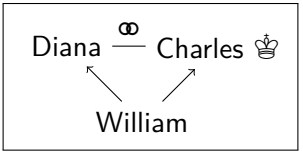

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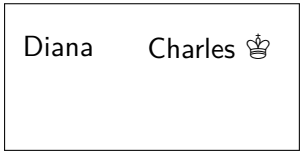

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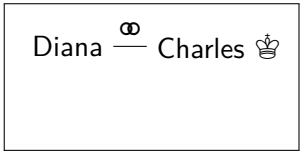

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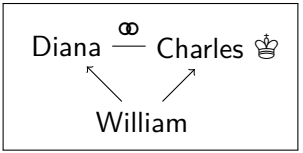

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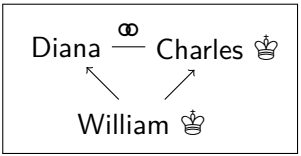

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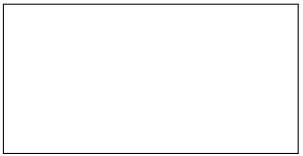

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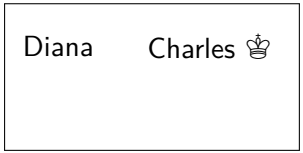

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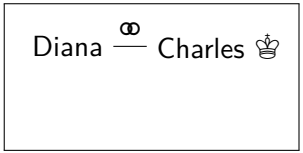

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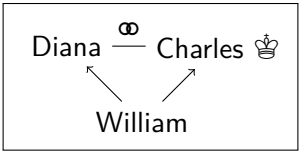

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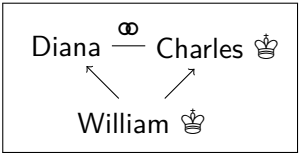

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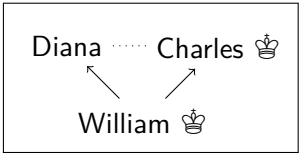

PSOA RuleML for Reconstruction

- object-relational knowledge
  - `Object#Predicate` — membership
  - `Object#Predicate( key+>value )` — dependent slot
  - `Object#Top ( key->value )` — independent slot
  - `Object#Predicate( elem_1 elem_2 ... )` — dependent tuple
  - `Object#Top ( -[elem_1 elem_2 ...] )` — independent tuple
  - `OID#Pred( d1... -[e1...] k1+>v1 k2->v2 ...)` — all together
- derivation rules

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Forall ?Q1 ?Q2 ... ?Qn (
    <conclusion> :- And( <cond_1> <cond_2> ...)
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New feature in PSOA Prova: `consult` and `unconsult` at run-time

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> consult RoyalFamily-KB2.psoa
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Translated KB:
prdsloterm('_1','_marriage','_partner','_Diana').
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> unconsult RoyalFamily-KB2.psoa

> marriage( partner+>Diana partner+>Charles )
Translated Query:
prdsloterm(Q1,'_marriage','_partner','_Diana'),
prdsloterm(Q1,'_marriage','_partner','_Charles'),
memterm(Q1,'_marriage').

Answer(s):
No
```

Succession by a Derivation Rule

```
Forall ?Ch ?P1 ?P2 (
  ?Ch#successor  :-
     And( ?Ch#child( parent->?P1 parent->?P2 )
          marriage( partner+>?P1 partner+>?P2 )
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```

$\rightsquigarrow$ Translation into Prolog:

```
memterm(QCh,'_successor')
  :- sloterm(QCh,'_parent',QP1),
     sloterm(QCh,'_parent',QP2),
     memterm(QCh,'_child'),
     prdsloterm(Q1,'_marriage','_partner',QP1),
     prdsloterm(Q1,'_marriage','_partner',QP2),
     memterm(Q1,'_marriage'),
     memterm(QP1,'_successor').
```

Succession by a Pure Production Rule

Definition

A *pure production rule* is an extended derivation rule, where the derived conclusion is asserted persistently to the KB. If the condition holds, the conclusion is derivable; moreover, the conclusion will be asserted at least before the condition becomes unsatisfied.

Notation: `<conclusion> ::- <condition>`

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```

Derivation vs. Pure Production Rule

Demonstration

(screenrecord – just in case)

Evaluation of a Pure Production Rule

Events to start evaluation $\hat{=}$ `assert` the conclusion:

1. **Structure operation**
   1. after `consult`
   2. before `unconsult`
   3. ...
2. **Behavior invocation**
   1. conclusion is derivation (sub)goal
   2. ...
3. **Clock** (e.g. polling)
4. **External**
5. ...

transparent for the user!

Results

- ✓ PSOATransRun fork on Github
- ✓ PSOATransRun[PSOA2Prova,Prova]
- ✓ Consult and unconsult
- ✓ Pure production rules

Wiki

The End