EFFICIENT UNFOLDING OF COLOURED PETRI NETS WITH INTERVAL DECISION DIAGRAMS

SCHWARICK - ROHR - LIU - ASSAF - CHODAK - HEINER
BRANDENBURG TECHNICAL UNIVERSITY COTTMBUS-SENFTENBERG
COMPUTER SCIENCE INSTITUTE
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COLOURED PETRI NETS
WHAT FOR ?
THE SIR MODEL
[https://en.wikipedia.org/wiki/Compartmental_models_in_epidemiology#The_SIR_model]
THE SIR MODEL

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THE SIR MODEL

[ https://en.wikipedia.org/wiki/Compartmental_models_in_epidemiology#The_SIR_model ]
Epidemic -> Pandemic Modelling

Joint work with David Gilbert, Shannon Connolly, Brunel University, London
EPIDEMIC -> PANDEMIC MODELLING

JOINT WORK WITH DAVID GILBERT, SHANNON CONNOLLY, BRUNEL UNIVERSITY, LONDON
EPIDEMIC -> PANDEMIC MODELLING

Susceptible 2 Infected 10 Recover 83,000

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Epidemic -> Pandemic Modelling

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Susceptible_DE  Infect_DE  Infected_DE  Recovered_DE

Susceptible_FR  Infect_FR  Infected_FR  Recovered_FR

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June 2020
Epidemic -> Pandemic Modelling

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EPIDEMIC -> PANDEMIC MODELLING

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EPIDEMIC -> PANDEMIC MODELLING

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Epidemic to Pandemic Modelling

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Epidemic -> Pandemic Modelling

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PN & BioModel Engineering
AND THEN THERE WAS COLOUR
PANDEMIC MODELLING WITH COLOURED NETS

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**colorsets:**

```cpp
enum Nodes = {AT, CH, DE, FR, IT};
```

---

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colorsets:
    enum Nodes = {AT, CH, DE, FR, IT};

variables:
    Nodes : x;

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**PANDEMIC MODELLING WITH COLOURED NETS**

**colorsets:**

```
enum Nodes = {AT, CH, DE, FR, IT};
```

**variables:**

```
Nodes : x;
```

---

**Joint work with David Gilbert, Shannon Connolly, Brunel University, London**

---

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colorsets:
enum Nodes = \{AT, CH, DE, FR, IT\};

variables:
Nodes : x; Nodes : y;

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colorsets:
  enum Nodes = {AT, CH, DE, FR, IT};
variables:
  Nodes : x; Nodes : y;

JOINT WORK WITH DAVID GILBERT, SHANNON CONNOLLY, BRUNEL UNIVERSITY, LONDON
colorsets:
enum Nodes = {AT, CH, DE, FR, IT};

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colorsets:

enum Nodes = \{ AT, CH, DE, FR, IT \};
Matrix = PROD (Nodes, Nodes);

\begin{verbatim}
Matrix = PROD (Nodes, Nodes);
\end{verbatim}
colorsets:

enum Nodes = {AT, CH, DE, FR, IT};
Matrix = PROD (Nodes, Nodes);
Connections = Matrix [ (x=AT & (y=CH | y=DE | y=IT)) |
(x=CH & (y=AT | =E | y=FR | y=IT)) | ... ];
PANDEMIC MODELLING WITH COLOURED NETS

**colorsets:**

```plaintext
enum Nodes = {AT, CH, DE, FR, IT};
Matrix = PROD (Nodes, Nodes);
Connections = Matrix [ (x=AT & (y=CH | y=DE | y=IT) | 
(x=CH & (y=AT | =E | y=FR | y=IT) | . . . ];
```

**colorfunction:**

```plaintext
bool connected (Nodes p, Nodes q) { (p,q) elemOf Connections };
```

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PANDEMIC MODELLING WITH COLOURED NETS

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PANDEMIC MODELLING WITH COLOURED NETS

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Susceptible

Recovered

Infected

ConnectionS
[connected(x,y)]

ConnectionI
[connected(x,y)]

ConnectionR
[connected(x,y)]

AT, CH, DE, FR, IT

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JOINT WORK WITH DAVID GILBERT, SHANNON CONNOLLY, BRUNEL UNIVERSITY, LONDON
PANDEMIC MODELLING WITH COLOURED NETS

P & BioModel Engineering

 recovered

 EUERPE

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PANDEMIC MODELLING WITH COLOURED NETS

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WHAT NEEDS TO BE CHANGED:

COLOUR SETS + INITIAL MARKING
SIMULATING AND ANALYSING PANDEMIC MODELS

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June 2020
HOW TO UNFOLD EFFICIENTLY?
How to unfold efficiently?
SNOOPY MARCIE SPIKE

HOW TO UNFOLD EFFICIENTLY?

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