Location-Aware Process Recovery via Petri Net Learning
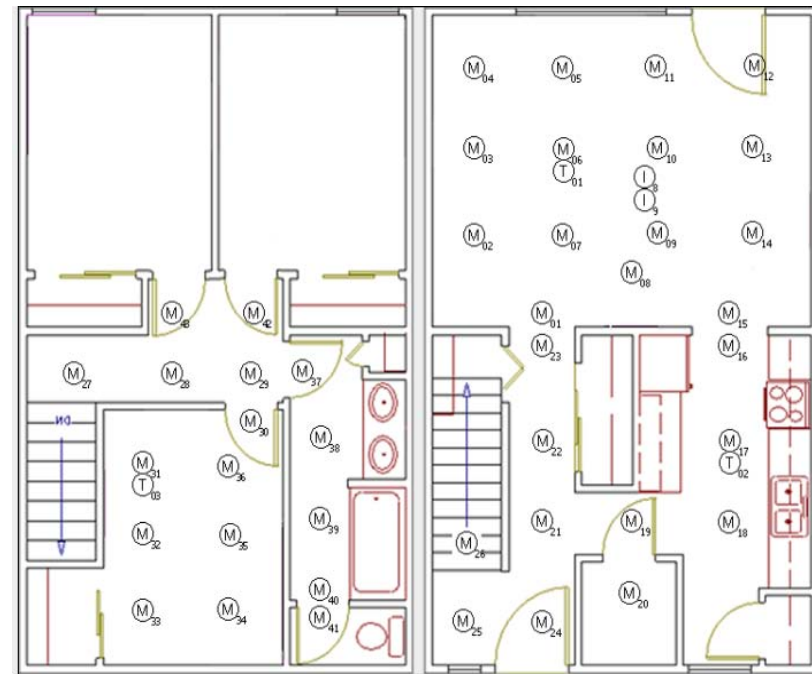
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Motivation

- The pervasive sensing technologies found in smart houses offer unprecedented opportunities for providing health monitoring and assistance to individuals experiencing difficulties living independently at home.

Motivation (cont.)

- If we treat human behaviors in smart houses as produce items in the factories.

- Sequential

- Parallel

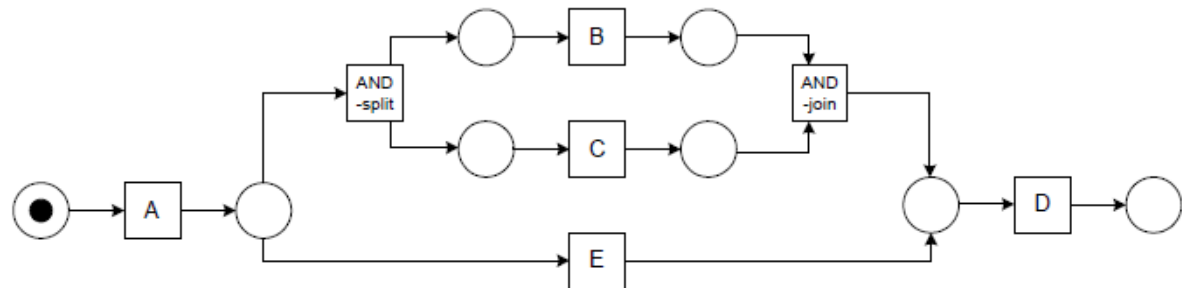- Exclusive

Background of Process Mining

- Process mining is to automatically determine and analyze actual process execution – How the processes are performing in a complete new and process oriented way.

- The basic idea behind Process Mining is to extract knowledge from event logs recorded by systems.

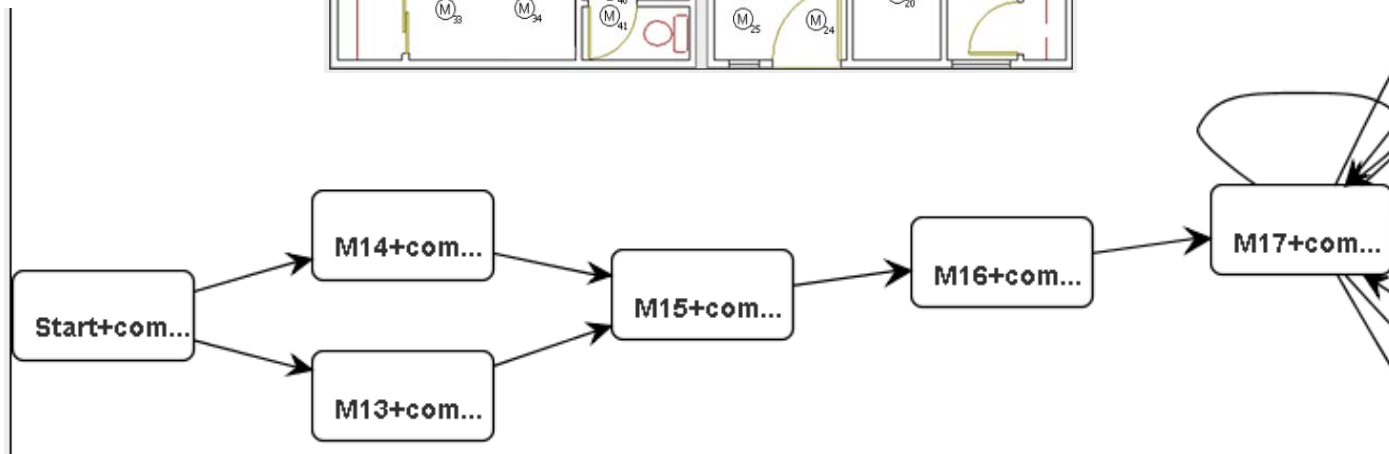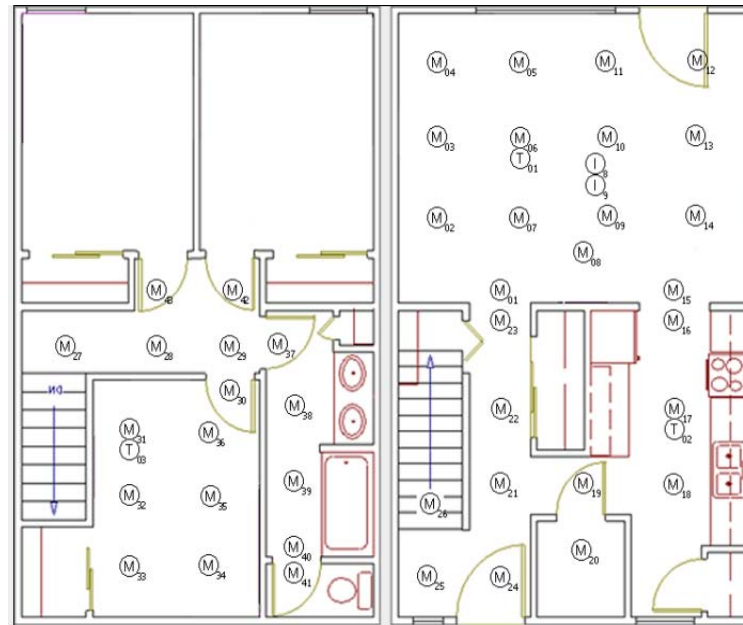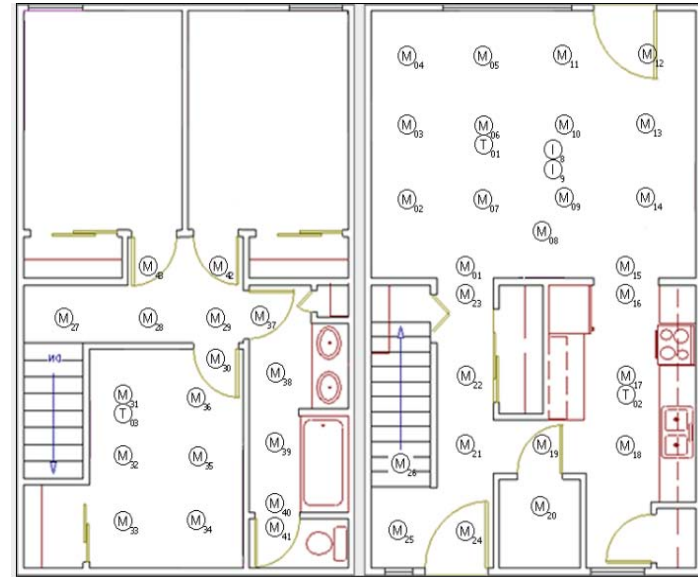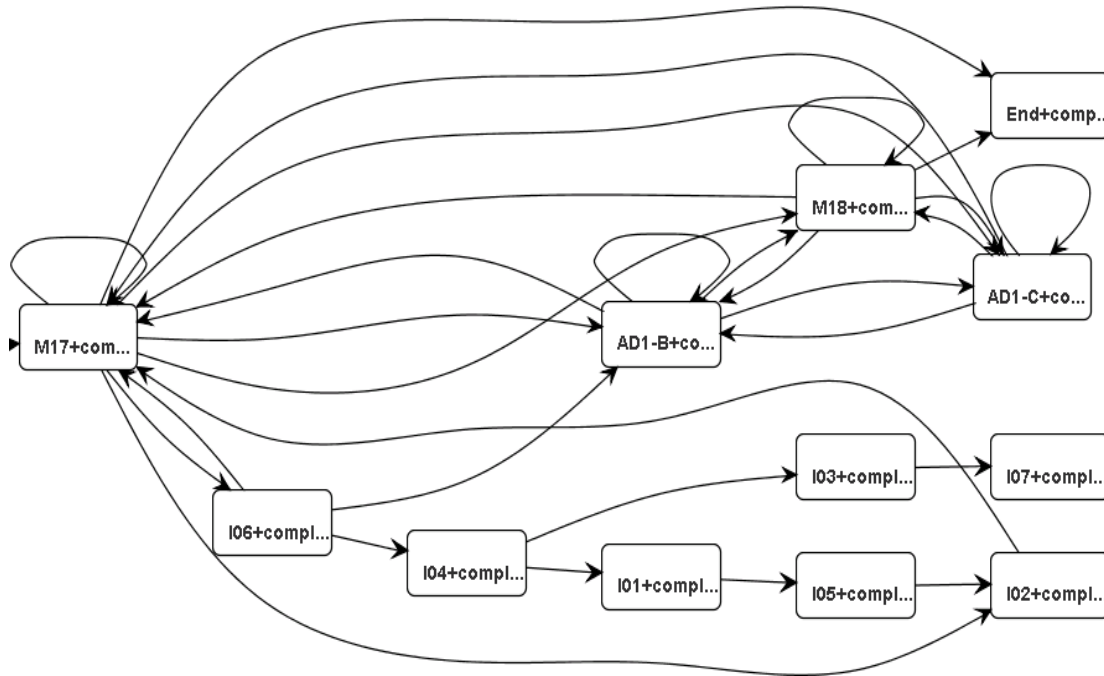| Patient ID	Treatment ID
1	A
2	A
3	A
3	B
1	B
1	C
2	C
4	A
2	B
2	D
5	A
4	C
1	D
3	C
3	D
4	B
5	E
5	D
4	D

Patient 1: ABCD
Patient 2: ACBD
Patient 3: ABCD
Patient 4: ACBD
Patient 5: AED

Example

Example (cont.)

Problem 1 Data Sources

```
2008-02-27   13:01:59.731257 M14 ON
2008-02-27   13:02:01.768668 M13 ON
2008-02-27   13:02:01.904702 M14 OFF
2008-02-27   13:02:03.610236 M13 OFF
2008-02-27   13:02:18.144571 M14 ON
2008-02-27   13:02:18.339518 M13 ON
2008-02-27   13:02:21.935527 M13 OFF
2008-02-27   13:02:26.979782 M15 ON
2008-02-27   13:02:27.65459  M16 ON
2008-02-27   13:02:29.167161 M17 ON
2008-02-27   13:02:29.78498  M15 OFF
2008-02-27   13:02:30.855689 M14 OFF
2008-02-27   13:02:31.460564 M16 OFF
2008-02-27   13:02:33.228621 M17 OFF
2008-02-27   13:02:33.506643 M17 ON
2008-02-27   13:02:35.44078  M17 OFF
2008-02-27   13:02:40.436585 M17 ON
2008-02-27   13:02:43.448725 D01 OPEN
2008-02-27   13:02:48.940119 M17 OFF
```

Patient ID	Treatment ID
1	A
2	A
3	A
3	B
1	B
1	C
2	C
4	A
2	B
2	D
5	A
4	C
1	D
3	C
3	D
4	B
5	E
5	D
4	D

Problem 2 Missing Data

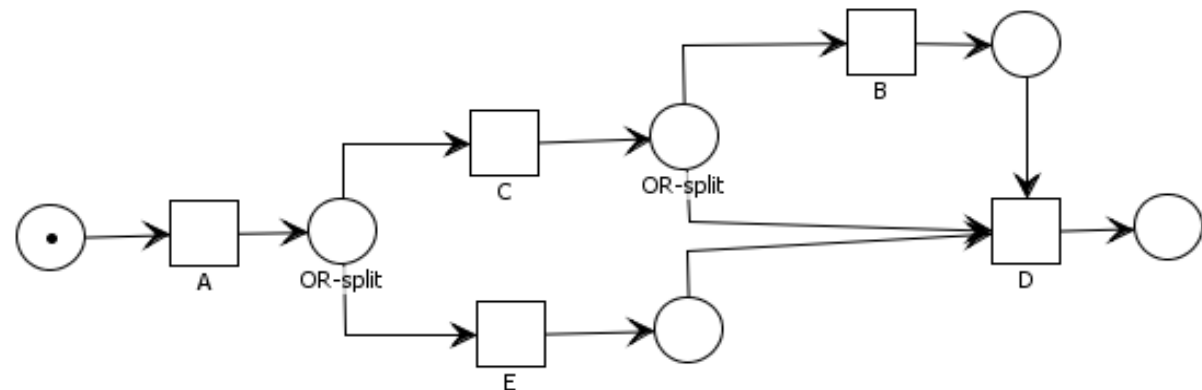| Patient ID	Treatment ID
1	A
2	A
3	A
~~3~~	~~B~~
~~1~~	~~B~~
1	C
2	C
4	A
2	B
2	D
5	A
4	C
1	D
3	C
3	D
4	B
5	E
5	D
4	D

Patient 1: ABCD   ->   ACD
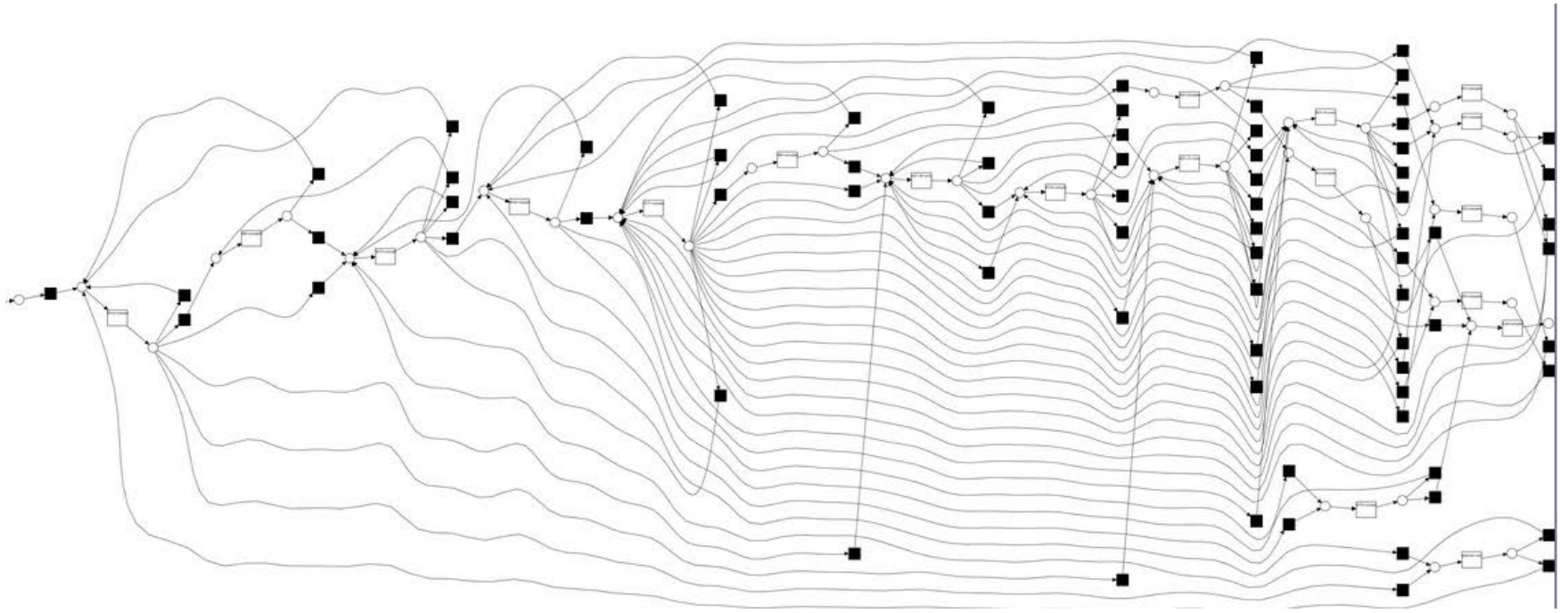Patient 2: ACBD
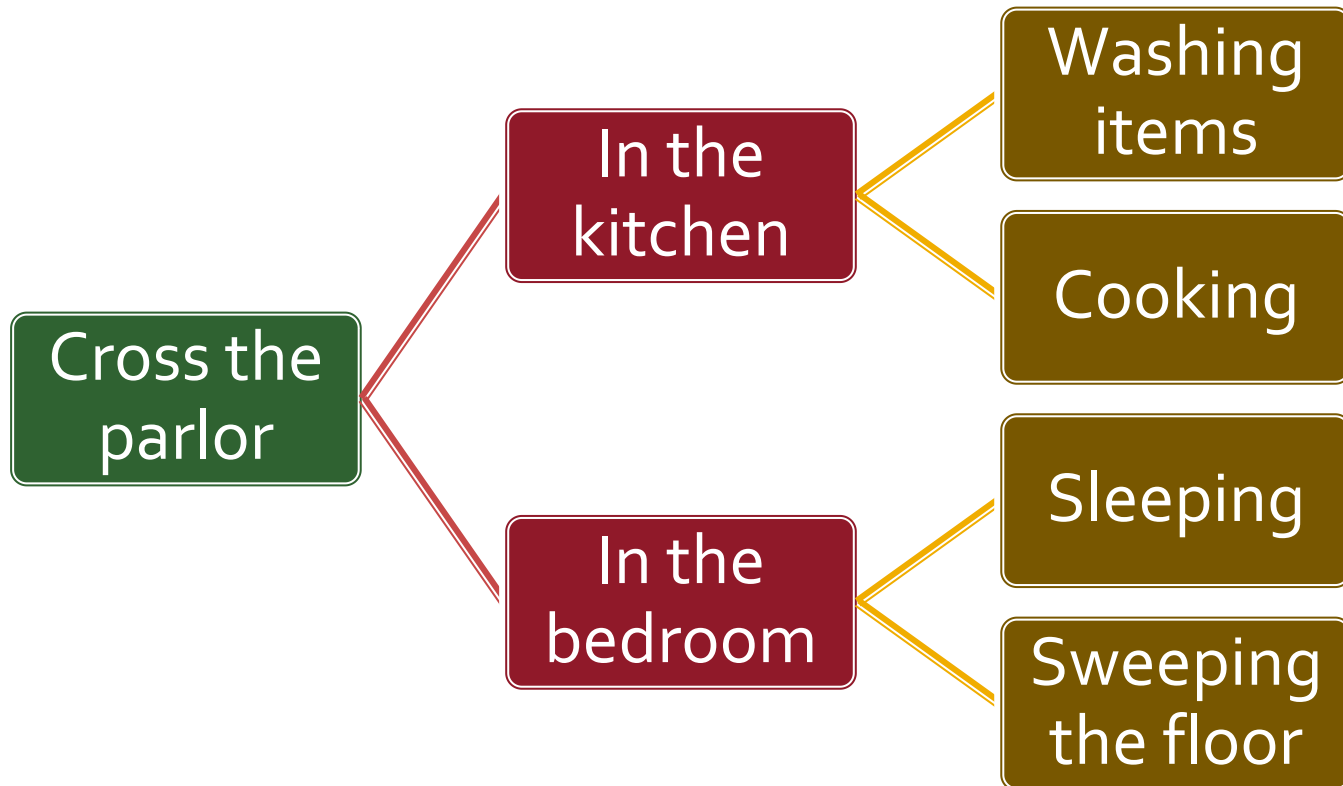Patient 3: ABCD   ->   ACD
Patient 4: ACBD
Patient 5: AED

Problem 3 Granularity
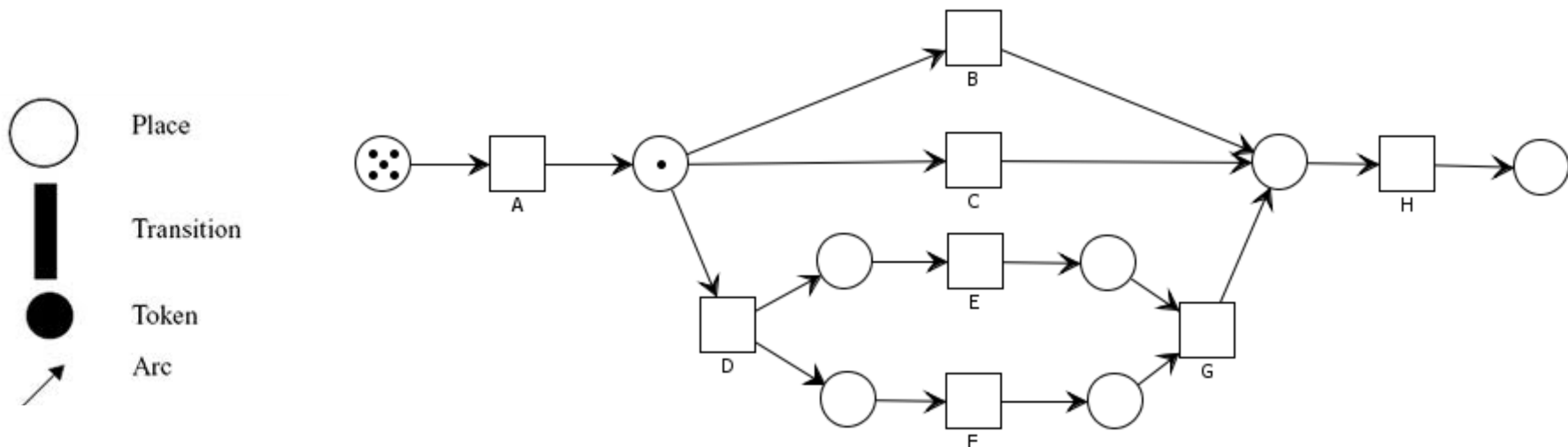
Problem 3 Granularity (cont.)

Literature Review

- There are several techniques that are used to perform process mining such as:

  - α algorithms (van der Aalst et al. 2004)

  - Genetic algorithms (Alves de Medeiros et al. 2007)
  - Heuristic mining (Weijters and vander Aalst 2003)
  - Fuzzy mining (Gunther and van der Aalst 2007)
  - Region-based approaches (van Dongen et al. 2007, Sole and Carmona 2010, etc.)
  - Mining interleaved data (Jian-Guang Lou et al. 2010)
  - Mining unlabelled data (Ferreira and Gillblad 2009)

Future work

- Introduce Location information

- Use Stochastic model

- Via Petri net learning
  - Simple
  - Powerful

Thank you!