Ordered and categorical structures for data sciences

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Cooking potatoes
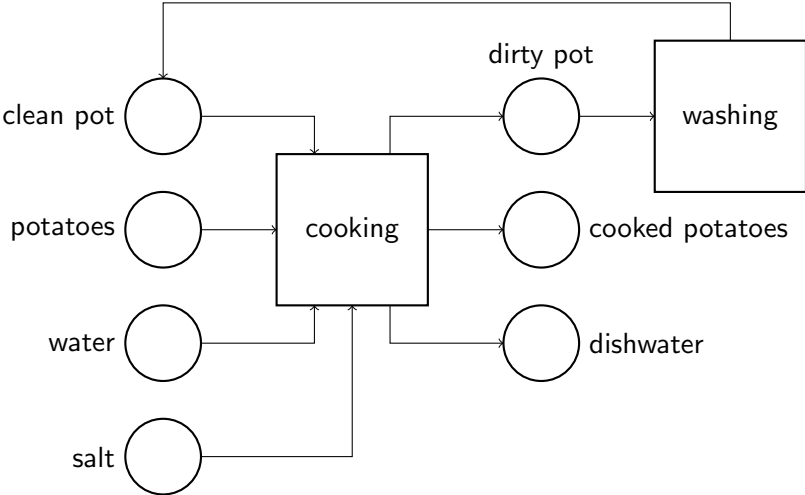
Properties of a flow

- There are processes and stacks. They alternate in any path.
- Processes are not machines. The machines (as well as workers) enter the processes as other inputs (and leave them after finishing).
- Loops are possible.
- The "recipe" can share common parts. We can consider a "net of all recipes".
- The flow can be simulated by timed Petri nets.
- Production is organized by *breakdown structures* — PBS, WBS. This yields *composition* of processes and/or stacks.
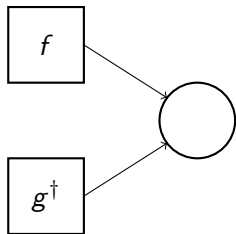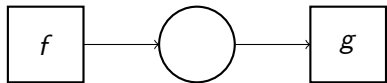
Breaking structure

receipt

1. preparation
    1.1. peeling
    1.2. cutting
2. cooking
    2.1. mixing
    2.2. warming up
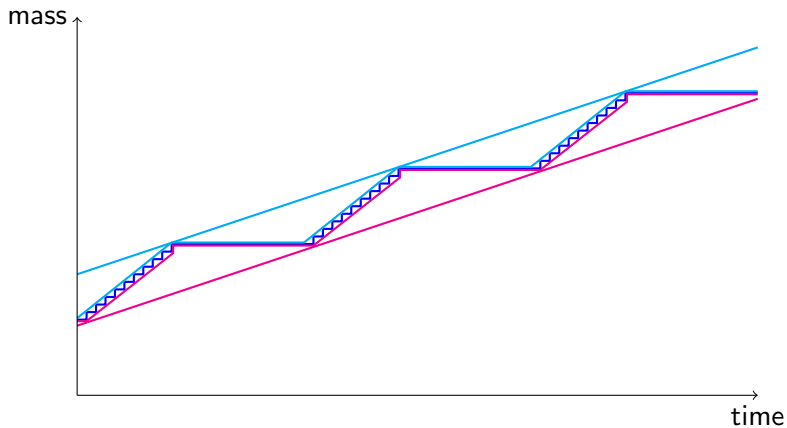   2.3. boiling
    2.4. pouring
3. washing the pot

Categories vs. graphs
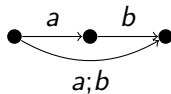
Validation of a flow on stacks

Sausage wrapping

Aggregation

There are two types of aggregation:

- ▶ of subsequent (categorical composition or tensoring) along the breaking structures,
- ▶ of similar (generalization, factorization).

The production scheme is a diagram on a category of processes.

All constraints are morphisms

Every arrow is a motion between *events* along time or material axes.

It expresses causality: before/after, previous/next.

Composite morphisms can be naturaly ordered which provides a 2-category structure.

Conclusion

Hypothesis: All production constrains can be described by means
of morphisms.

Thank you for attention!