

# Categories for industrial planning

David Kruml

Jan Paseka

**David Kruml** (`kruml@math.muni.cz`)  
Masaryk University, Brno, Czechia

**Jan Paseka** (`paseka@math.muni.cz`)  
Masaryk University, Brno, Czechia

**Abstract.** Category theory provides a way of thinking in solving many complex problems. We intend to explain an application on industrial networks, flows, and their data organization which was a part of two long-term applied projects solved in recent years.

The networks consist of processes, stacks, and channels, and those are aggregated into breakdown structures. Such organization naturally define a structure of dagger compact category and production schemes are described as certain diagrams. Namely, the tensor product aggregates resources and the dagger enables to define backward flows.

The model is mostly inspired by that of quantum protocols introduced by Abramsky and Coecke [1] and provides an interesting link between the two areas. For example, we will present a production analog of the double-split experiment. However, “logic” of the production networks is arise from classical finite relations (and not finite-dimensional Hilbert spaces). This provides a direct interpretation of categorical operations as clauses in relational databases.

## References

- [1] S. Abramsky and B. Coecke, *A categorical semantics of quantum protocols*, Proceedings of the 19th Annual IEEE Symposium of Logic in Computer Science (2004), IEEE Computer Science Press, 415-425.