

Directed topology and Concurrency Theory

Lisbeth Fajstrup,

Department of Mathematics Aalborg University

Abstract:

Insights of a topological nature play a more and more prominent role in discovery and analysis of fundamental mechanism in engineering and science. This talk will be a survey of a specific development, namely in the modelling and analysis of concurrency, i.e., parallel structures in computer science.

About 20 years ago, we introduced directed algebraic topology, topological spaces with a “time”-direction, to study models of concurrent computing such as PV-models and Higher Dimensional Automata. The spaces model the joint states of the system and executions are (time)-directed paths. Executions are equivalent if the corresponding directed paths can be continuously deformed into each other via directed paths – they are homotopic through directed paths. Topology is certainly the right tool, but time directions have to be taken into account, hence, directed topology is needed. Both algorithms and insight have come out of this interplay between a new mathematical area and the applications.

This talk will give an introduction to this mathematical field and the applications in concurrency theory.

.....End