

Model-checking of Modal Logics

Section for Algorithms, Logic and Graphs

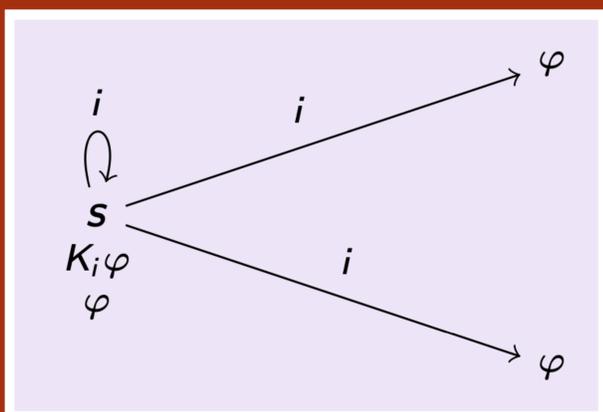
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Many naturally occurring systems can be represented as graphs, for instance: transportation systems, the flow of time, knowledge in a multiagent system.

Modal logics extend propositional logic with so-called modal operators. They allow using a local perspective: checking properties in the nodes of the graph.

type of logic	reasoning about	specification (e.g.)
Temporal	time	“time is dense”
Spatial	space	“a is closer to b than to c”
Epistemic	knowledge	“whatever is known, is also true”
Doxastic	beliefs	“b has a false belief”
Dynamic	programs	“after n runs of a program, the process halts”
Deontic	obligations	“if I am obliged to do it, I am allowed to do it”

EXAMPLE



An agent knows that φ if φ is true in all states she considers possible (those accessible with i -edges).

Specification: „Whatever is known, is also true.”

Corresponding property of the graph: looping edges.

In the project you will:

Learn about syntax and semantics of modal logic.

Study the concepts of decidability and complexity of a logic.

Chose one type of modal logic and learn about its distinctive features.

Build a simple model-checker – an algorithm that on the input of a graph and a modal formula decides if the fomula accurately describes the graph.

Learn about the existing solutions to the problem.

Investigate the possibility of applying your modelling to a real-life domain.

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