Constructing integrated models: a scheduler to execute coupled components

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Motivation

The construction of integrated models holding components of environmental, social and economic systems is relevant for scientific research and decision support. Software tools supporting the construction of these models exist, but they often impose extensive knowledge of system programming languages and software engineering on the user.

Example model

We apply the framework to a two-component model with bidirectional interaction and each different time steps. The coupled model consists of a component simulating biomass growth processes (Dakos, 2009) on a fixed yearly timestep, and a component simulating fire spread (Karafyllidis, 1997) on a variable time step.

The framework provided as Python module in combination with existing Python libraries allows straightforward development of spatio-temporal models with variable temporal discretisations. Future research will focus on the integration of advanced analysis schemes and the extension of formalised component descriptions.

Objective

The objective of this research is the development of an environment for model component construction, coupling and assessment tailored to explorative model construction.

Software architecture

The user develops components with flexible time steps and accumulators with the help of base classes provided by the framework. The temporal discretisation and interactions between components determine the execution order during the model run. Base classes and model execution are provided as modules for the high-level programming language Python.

Conclusions

The framework provided as Python module in combination with existing Python libraries allows straightforward development of spatio-temporal models with variable temporal discretisations. Future research will focus on the integration of advanced analysis schemes and the extension of formalised component descriptions.

References