
Modularisierung in GAMS

Anastasis Giannousakis

PIK

Nachhaltige Lösungsstrategien

Motivation

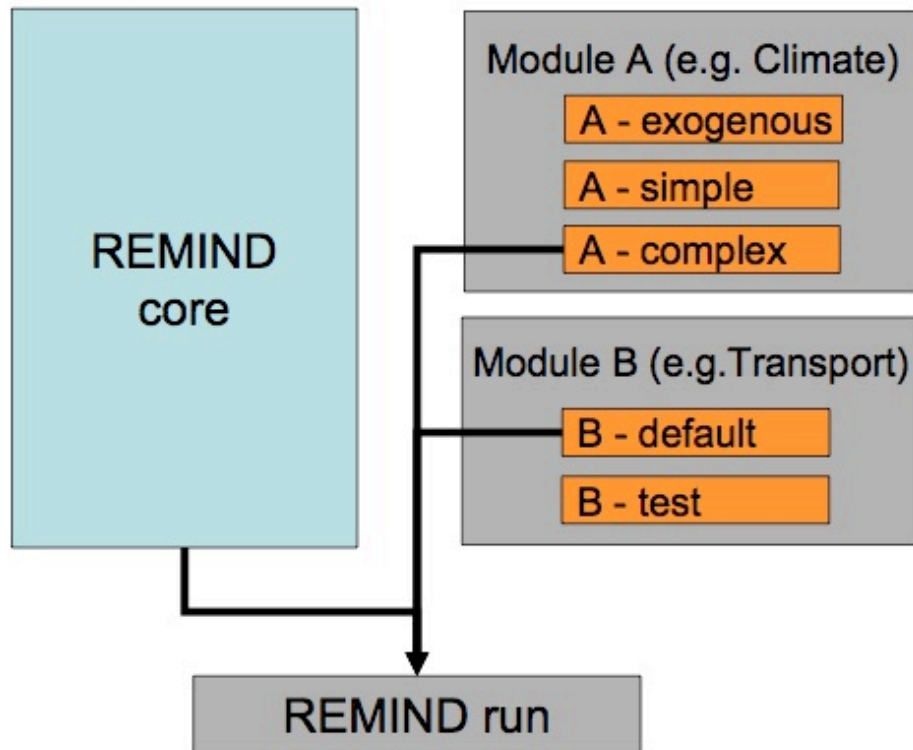
Probleme:

- Das Modell wird immer größer, komplexer
- SVN Branches für: Features, Nutzer
- Modellentwicklung führt oft zu nicht funktionierenden Versionen

Lösungen:

- Modell ist viel, viel, viel übersichtlicher
- Alle nutzen nur den Trunk, mit zusätzlichen Vorteilen
- Modell immer produktionsfertig, bzw. einfach zu debuggen

Darstellung 1



```
- main.gms
  [571] sets.gms
  - [572] include.gms sets
    + [L5] 10_climate.gms
    - [L6] 30_biomass.gms
      + [3] exogenous.gms
      + [4] hoogwijk.gms
      - [5] magpie.gms
        [L3] sets.gms
        [L4] declarations.gms
        + [L5] datainput.gms
          [L6] equations.gms
          [L7] preloop.gms
          [L8] bounds.gms
          [L9] presolve.gms
          [10] postsolve.gms
          [11] output.gms
        + [L7] 31_fossil.gms
        + [L8] 35_transport.gms
        + [L9] 80_optimization.gms
      [578] declarations.gms
    + [579] include.gms declarations
    + [584] datainput.gms
    + [585] include.gms datainput
    + [590] equations.gms
    + [591] include.gms equations
    + [597] preloop.gms
    + [598] include.gms preloop
    + [603] loop.gms
    + [608] output.gms
    + [609] include.gms output
```

Darstellung 2

The image displays a file explorer interface showing a project structure. The structure is organized into four main sections, each with a list of folders and files, and green checkmarks indicating successful status.

- Section 1 (Top Left):**
 - Folder: **core** (checked)
 - Folder: **modules** (checked)
 - Folder: **output** (checked)
 - Other:
 - File: **main.gms** (checked)
- Section 2 (Top Right):**
 - Folder: **input** (checked)
 - Other:
 - File: **bounds.gms** (checked)
 - File: **datainput.gms** (checked)
 - File: **declarations.gms** (checked)
 - File: **equations.gms** (checked)
 - File: **loop.gms** (checked)
 - File: **output.gms** (checked)
 - File: **postsolve.gms** (checked)
 - File: **preloop.gms** (checked)
 - File: **presolve.gms** (checked)
 - File: **sets.gms** (checked)
- Section 3 (Bottom Left):**
 - Folder: **core** (checked)
 - Folder: **modules** (checked)
 - Folder: **output** (checked)
 - Other:
 - File: **main.gms** (checked)
- Section 4 (Bottom Middle):**
 - Folder: **10_climate** (checked)
 - Folder: **20_growth** (checked)
 - Folder: **21_tax** (checked)
 - Folder: **22_subsidizeLearning** (checked)
 - Folder: **30_biomass** (checked)
- Section 5 (Bottom Right):**
 - Folder: **box** (checked)
 - Folder: **magicc** (checked)
 - Folder: **off** (checked)
 - Other:
 - File: **10_climate.gms** (checked)
 - File: **box.gms** (checked)
 - File: **magicc.gms** (checked)
 - File: **off.gms** (checked)
- Section 6 (Bottom Far Right):**
 - Folder: **input** (checked)
 - Other:
 - File: **bounds.gms** (checked)
 - File: **datainput.gms** (checked)
 - File: **declarations.gms** (checked)
 - File: **equations.gms** (checked)
 - File: **output.gms** (checked)
 - File: **postsolve.gms** (checked)
 - File: **preloop.gms** (checked)
 - File: **presolve.gms** (checked)
 - File: **sets.gms** (checked)

Wichtige Konzepte

- Die üblichen GAMS Befehle (include, batinclude)
- Dateinamen, Ordnerstruktur, sind standardisiert
- Interfaces
- Möglichkeit gezielt eine beliebige Modelversion zu basteln
- Module Contracts
- model “all”

2.11.1 10 climate

Current contract

The climate module calculates the radiative forcing, the temperature and the concentration of Greenhouse Gases in the atmosphere based on the emissions that it reads in.

Input

- `vm_emieng` global energy-related emissions of type `enty` [units depend on type, consistent with units of ANT]
- `vm_emineg` global non-energy-related emissions of type `enty` [units depend on type, consistent with units of ANT]
- `pm_emi_budget1` budget for global energy-emissions in period 1
- `pm_emi_budget1_reg` budget for regional energy-emissions in period 1

Output

- `vm_forc_os` forcing overshoot
- `v_emimac0` baseline emissions of `mac` options
- `vm_emieng` global energy-related emissions of type `enty` [units depend on type, consistent with units of ANT]
- `vm_emineg` global non-energy-related emissions of type `enty` [units depend on type, consistent with units of ANT]
- `pm_emi_budget1` budget for global energy-emissions in period 1
- `pm_emi_budget1_reg` budget for regional energy-emissions in period 1

Invariants

- No main-code parameters are changed in the module

Current realizations and their limitations

box (Petschel - Held)

For this realization the simple climate box-model is used.

MAGICC

This realization simply runs MAGICC (like it is run during post-processing) with the emission trajectories and feeds back the total anthropogenic radiative forcing (file `DAT_TOTAL_ANTHRO_RF.OUT`) in 2100 `pm_emi_budget1_reg1`.

off

No climate coupling. One can use the REMIND emissions output to run a stand-alone mode of a climate model.

Reference

Developer(s)

- *MAGICC*: Michaja Pehl

Zusätzliche Tools

- Coding etiquette: Richtlinien für Namen und Code-Struktur
- R libraries

Vielen Dank!

giannou@pik-potsdam.de