



CAT AND TOP THINKING FOR INDUSTRIAL SOLUTIONS

Congress on Categorical Methods
in Algebra and Topology


August 20-26, 2000
Bremen, Germany

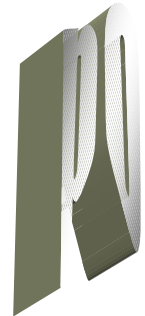
UNIVERSITÄT
BREMEN





agenda

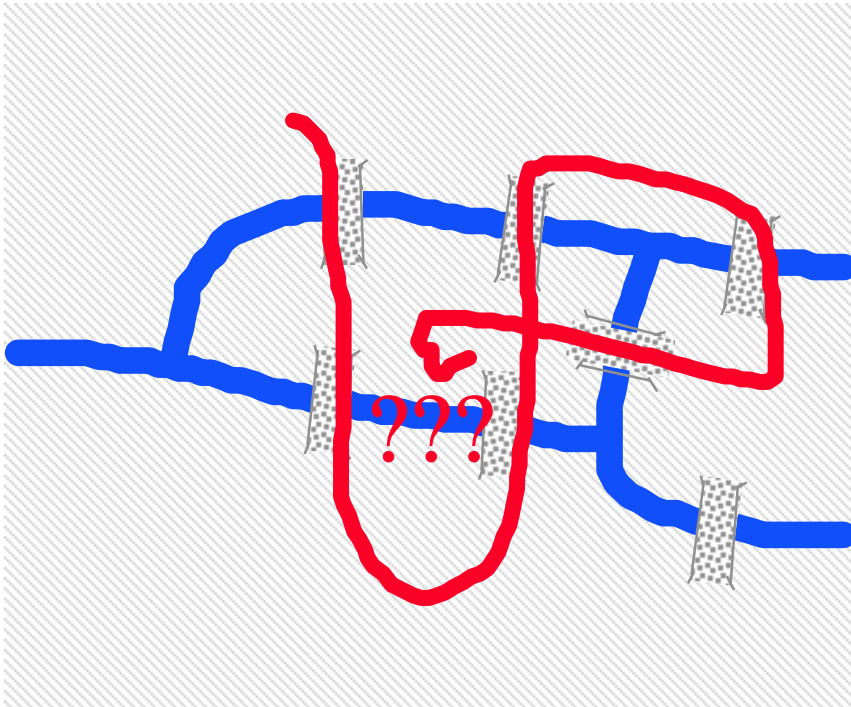
- **C**ats
- **a**pplications
- **t**ops
- **M**eteorology
- **A**nti „vogue“
- **T**heory  but realisation still open problem
- **2000** program for visualisation





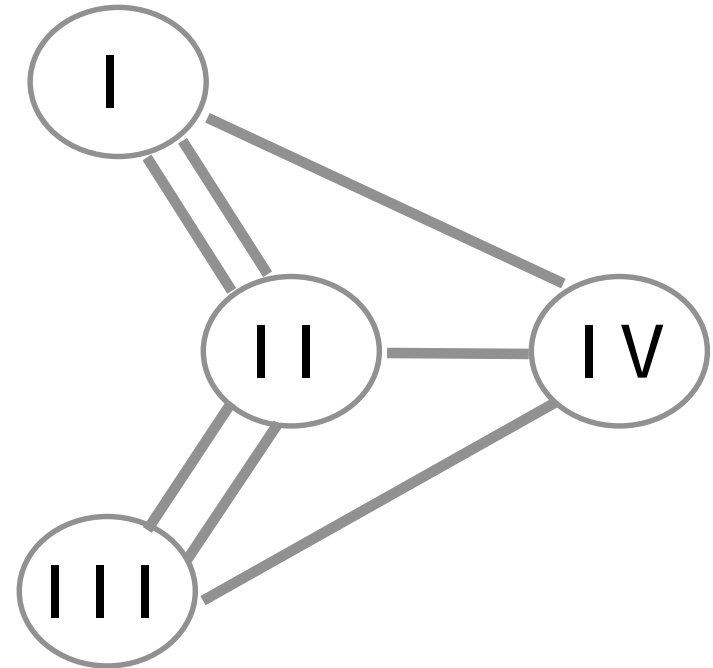
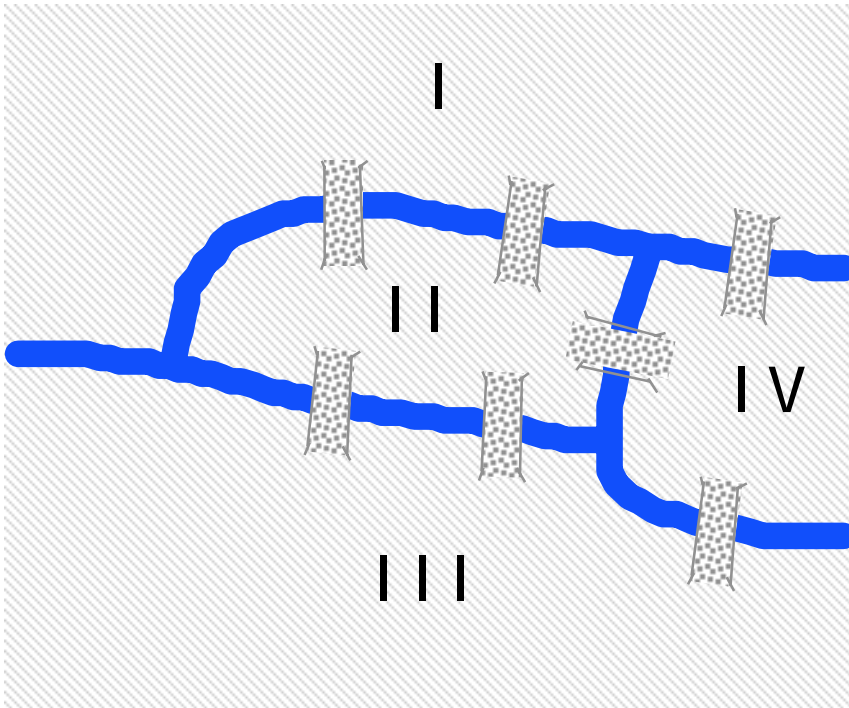
Cat and Top Thinking for Industrial Solutions

L. Euler (1707-1783): "Königsberger Brückenproblem"





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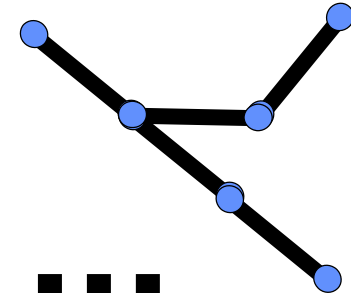
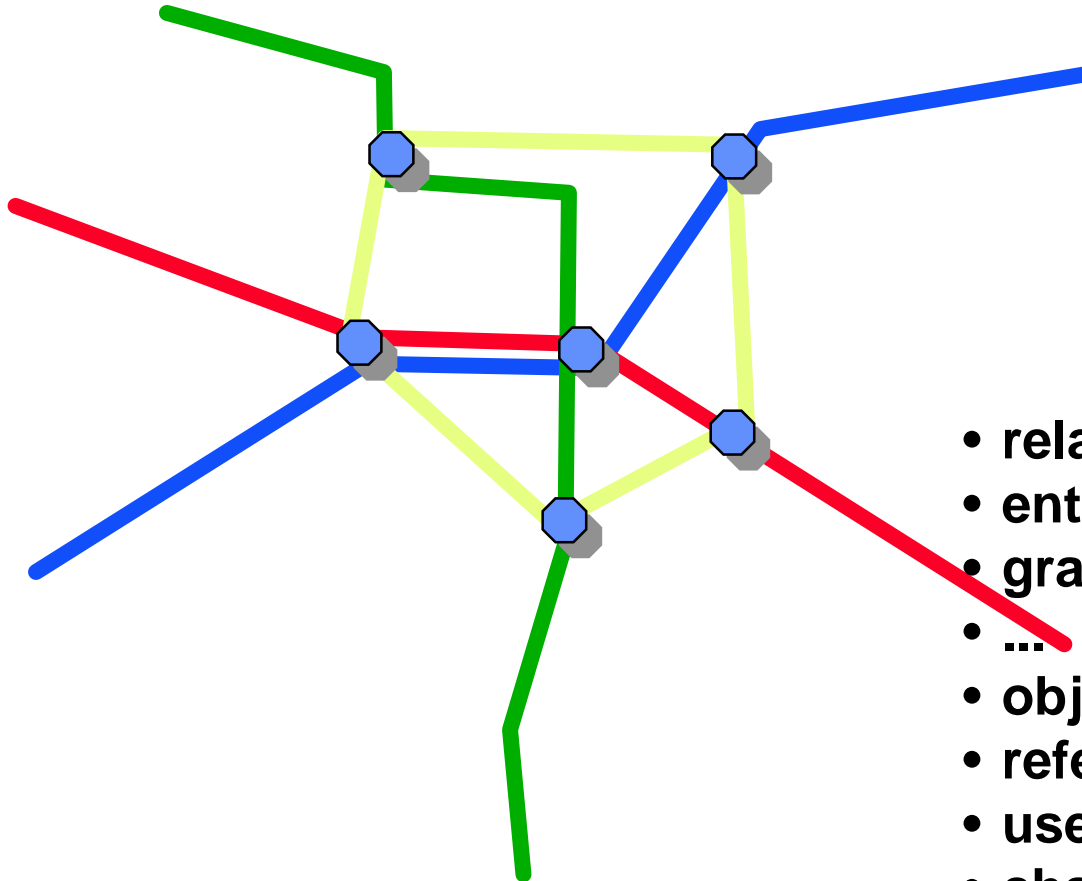


"topological view" (simplified visualisation)

- ✧ traffic grids
- ✧ pipeline networks
- ✧ power networks
- ✧ biochemistry, knot theory, ...

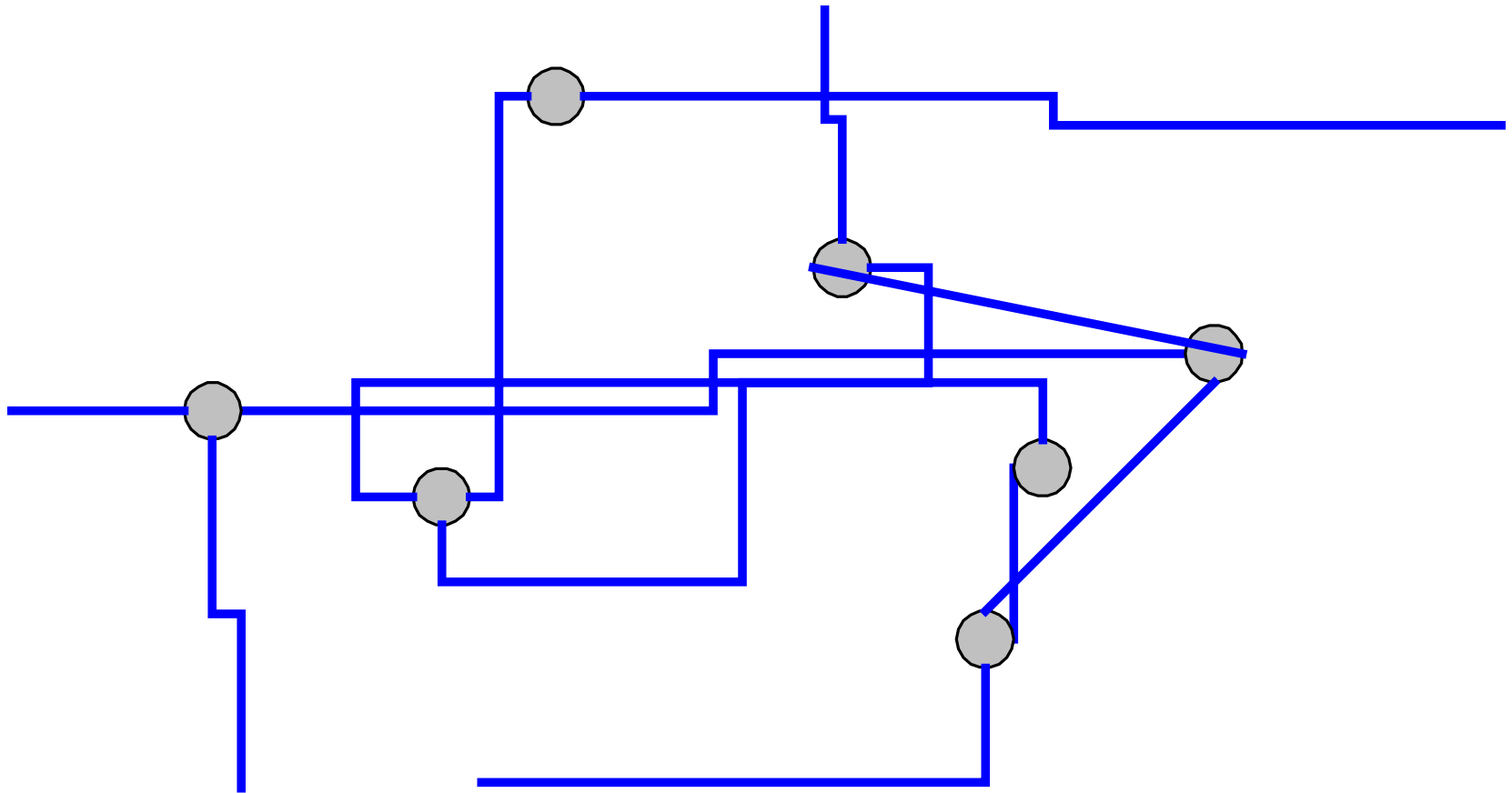


points vs relations



- relational DBs
 - entity relationship models
 - graph theory in comp. sc.
 - ...
 - object orientation (oop)
 - referential integrity
 - user's view
 - chaos in big info systems
- need of cat top assistance**

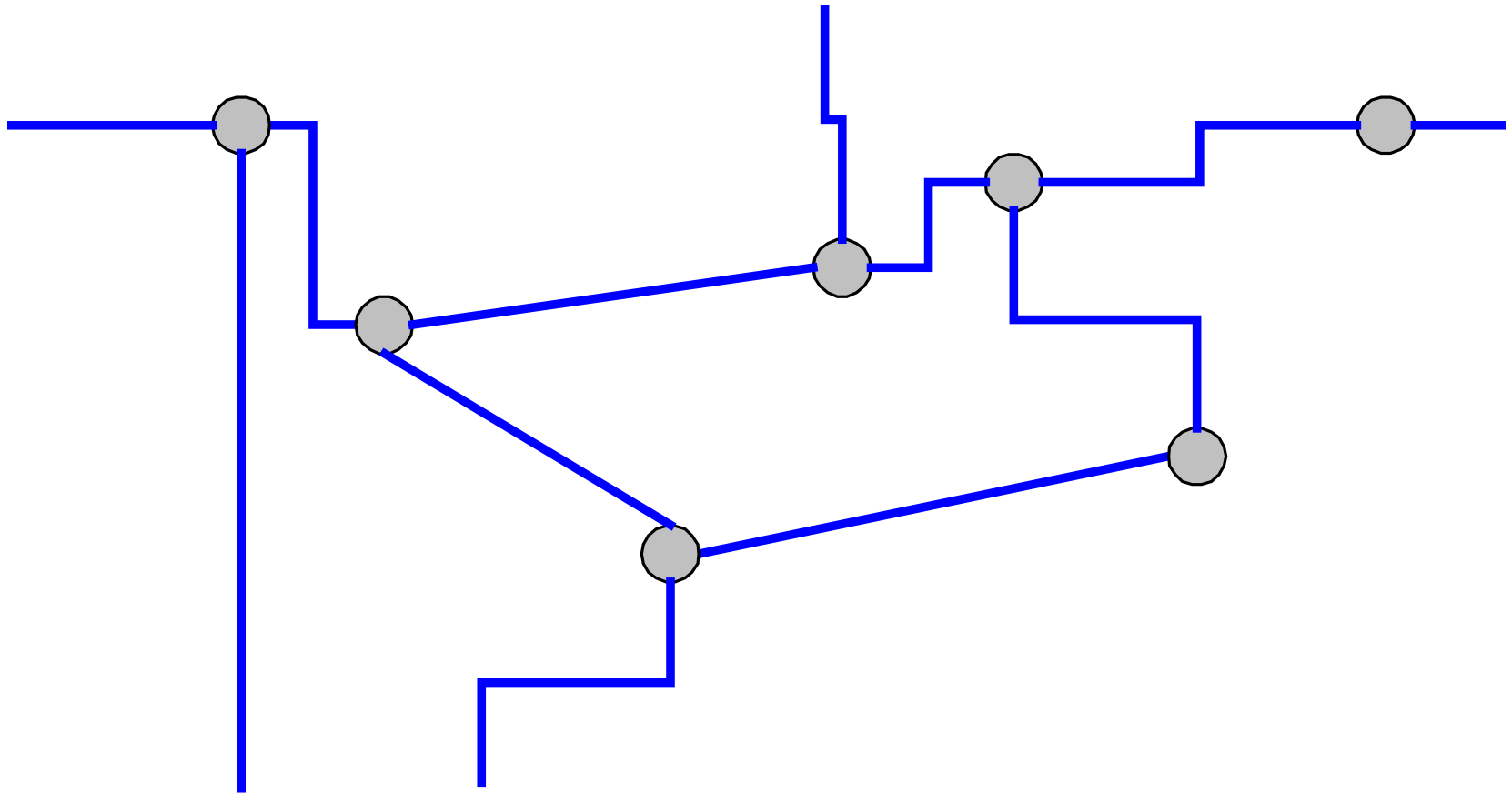






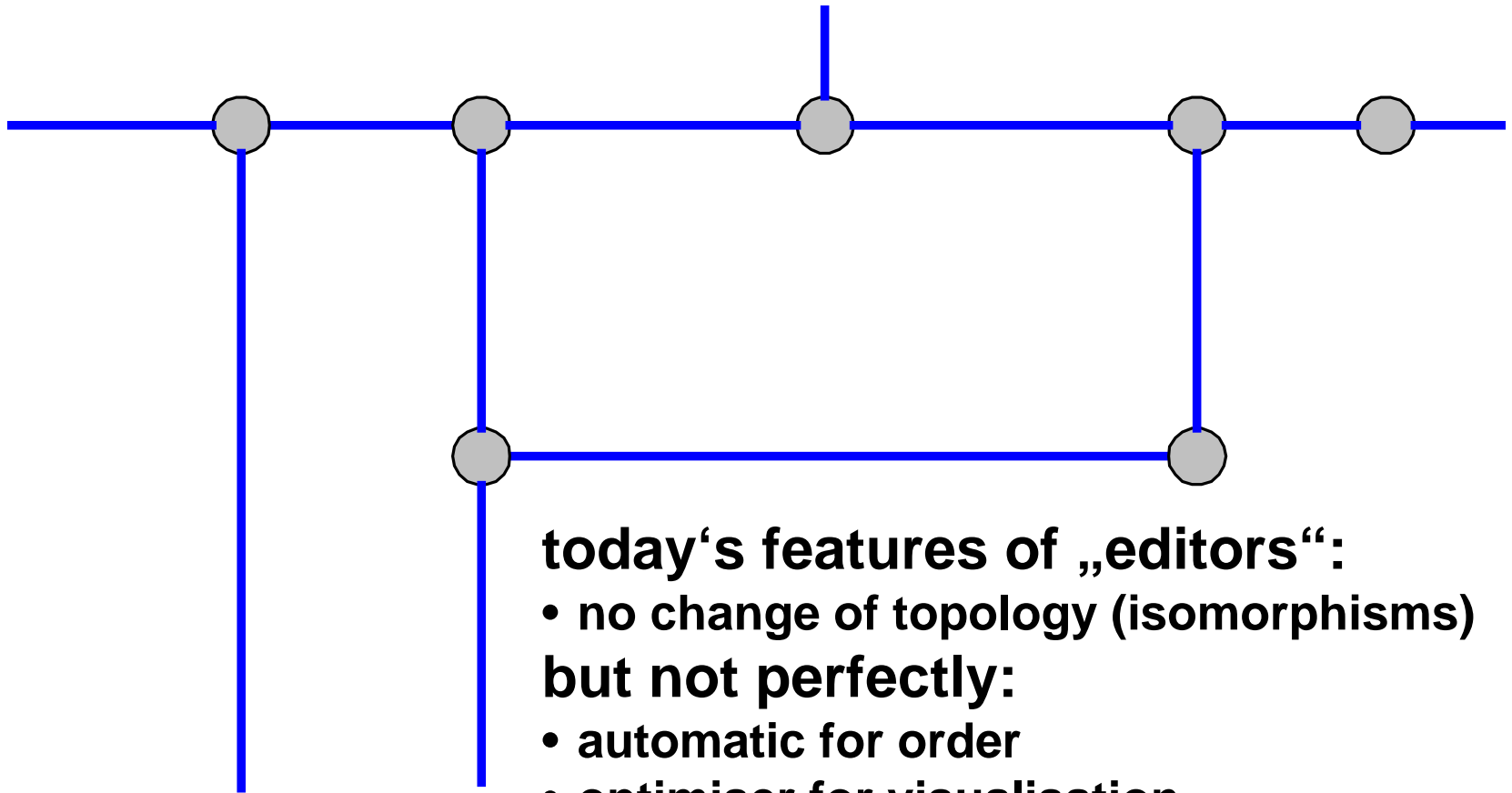
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pipelines ...





pipelines ... topology editors



today's features of „editors“:

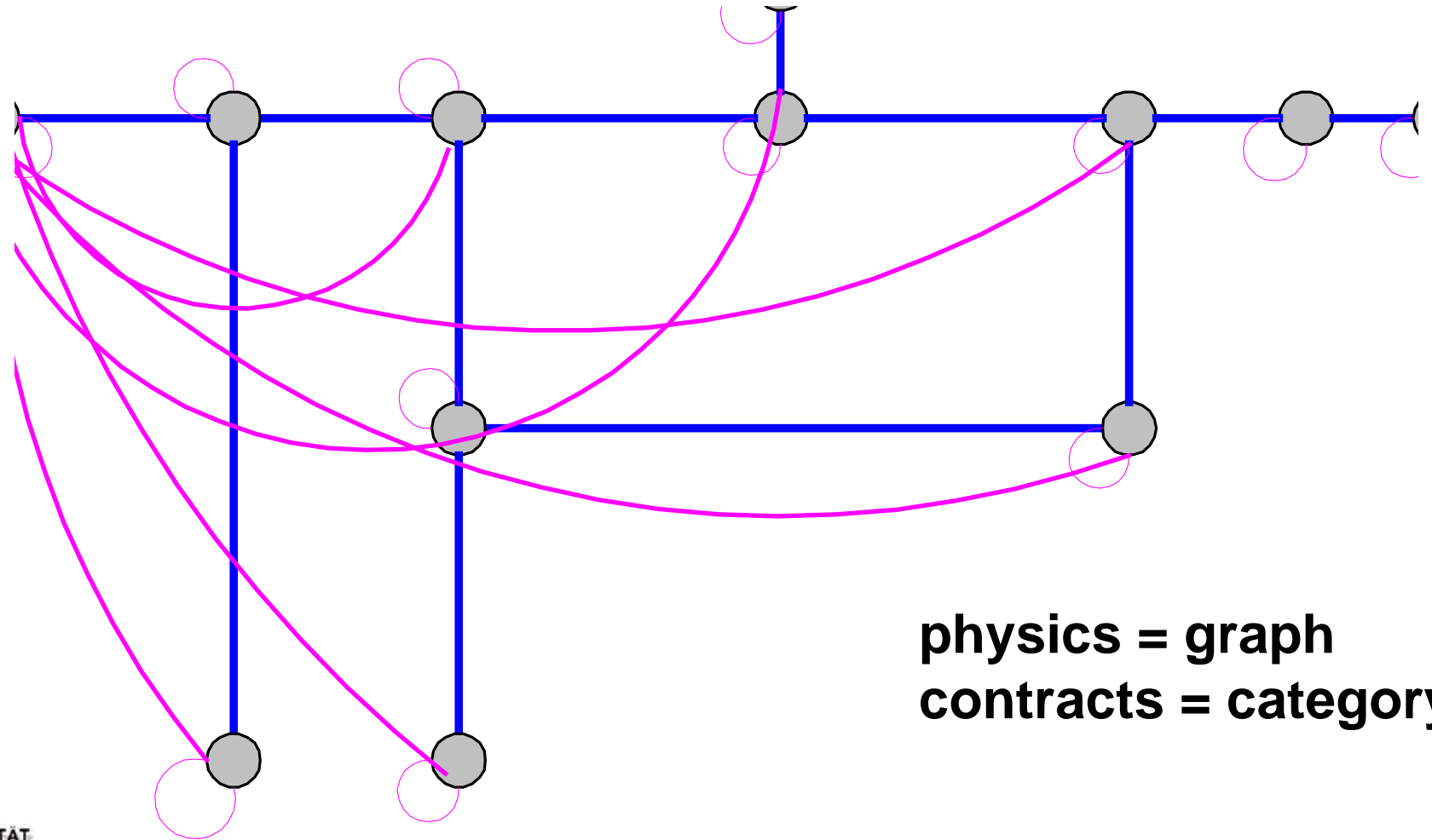
- no change of topology (isomorphisms)

but not perfectly:

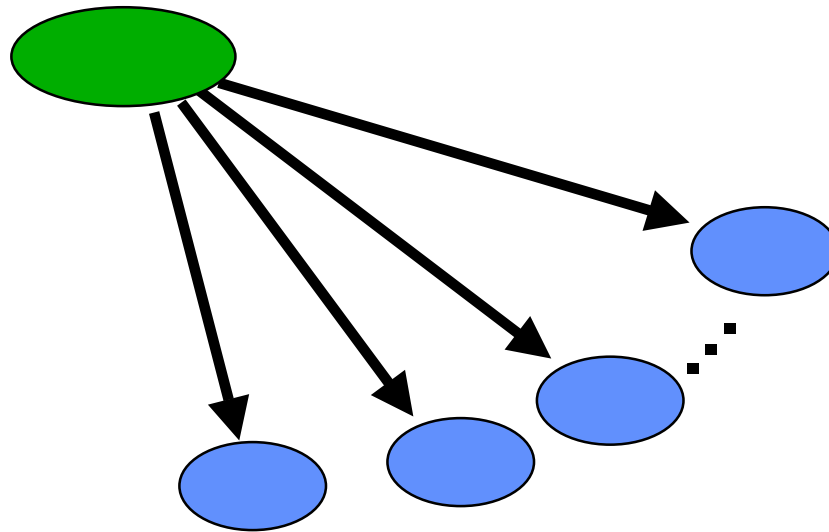
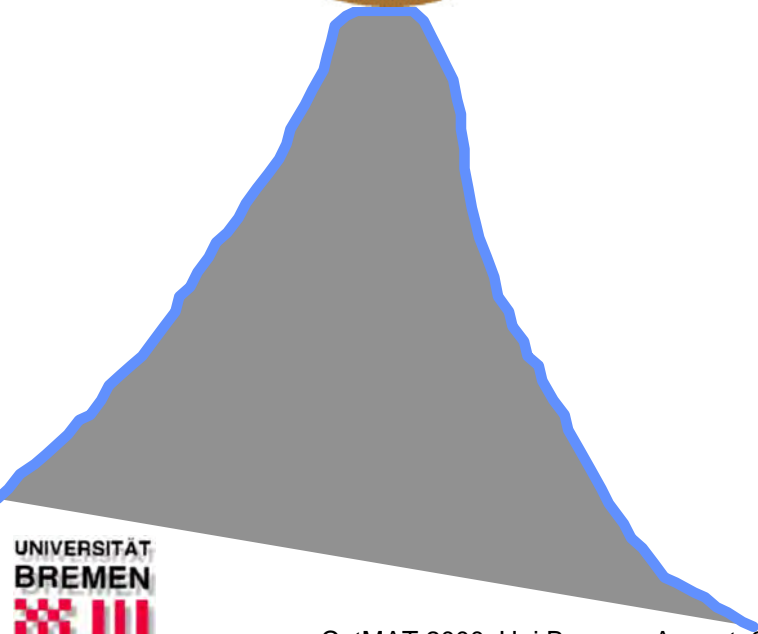
- automatic for order
- optimiser for visualisation

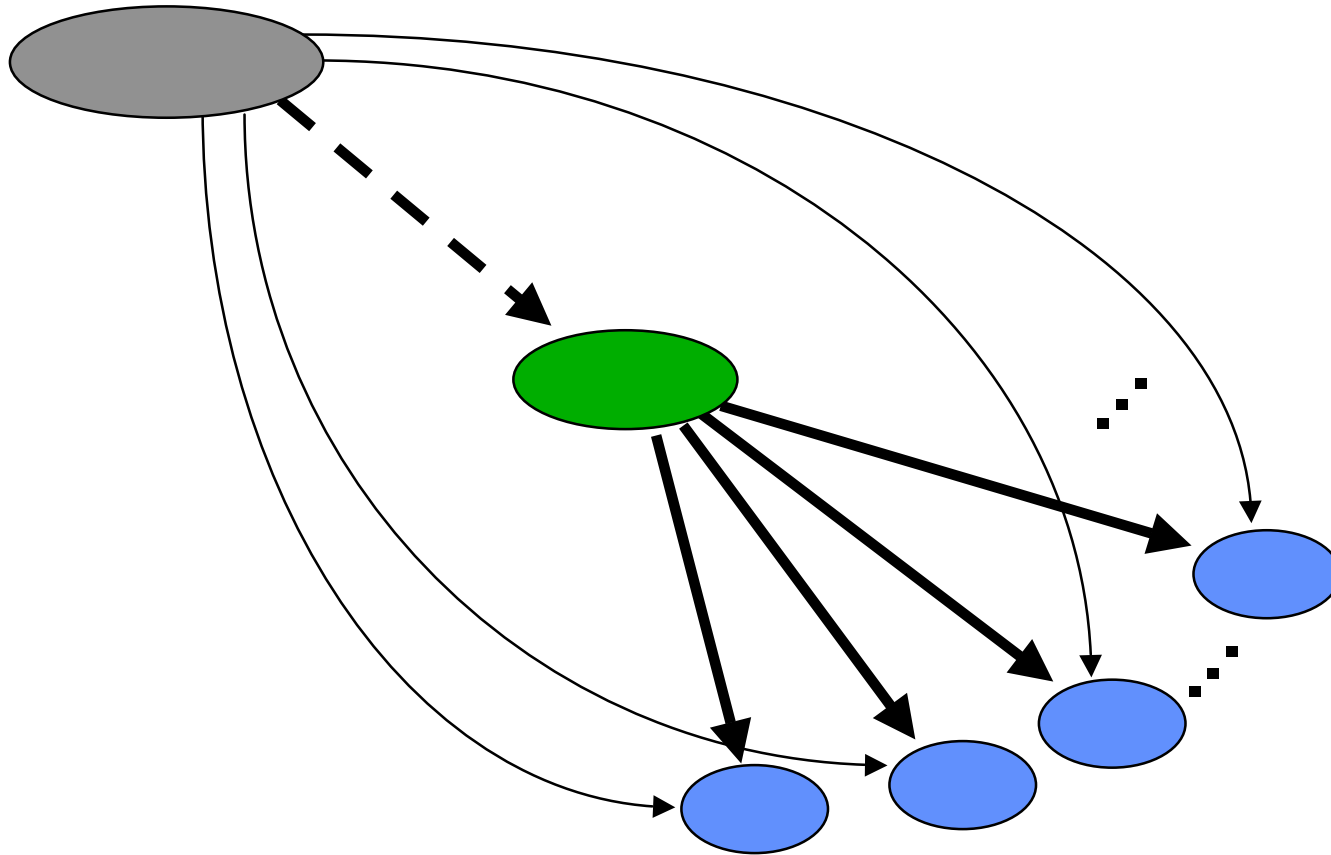
but definitely not:

- limits and colimits ...



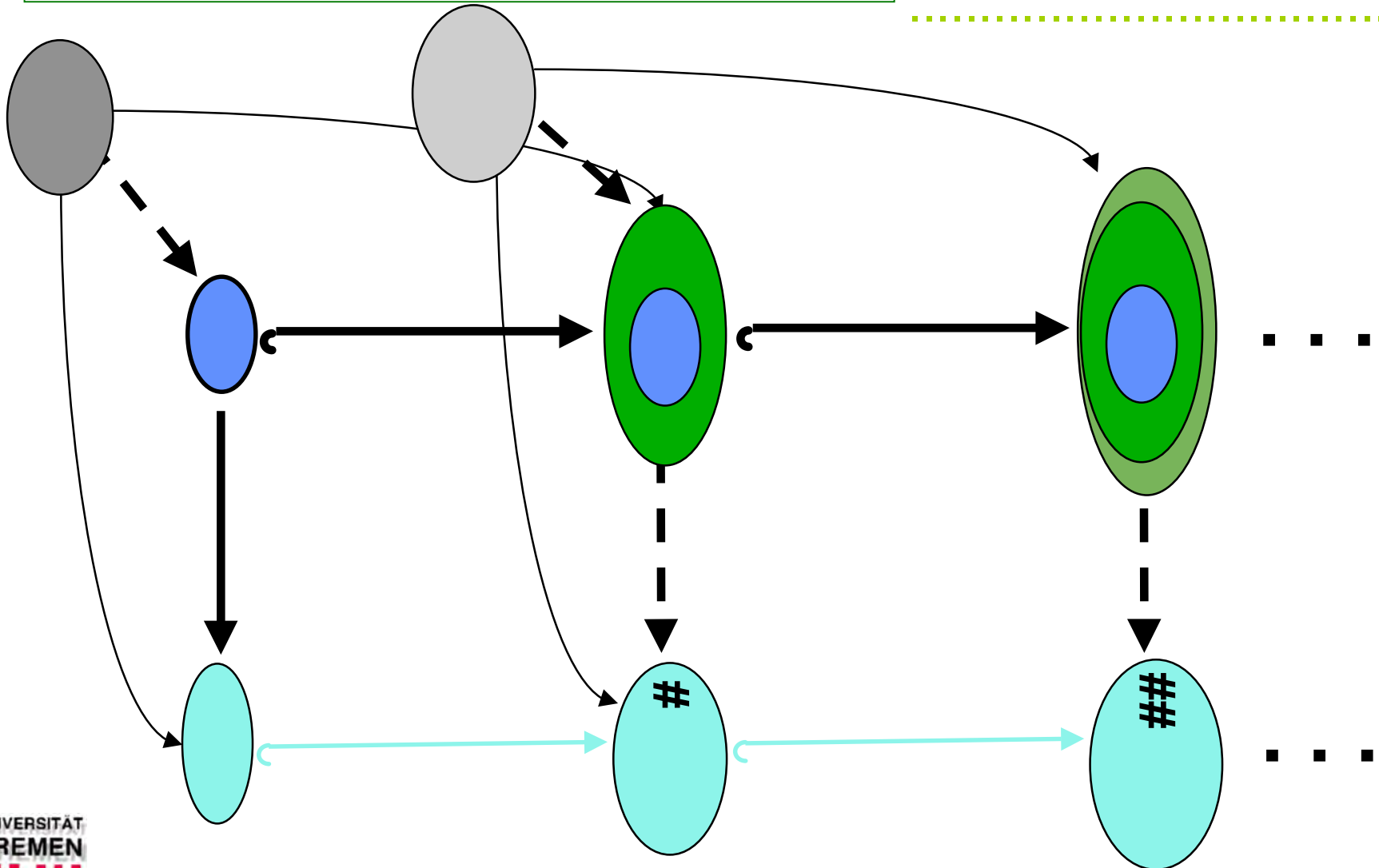
physics = graph
contracts = category





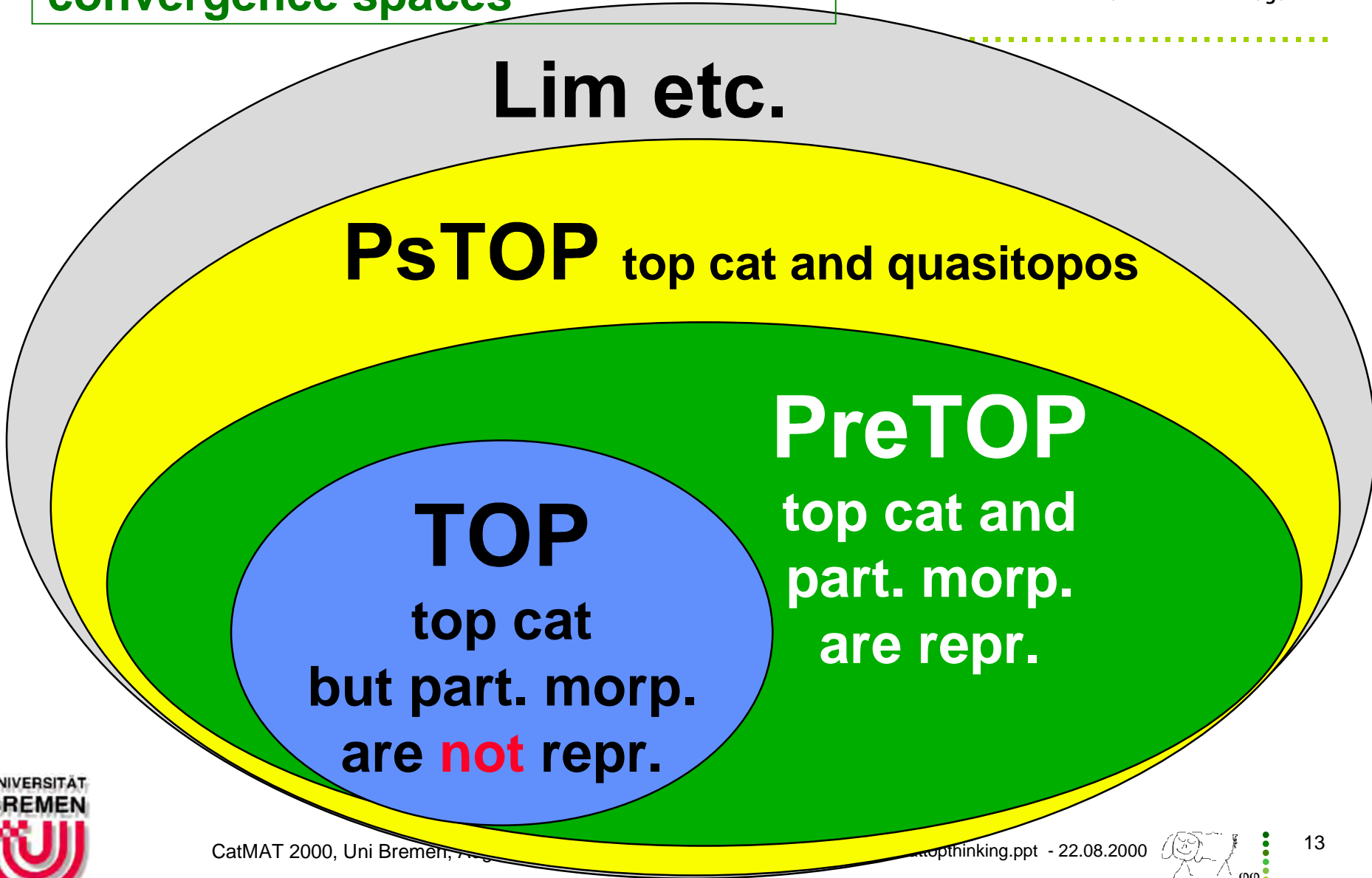


quasitopoi - partial morphisms





convergence spaces





viva PreTOP ...

in practice:

- 👁️ look for non idempotent hull operators
- 👁️ look for “partial knowledge”
- 👁️ look for extensions

**pretopologies have the “build in”
iterative process, in particular
needed, if no direct solutions are
possible and/or known !!!**





applications

✌ wired circuit boards

✌ space technology

✌ logistics ("d...")

✌ balancing o...

✌ pattern reco...

✌ ...

traditional and modern things:

- net flow algorithms
- gas net flow simulation
- linear programming (simplex algorithm)
- fem
- rulebased systems
- expert systems
- in general artificial intelligence tools

very popular at the moment:

- fuzzy logic
- neural nets

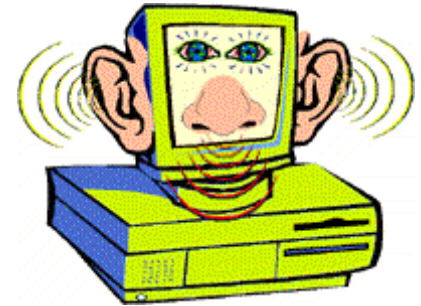


Human Interface Supervision System

Seeing



- External influences due to unauthorised persons/ fire/storm damage
- Formation of ice on parts of plants (leaks)
- Accumulations of liquids



Smelling



- Detection of small leaks
- Detection of the key substances benzene and hydrogen sulphide
- Separation of plant-specific smells from external smells (e.g. sour gas/liquid manure)

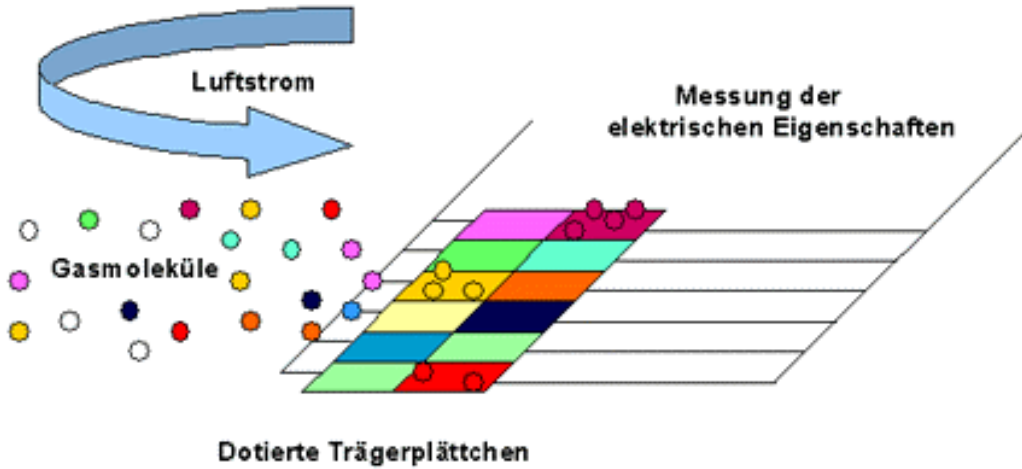
Hearing



- Detection of small leaks (emissions of gases)
- Detection of faults (e.g. damage to pumps, bearings, etc.)
- Detection of malfunctions from the prevailing ambient noises

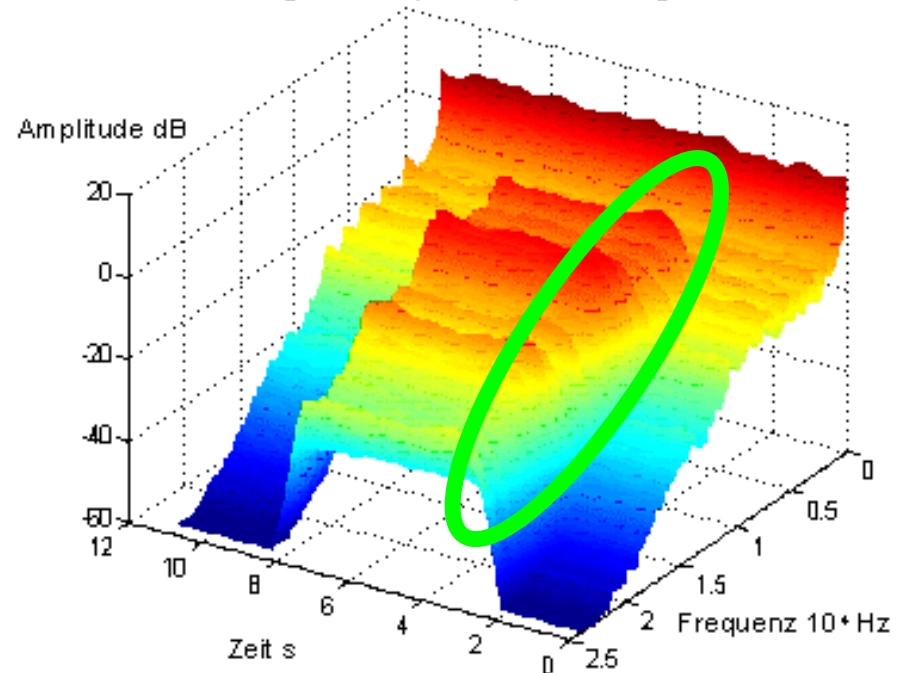


HISS



**pattern recognition:
fuzzy logic & neural nets
better => PreTOPs**

Ausströmgeräusch (5Nm³/h) mit Grundgeräusch



<http://www.beb.de>



Intelligente Erdgasförderung

EXPO2000 HANNOVER

Registriertes Projekt der Weltausstellung





Cat and Top Thinking for Industrial Solutions

forecasting energy over temperature

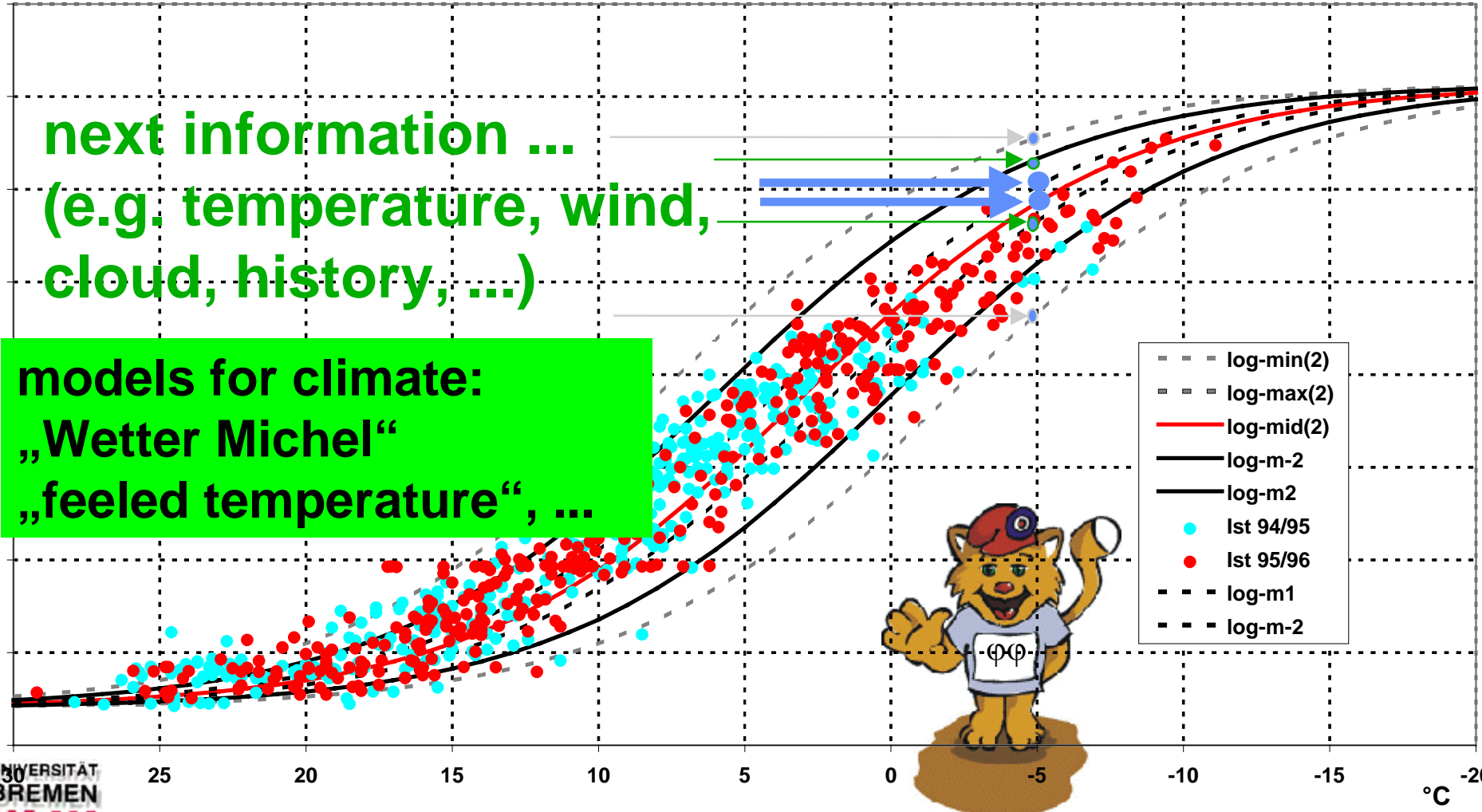


Unternehmen Erdgas

m³/d

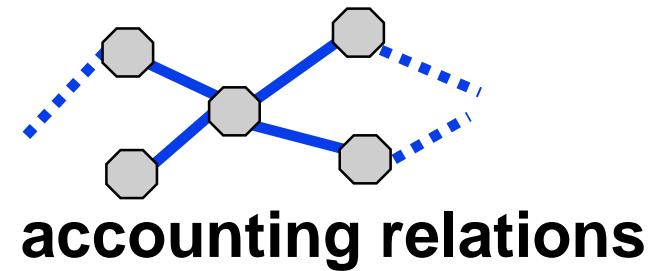
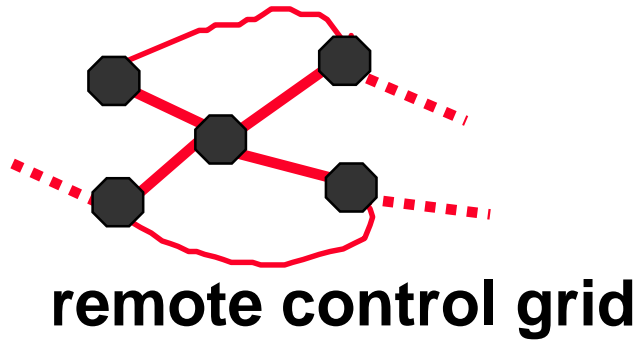
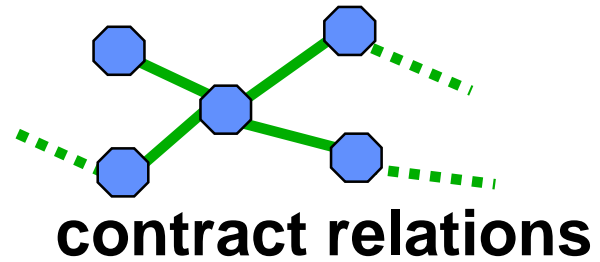
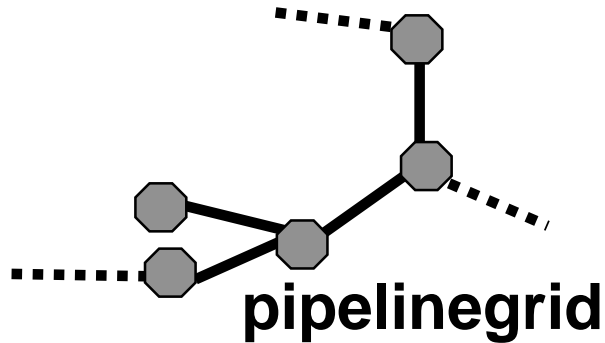
next information ...
(e.g. temperature, wind,
cloud, history, ...)

models for climate:
„Wetter Michel“
„feeled temperature“, ...



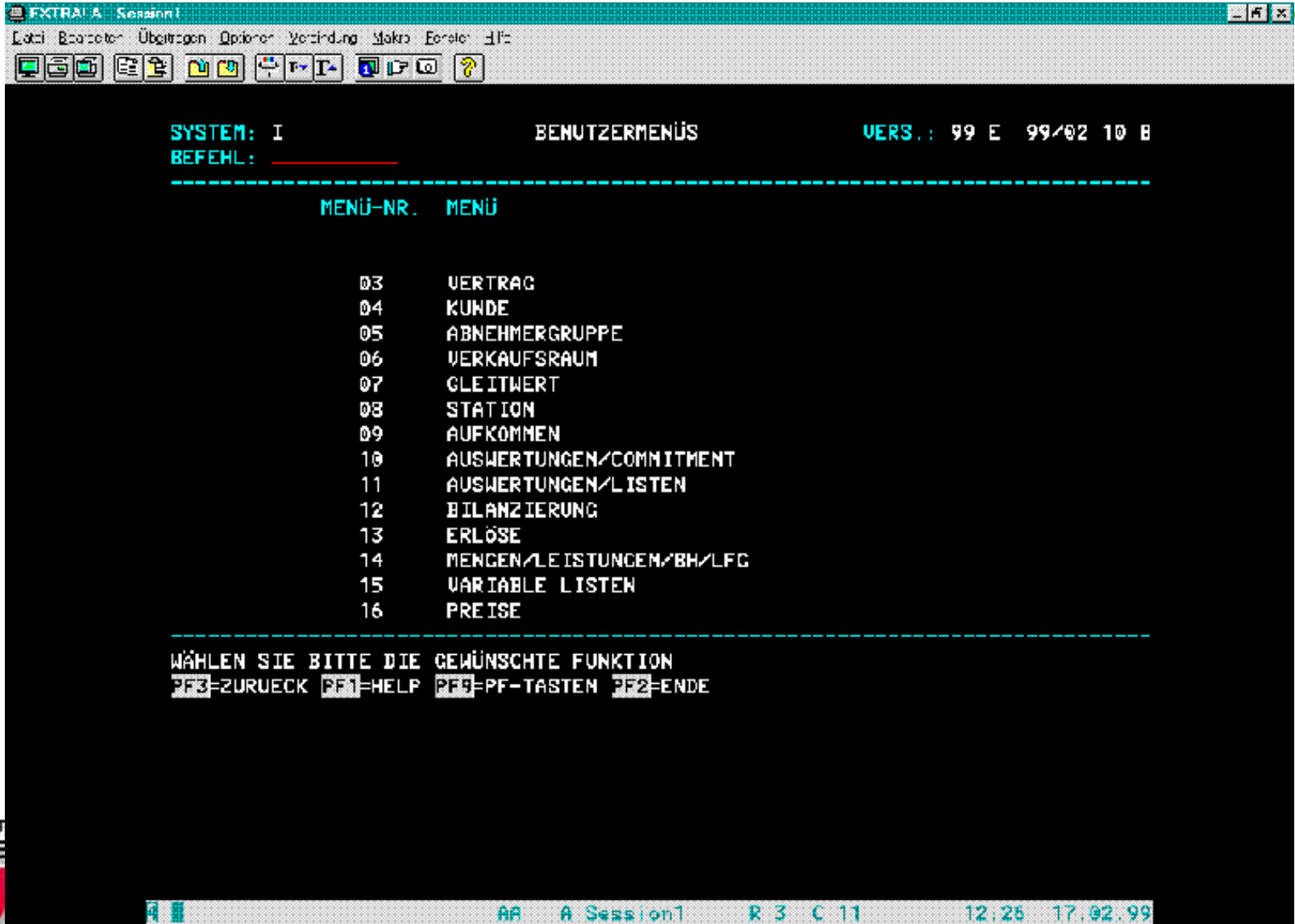


urgent help from cat top ?





visualisation 80-ies





The screenshot displays a Windows 95 desktop environment. On the left is a file explorer showing a directory structure with folders like 'Winword', 'Xvision', and 'Arollis'. The main window is a calendar application for February and March 1999, showing a Gantt chart view of a schedule. The vertical axis represents time from 09:00 to 16:30. The horizontal axis represents days of the month. Blue vertical bars indicate tasks, with a prominent one on March 1st. A toolbar at the top contains standard Windows icons. At the bottom, a navigation bar includes buttons for 'Zurück', 'Vorwärts', 'Abbrechen', 'Aktualisieren', 'Startseite', 'Suchen', 'Favoriten', 'Veilau', and 'Channels'. Below the navigation bar is a browser address bar showing 'http://www.efa.de/grh_set.htm'. A sidebar on the left of the browser window contains a 'Fahrplan Info' section with links like 'Fahrtauskunft', 'Haltstellen', and 'OPNV Anbieter'. A weather forecast section titled 'Die weiteren Aussichten' shows icons for Friday, Saturday, Sunday, and Monday.

Fahrplan Info

- Fahrtauskunft
- Haltstellen
- EFA Flug
- Pers. Fahrplan
- Reise assistent

OPNV Anbieter

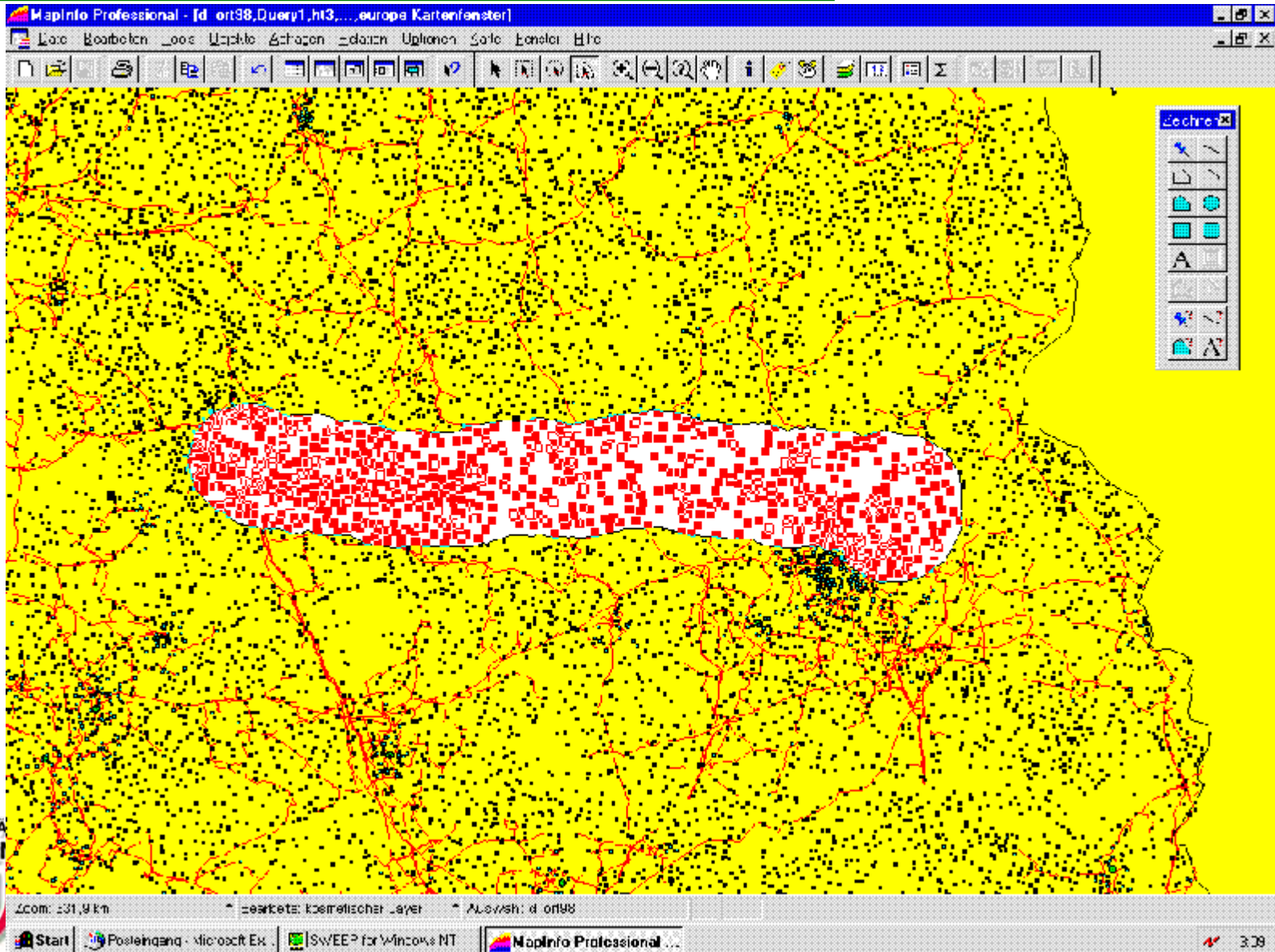
- Übersichtskarte
- ÖVH
- VBN
- BVAG

Die weiteren Aussichten

- Freitag**:
- Samstag**:
- Sonntag**:
- Montag**:



visualisation GIS (geo info sys's)





visualisation GIS

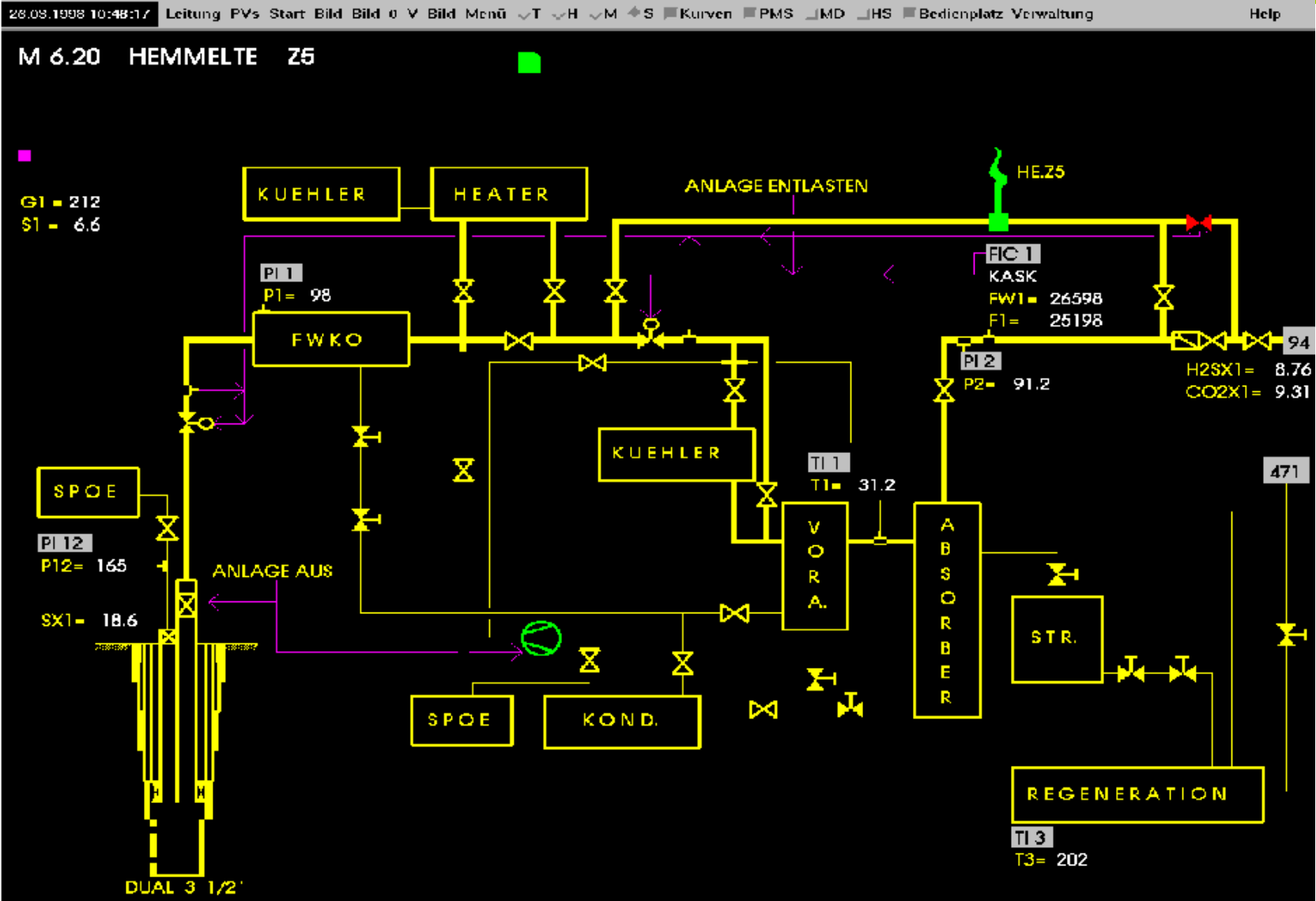
The screenshot displays a GIS application window titled 'Hauptgrafikfenster BEB Erdgas und Erdöl'. The interface includes a menu bar with options like 'System', 'Ansicht', 'Auswählen', 'Bearbeiten', 'Abfragen', 'BEB', and 'Entwicklung'. Below the menu is a toolbar with various icons for map navigation and editing. The main map area shows a detailed street map of Berlin with several utility objects highlighted, including 'ROTA T1' (a yellow circle) and 'BTSM 26' (a black circle). A label 'ROGN 2' is also visible on the map.

On the left side, there is a 'Objektklassen Menü' (Object Class Menu) window. It shows a hierarchical tree structure under the heading 'Gie (Smallworld Datenbank)'. The tree is expanded to show 'Betriebsmittel' (Operating Materials), which includes various categories such as 'FG Armatur', 'FG Behörde', 'FG Bereichsgrenze', 'FG Beteiligung', 'FG Bohrloch', 'FG Drainage', 'FG Verbindung', 'FG Fremdleitung', 'FG Fremdl. Kennz.', 'FG Höhenpunkt', 'FG Kilometerpunkt', 'FG Kreuzung', 'FG Leitung', 'FG Leitung Kennz.', 'FG Leitungsabschnitt', 'FG LA Kennz.', 'FG LA Kennz. 1:25000', 'FG Meisterbereich', 'FG Merkstein', 'FG Moßstelle', 'FG Netzbereich', 'FG Rohr', 'FG Rohrformatücke', and 'FG Rohr-schaden'. Each item has a small icon next to it, and some are expanded to show sub-items.

At the bottom of the 'Objektklassen Menü' window, there are several control buttons: 'Editor: Objekt...', 'Darstellung...', 'Abfrage', 'Schalte: Sichtbar', 'Zeichen-Priorität', 'Speichern/Laden', 'Zurücksetzen', 'Hilfe', and 'Ende'. The status bar at the bottom of the main window shows 'Maßstab: 1:25000', 'Geometrie ausgewählt', and 'Keine aktuelle Auswahl'.

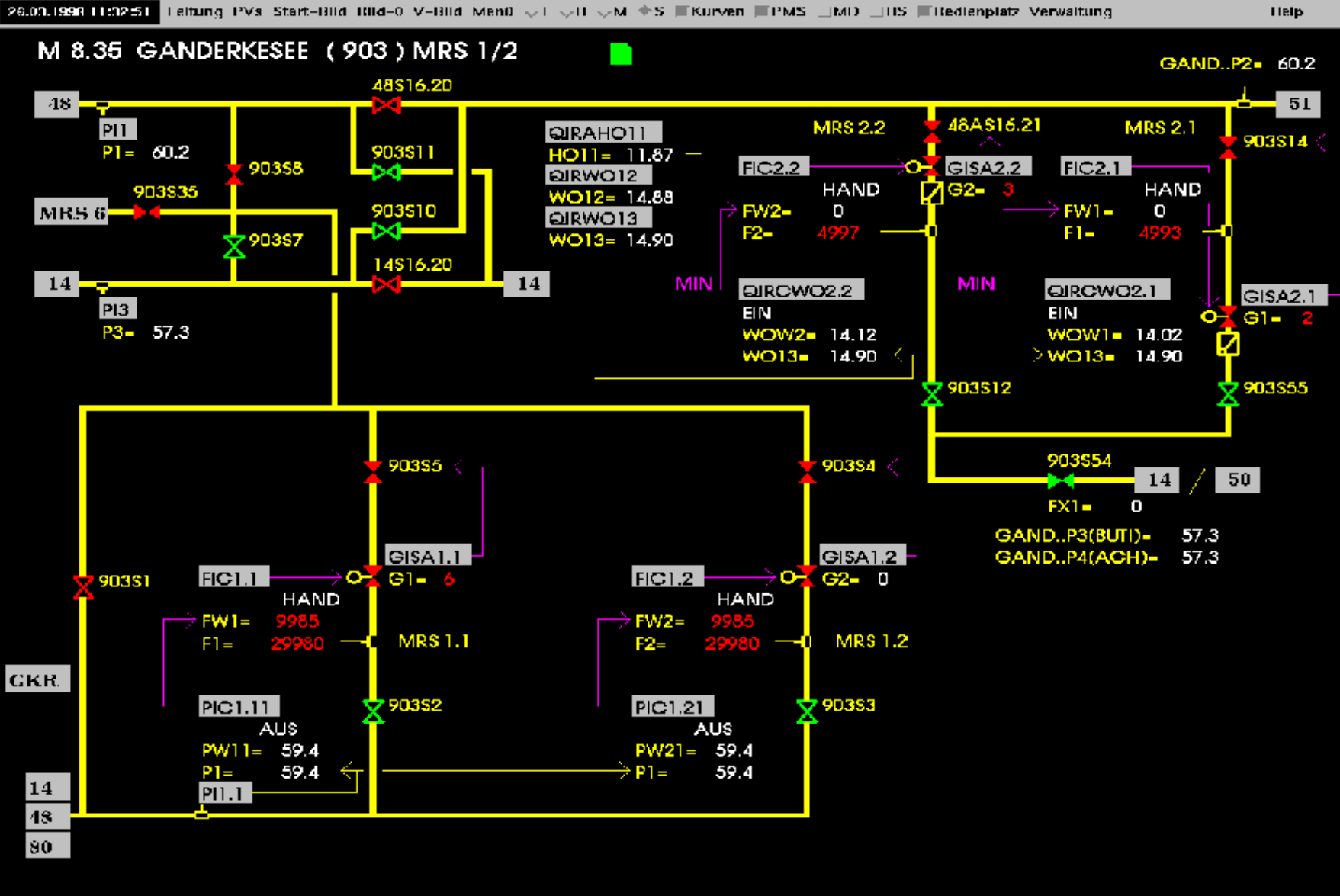


visualisation SCADA





visualisation SCADA





where we have to go ... ?

my 5-point-"edit"-program: computer assistance for

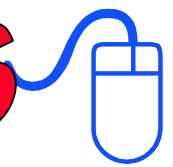
- ≅ better isos e.g. automation for combinatorial optimiser for visualisation, ...
- 👁 part of grid (sub-strates)
- 📄 gluing together of grids (coproducts)
- ❄ simplifying grids (quotients)
- 👋 product of grids (products)

cattop editors

my 5-point-"navigator"-program: computer assistance for

- ≅ "topology" of configuration (ref. integrity)
- 👁 arbitrary relation (or point/object) "enclosure" interaction
- 📄 neighbourhoods stepwise via morphisms
- ❄ alternative info ("fuzzy", "mess")
- 👋 "pattern" recognition (quick reconstruction/reuse of p...

+ cattop navigators

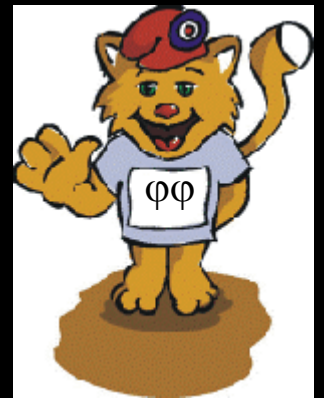


=> **raw topological features re**

= Rollis 10-point-program



... thank you
for your
kind
attention ...





agenda of **CATOP 2000**



~~pe
er~~



- **K**itchen: cats and tops
- **L**ogic of topos
- **E**nergy
- **I**ndustry
- **S**ystems
- **L**ook for next century
- **I**nformation and forecasts

70th of Heinrich Kleisli

