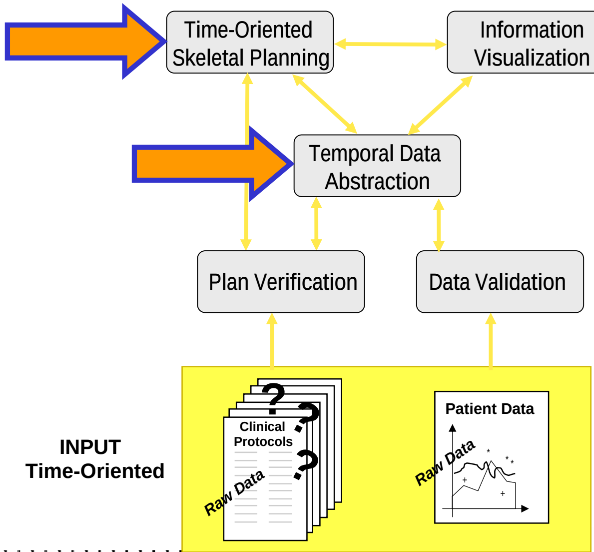
Part 2

Planning ↔ Plan Management

Building Blocks

[Miksch, 2001]



Temporal Data Abstraction - TDA

[Bellazzi, et a. 1999; Miksch & Gärtner, 1995]

View A: Data Oriented

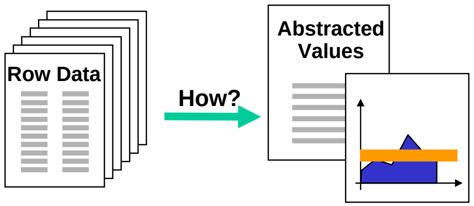
Huge numbers of data

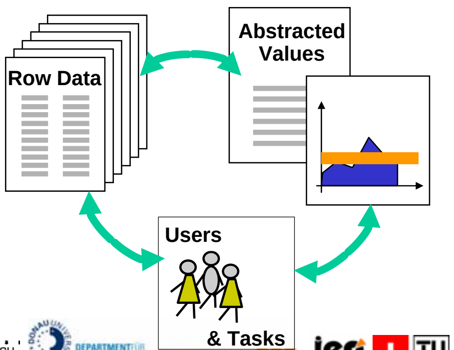
Comprehend data effectively!

View B: Task Oriented

Persons with tasks

Support their data analyses!





TDA: Data

[Lavrac, et al. 1997; Miksch, et al. 1996]

Different Observation Frequencies

High / Low Frequency Data

Different Regularities

Continuously / Discontinuously

Different Data Types

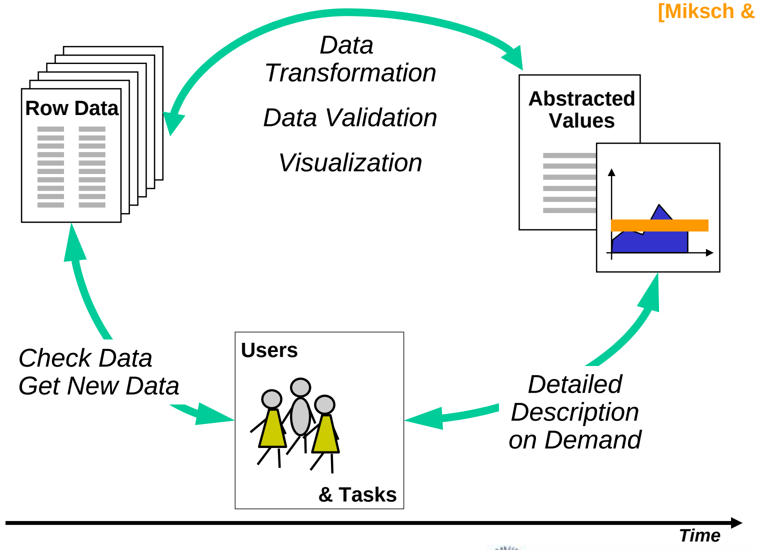
Quantitative / Qualitative

Underlying Models Poorly Understood

Vague Data

TDA: Overview

[Miksch & Gärtner, 1995]



TDA: 5 Tasks

[Shahar, 1997]

Temporal-Context Restriction

Creation of relevant interpretation contexts

Vertical Temporal Inference

Contemporaneous propositions → high-level

Horizontal Temporal Inference

Similar-type propositions → over time periods

Temporal Interpolation

Join of disjoint points or intervals

Temporal Pattern Matching

Creation of intervals by matching of patterns

TDA: Types

[Shahar, 1997]

State Abstraction

Classification of the value of a parameter

e.g., LOW, HIGH

Gradient Abstraction

Direction of the parameters' change

e.g., DECREASING, INCREASING

Rate Abstraction

Classification of the rate of change of a parameter

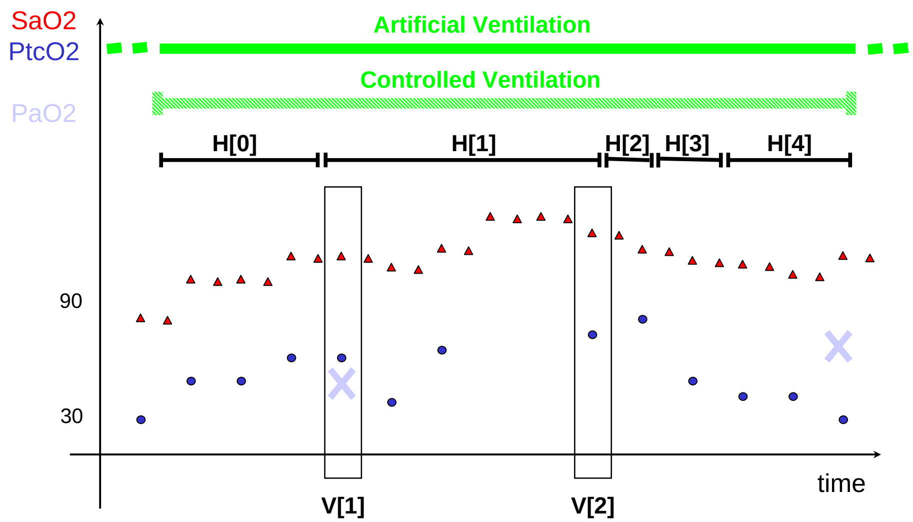
e.g., FAST, SLOW

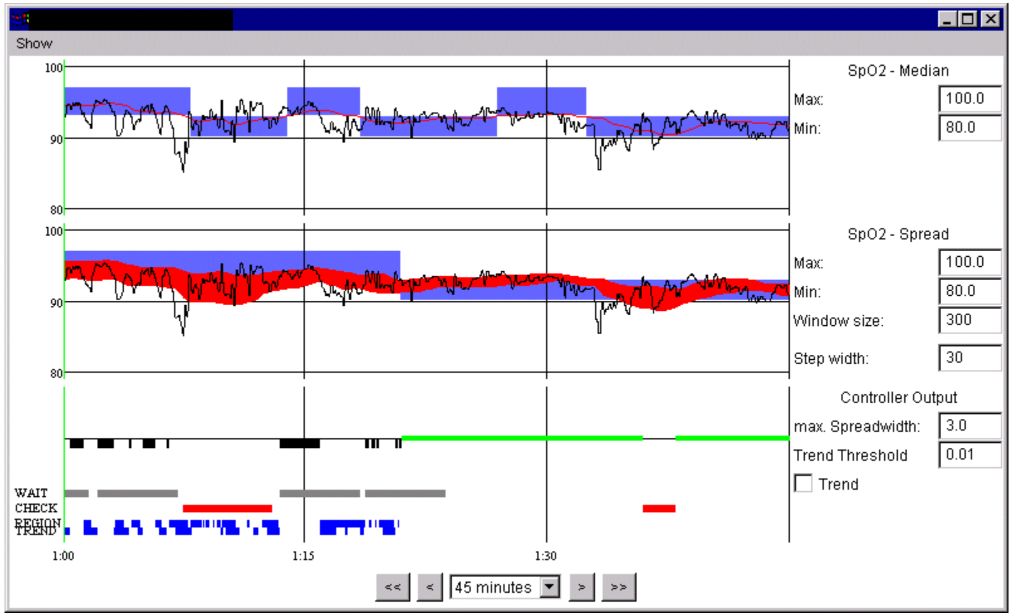
Pattern Abstraction

Classification of a parameter within a time period

e.g., CRESCENDO

Example: TDA Tasks

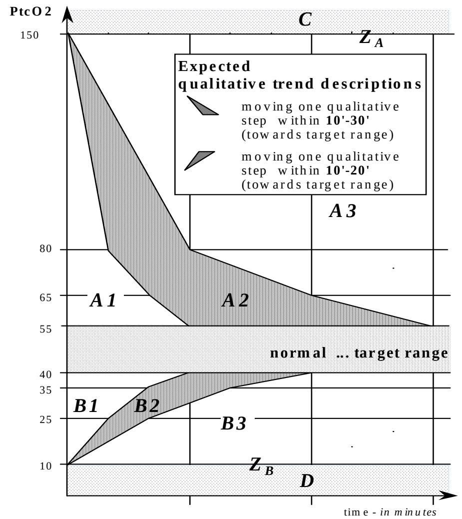




Trend-curve-fitting Schemata

example PO2 (tc, IMV)

[Miksch, et al. 1996]



derived qualitative trend-categories

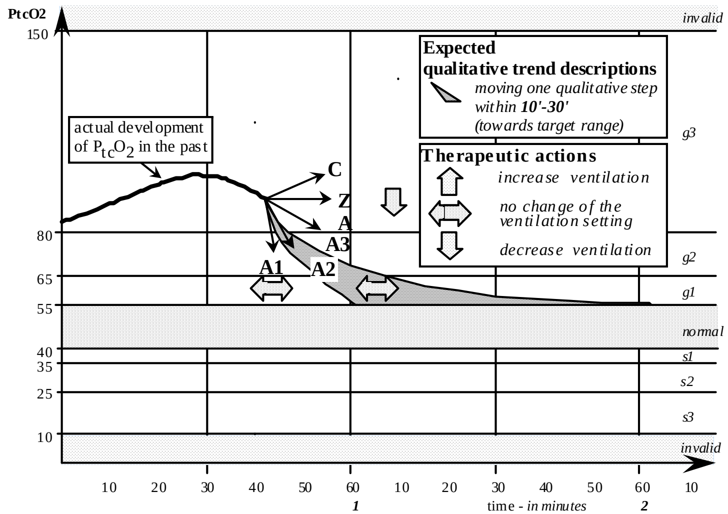
(1) C ... dangerous increase
(2) ZA ... zero change
(3) A3 ... decrease too slow
(4) A2 ... normal decrease
(5) A1 ... decrease too fast

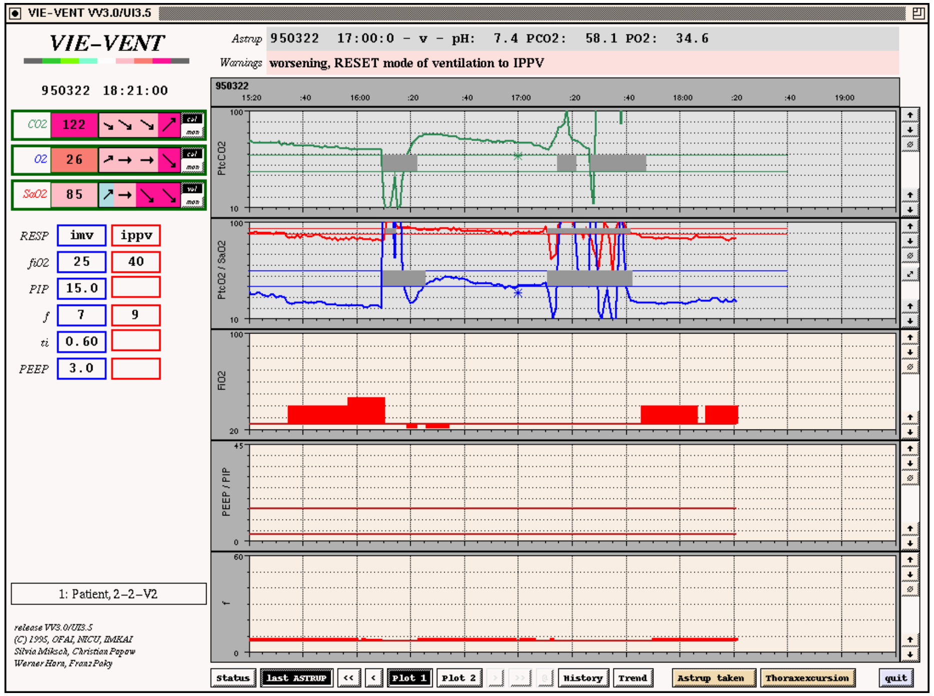
(6) B1 ... increase too fast
(7) B2 ... normal increase
(8) B3 ... increase too slow
(9) ZB ... zero change
(10) D ... dangerous decrease

Trend-curve-fitting Schemata

example PO2 (tc, IMV)

[Miksch, et al. 1996]





Examples: Plan Management

Examples

Asgaard / Asbru Project

Protocure

CareVis

Asgaard / Asbru Project :

Designing Task-Specific Problem-Solving Methods to Support the Design and the Execution of Time-Oriented Skeletal Plans

Peter Johnson
Silvia Miksch
Yuval Shahar

Stanford University
Stanford Medical Informatics
(SMI)

W. Aigner, K. Kaiser, K. Hammermüller R. Kosara, A. Seyfang. P. Votruba
and students

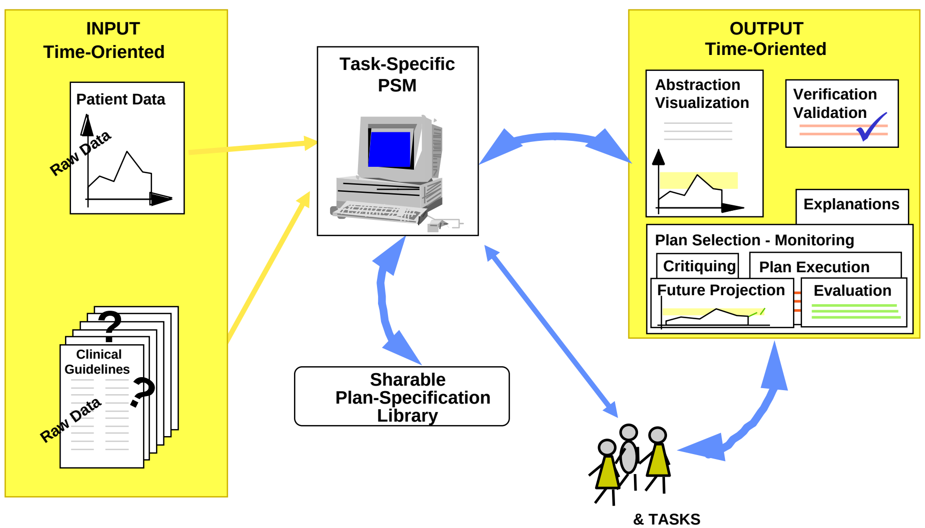
Vienna University of Technology
Vienna, Austria

Yuval Shahar
and students
Ben-Gurion University of the Negev
Beer-Sheva, Israel

international cooperation

- Vrije Universiteit Amsterdam
- University of Aberdeen
- University of Augsburg
- CBO, Dutch - Healthcare Improvement

Asgaard / Asbru Project



Asbru's Key Features

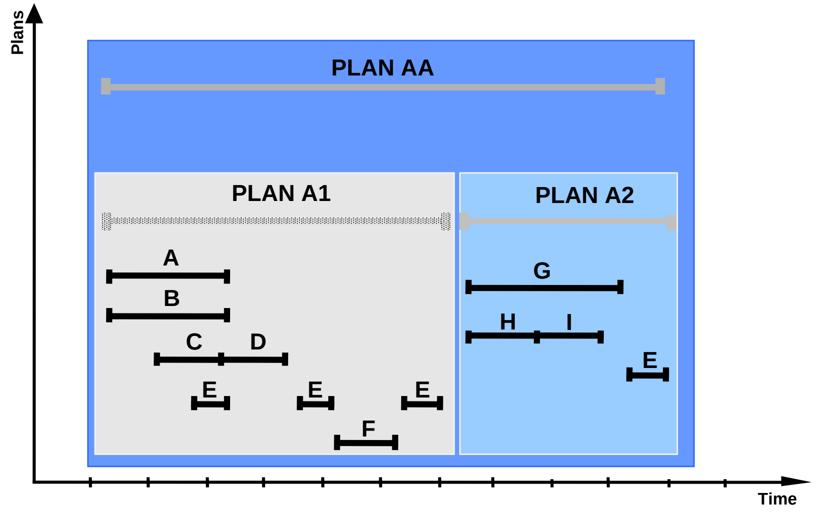
Hierarchical Decomposition of Plans

Temporal Annotations & Uncertainty

Knowledge Roles

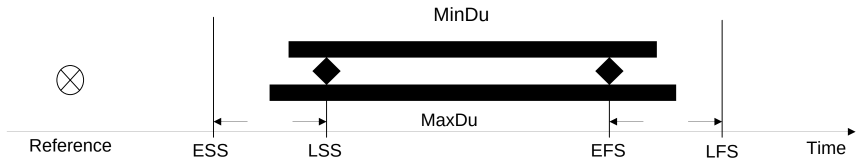
- Preferences
- Intentions
- Conditions
- Effects
- Plan Layouts

Hierarchical Decomposition of Plans



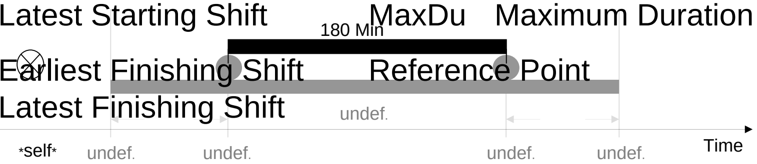
Asbru 's Time Annotation

Definition: [[ESS, LSS], [EFS, LFS], [MinDu, MaxDu], Reference]

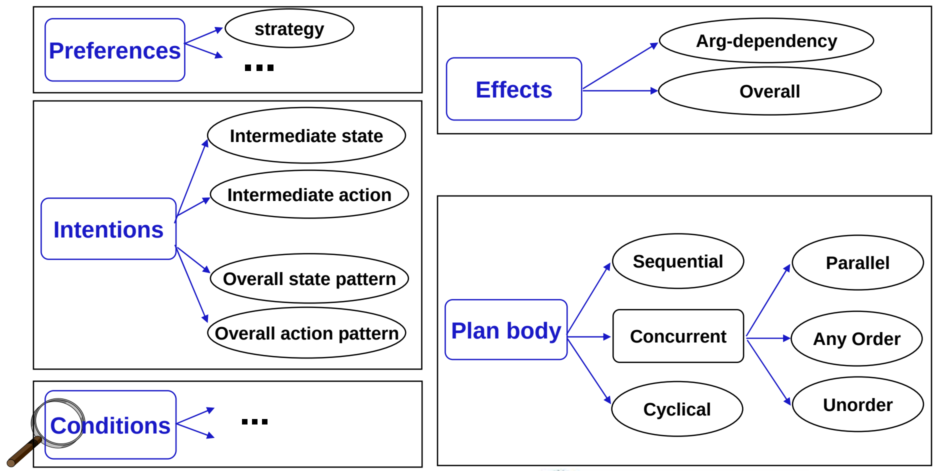


Example: [[_, _], [_, _], [180 MIN, _], *self*]

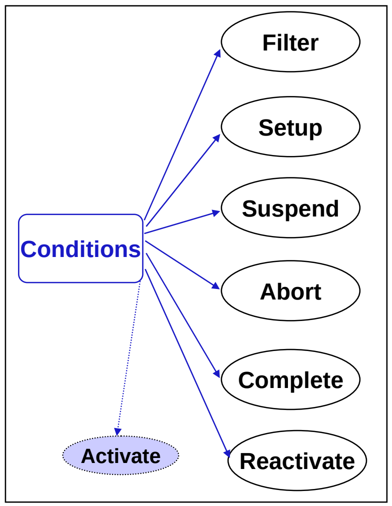
ESS Earliest Starting Shift MinDu Minimum Duration
LSS Latest Starting Shift MaxDu Maximum Duration
EFS Earliest Finishing Shift Reference Point
LFS Latest Finishing Shift



Asbru's Knowledge Roles (1/2)



Asbru's Knowledge Roles (2/2)



I-RDS Example in Asbru 6.5

(**PLAN** *controlled-ventilation*
(PREFERENCES **(SELECT-METHOD BEST-FIT))**
(INTENTION:**INTERMEDIATE-STATE (MAINTAIN STATE(BG) NORMAL controlled-ventilation *))**
(INTENTION:**INTERMEDIATE-ACTION (MAINTAIN STATE(RESPIRATOR-SETTING) LOW controlled-ventilation *))**
(SETUP-PRECONDITIONS **(PIP (<= 30) I-RDS *now*)**
(BG available I-RDS [[_, _], [_, _],[1 MIN,_](ACTIVATED initial-phase#1)]))
(ACTIVATED-CONDITIONS **AUTOMATIC)**
(ABORT-CONDITIONS ACTIVATED
(OR (PIP (> 30) controlled-ventilation [[_, _], [_, _], [30 SEC, _], *self*])
(RATE(BG) TOO-STEEP controlled-ventilation [[_, _], [_, _], [180 MIN,_], *self*]))
(SAMPLING-FREQUENCY 10 SEC))
(COMPLETE-CONDITIONS
(FiO2 (<= 50) controlled-ventilation [[_, _], [_, _], [180 MIN, _], *self*])
(PIP (<= 23) controlled-ventilation [[_, _], [_, _], [180 MIN, _], *self*])
(f (<= 60) controlled-ventilation [[_, _], [_, _], [180 MIN, _], *self*])
(patient (NOT DYSPNEIC) controlled-ventilation [[_, _], [_, _], [180 MIN,], *self*])
(STATE(BG) (OR NORMAL ABOVE-NORMAL) controlled-ventilation [[_, _], [_, _], [180 MIN,_], *self*])
(SAMPLING-FREQUENCY 10 MIN))
(DO-ALL-SEQUENTIALLY
(*one-of-increase-decrease-ventilation*)
(*observing*)))

I-RDS Example in Asbru 7.1d


```
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE plan-library (View Source for full doctype...)>
- <plan-library>
- <domain-defs>
- <domain name="i-rds">
- <record-def name="patient">
<field-def name="name" type="STRING" />
<field-def name="sex" type="maleorfemale" />
</record-def>
- <qual-scale-def name="rate-change">
<qual-entry entry="normal" />
<qual-entry entry="too-steep" />
</qual-scale-def>
- <qual-scale-def name="bg_state">
<qual-entry entry="normal" />
<qual-entry entry="strange" />
<qual-entry entry="critical" />
</qual-scale-def>
- <qual-scale-def name="respirator-setting">
<qual-entry entry="low" />
<qual-entry entry="normal" />
<qual-entry entry="high" />
</qual-scale-def>
- <qual-scale-def name="maleorfemale">
<qual-entry entry="male" />
<qual-entry entry="female" />
</qual-scale-def>
- <qual-scale-def name="facecolor">
<qual-entry entry="not_dypneic" />
<qual-entry entry="dyspneic" />
</qual-scale-def>
- <unit-def name="frequency" rounding="nearest">
- <compound-def>
<numerator />
- <denominator>
<unit-class name="time" exponent="1" />
</denominator>
</compound-def>
</unit-def>
- <unit-def name="flow-unit" rounding="nearest">
- <compound-def>
- <numerator>
<unit-class exponent="1" name="amount" />
</numerator>
<denominator />
</compound-def>
</unit-def>
- <parameter-def name="bg" required="yes" type="bg_state">
- <qual-parameter-def scale="bg_state">
- <limits>
<context-ref name="controlled-ventilation" />
<limit-entry value="1" />
<limit-entry value="5" />
<limit-entry value="7" />
<limit-entry value="9" />
<numerical-constant unit="s" value="30" />
</limits>
<raw-data-def mode="manual" />
</qual-parameter-def>
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="repirator-setting" required="no" type="respirator-setting">
- <qual-parameter-def scale="respirator-setting">
- <limits>
<context-ref name="i-rds" />
<limit-entry value="low" />
<limit-entry value="normal" />
<limit-entry value="high" />
<numerical-constant unit="s" value="10" />
</limits>
- <spread-def>
<numerical-constant unit="s" value="10" />
<numerical-constant unit="s" value="10" />
<raw-data-def mode="automatic" />
</spread-def>
</qual-parameter-def>
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="PIP" required="yes" type="pressure">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="f" required="yes" type="frequency">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="30" />
</parameter-def>
- <parameter-def name="FiO2" required="yes" type="flow-unit">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="facecolor" required="yes" type="facecolor">
<raw-data-def mode="manual" />
<numerical-constant unit="h" value="1" />
</parameter-def>
</domain>
</domain-defs>
<value-defs />
- <plans>
- <group name="controlled-ventilation">
- ...
```


Impossible to use for Domain Experts

Problem Solving Methods (PSM)

Selected PSM

- Authoring Protocols
  - AsbruView - SopoView
  - Guideline Markup Tool
  - Advanced Editors: PIXEE
  - Information Extraction & Integration
- Plan Verification
- Monitoring and Execution
- Information Visualization

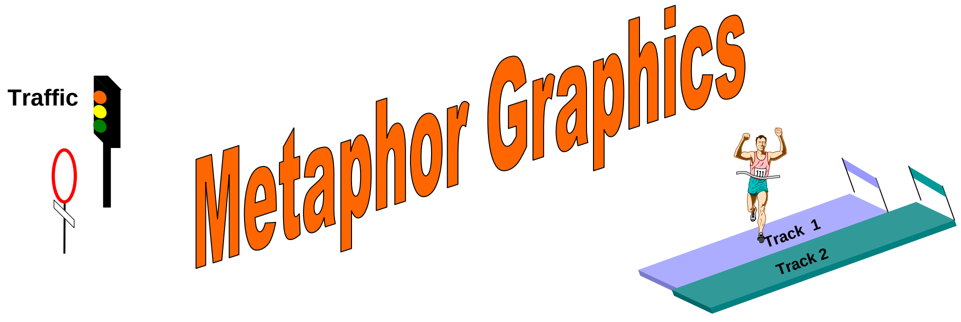
I-RDS Example in Asbru 7.1d


```
<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE plan-library (View Source for full doctype...)>
- <plan-library>
- <domain-defs>
- <domain name="i-rds">
- <record-def name="patient">
<field-def name="name" type="STRING" />
<field-def name="sex" type="maleorfemale" />
</record-def>
- <qual-scale-def name="rate-change">
<qual-entry entry="normal" />
<qual-entry entry="too-steep" />
</qual-scale-def>
- <qual-scale-def name="bg_state">
<qual-entry entry="normal" />
<qual-entry entry="strange" />
<qual-entry entry="critical" />
</qual-scale-def>
- <qual-scale-def name="respirator-setting">
<qual-entry entry="low" />
<qual-entry entry="normal" />
<qual-entry entry="high" />
</qual-scale-def>
- <qual-scale-def name="maleorfemale">
<qual-entry entry="male" />
<qual-entry entry="female" />
</qual-scale-def>
- <qual-scale-def name="facecolor">
<qual-entry entry="not_dypneic" />
<qual-entry entry="dyspneic" />
</qual-scale-def>
- <unit-def name="frequency" rounding="nearest">
- <compound-def>
<numerator />
- <denominator>
<unit-class name="time" exponent="1" />
</denominator>
</compound-def>
</unit-def>
- <unit-def name="flow-unit" rounding="nearest">
- <compound-def>
- <numerator>
<unit-class exponent="1" name="amount" />
</numerator>
<denominator />
</compound-def>
</unit-def>
- <parameter-def name="bg" required="yes" type="bg_state">
- <qual-parameter-def scale="bg_state">
- <limits>
<context-ref name="controlled-ventilation" />
<limit-entry value="1" />
<limit-entry value="5" />
<limit-entry value="7" />
<limit-entry value="9" />
<numerical-constant unit="s" value="30" />
</limits>
<raw-data-def mode="manual" />
</qual-parameter-def>
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="repirator-setting" required="no" type="respirator-setting">
- <qual-parameter-def scale="respirator-setting">
- <limits>
<context-ref name="i-rds" />
<limit-entry value="low" />
<limit-entry value="normal" />
<limit-entry value="high" />
<numerical-constant unit="s" value="10" />
</limits>
- <spread-def>
<numerical-constant unit="s" value="10" />
<numerical-constant unit="s" value="10" />
<raw-data-def mode="automatic" />
</spread-def>
</qual-parameter-def>
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="PIP" required="yes" type="pressure">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="f" required="yes" type="frequency">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="30" />
</parameter-def>
- <parameter-def name="FiO2" required="yes" type="flow-unit">
<raw-data-def mode="automatic" />
<numerical-constant unit="s" value="10" />
</parameter-def>
- <parameter-def name="facecolor" required="yes" type="facecolor">
<raw-data-def mode="manual" />
<numerical-constant unit="h" value="1" />
</parameter-def>
</domain>
</domain-defs>
<value-defs />
- <plans>
- <group name="controlled-ventilation">
- ...
```

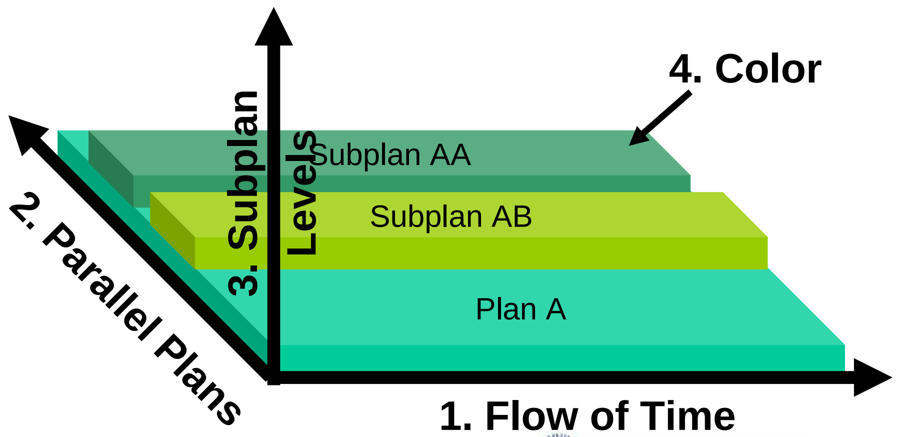

Impossible to use for Domain Experts

AsbruView

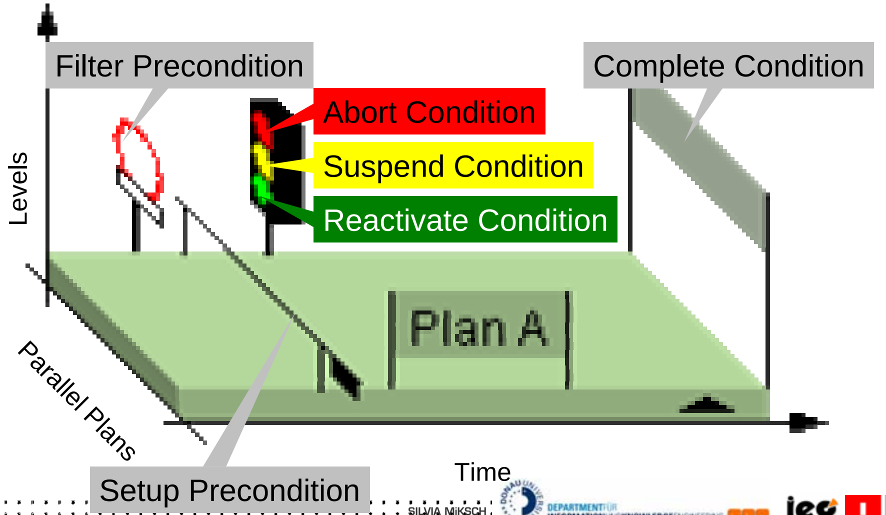
Interface to the
Plan-Representation Language Asbru



AsbruView's Dimensions

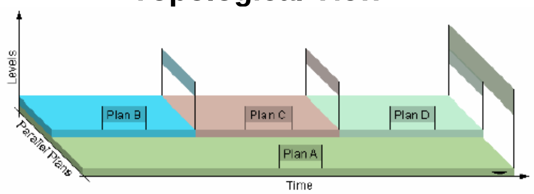


Anatomy of a Plan

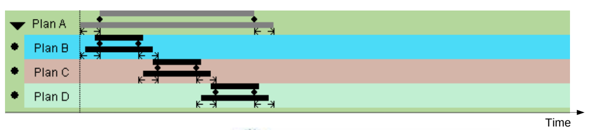


Sequential Plans

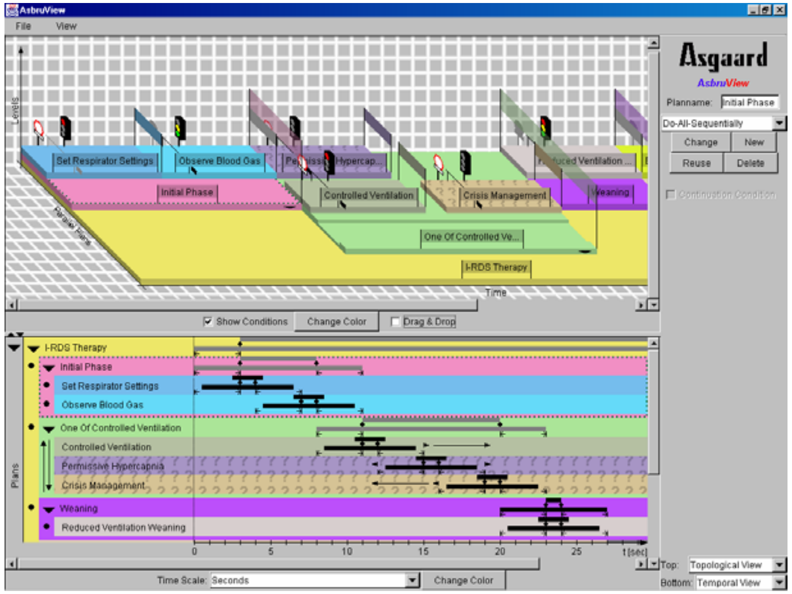
Topological View



Temporal View



AsbruView

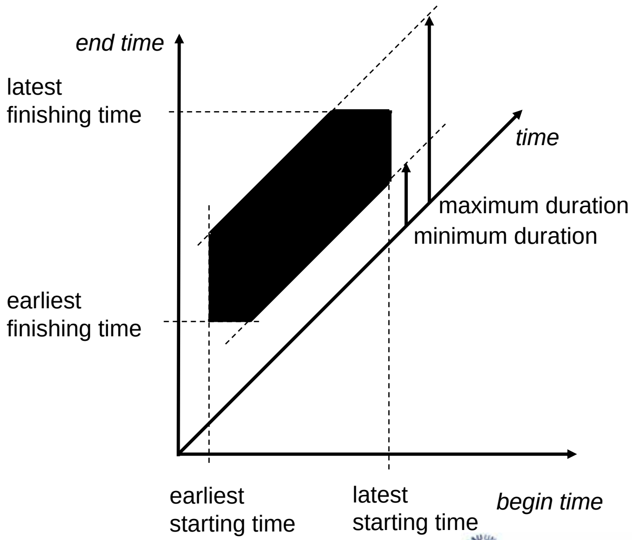


Evaluation

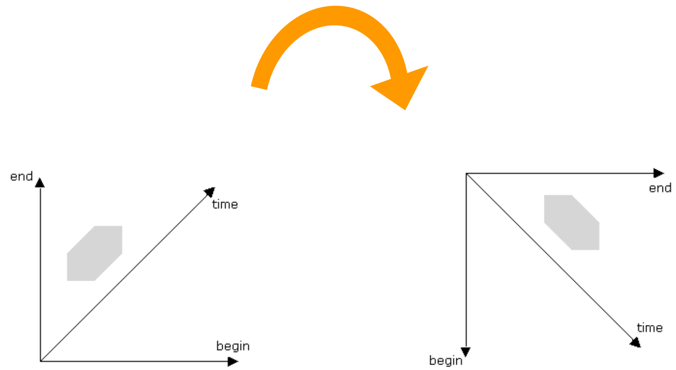
Metaphors
Colors
Two Views
Time Annotations

Speed
(Plan Placement)

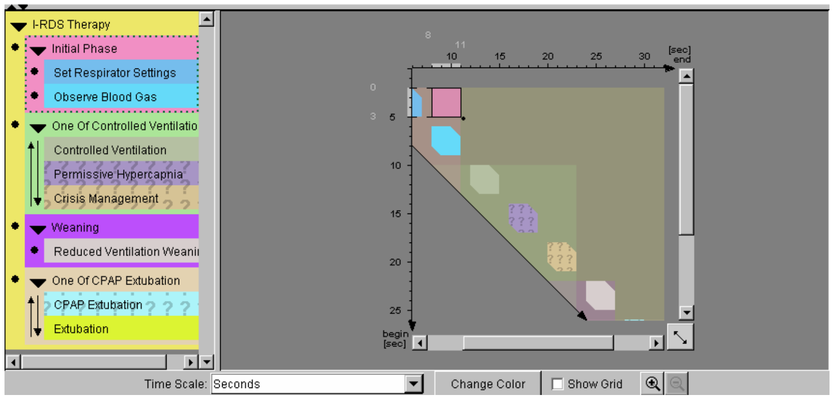
SOPOs



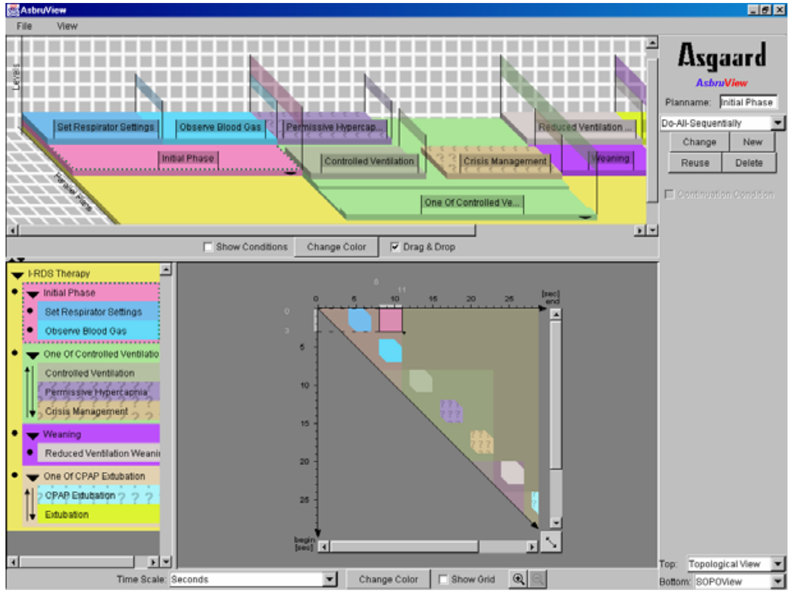
SOPOs



AsbruView - SopoView



AsbruView - SopoView



SOPOs

SOPO = Set of Possible Occurrences

Pro:

Temporal Uncertainty

Evaluated in Small User Study

Con:

Hard to Understand (not Intuitive)

No Hierarchical Decomposition (Unmodified)

No Facets (Very Difficult)

DELT/A: Document Editing & Linking Tool with Add-ons

[Votruba, et al. 2004]

Working with Guidelines' & Protocols' Versions

2 Main Featues

Links

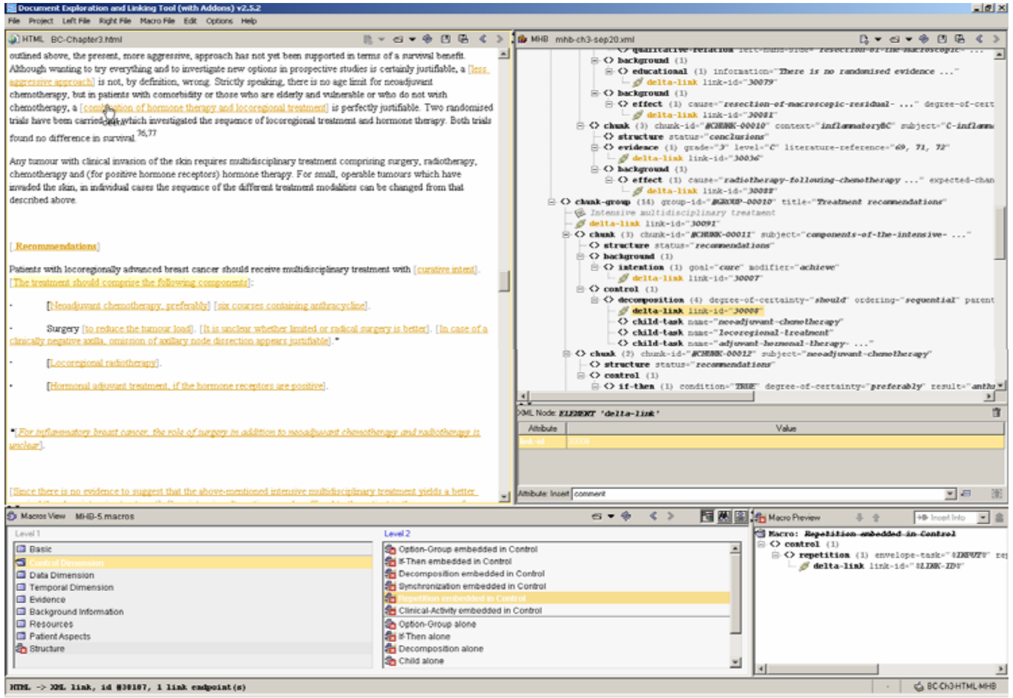
Linking between the textual guideline and its formal representation

Connect related parts in different versions of the same guideline

Macros

Applying design patterns in the form of macros

Combine multiple XML-elements to facilitate construction of an XML file



DELT/A: Tasks

Authoring GL
Designing FR
Augmenting GL
Annotating FR
Understanding GL & FL
Using Links & Navigation
Structuring GL & FL
Using Macros
Living Guidelines
Using Macros, Links & Navigation

GL ... Raw Guideline
FR ... Formal Representation of GL

Knowledge Maintenance of Guidelines

Sample DELTA – Feature: Filtering/Folding

Problem
- Files complex & large
- Focus on partial aspects necessary

Solution
- Define filters on the fly
- Show/hide parent nodes
- Show/hide child nodes

Example: Show all data usage elements

Evaluation

Qualitative Study [Votruba, et al. 2004]

3 Phases
- A questionnaire: assessing participant's skills
- An exploration session: examining functionality
- A questionnaire: assessing the three views

Results
- Homogeneous sample
- Three views are very appropriate
- Linking features necessary
- Markros help to structure and understand

Conclusion (Benefits)

Tool for maintaining knowledge in clinical guidelines & protocols

Linking two representations of same guideline

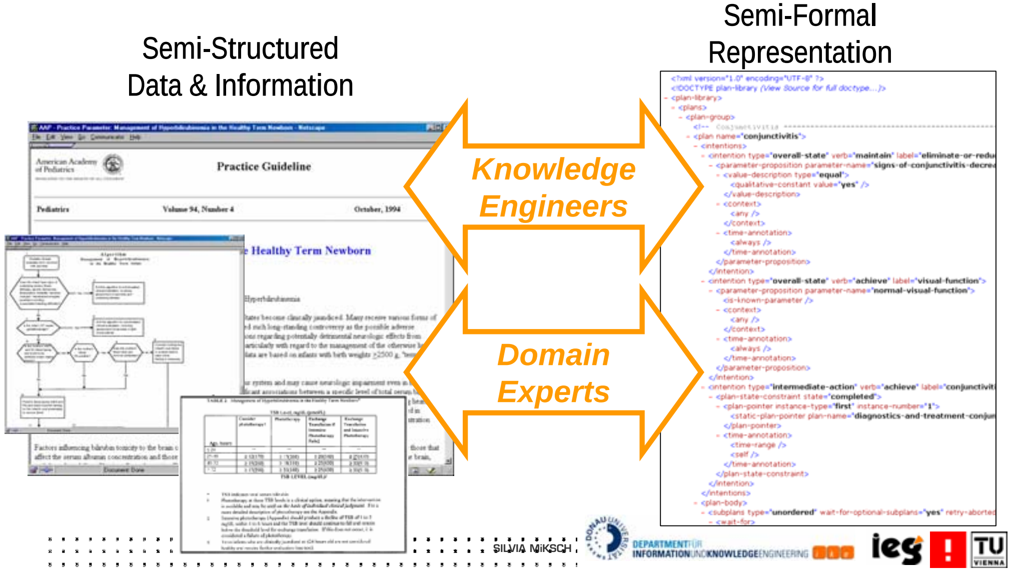
Cross-checking for errors and inconsistencies

XML-Macros: Simple construction of new XML guidelines

Full-featured XML-Editor: No need to switch to standard XML-editor for post-processing of guideline

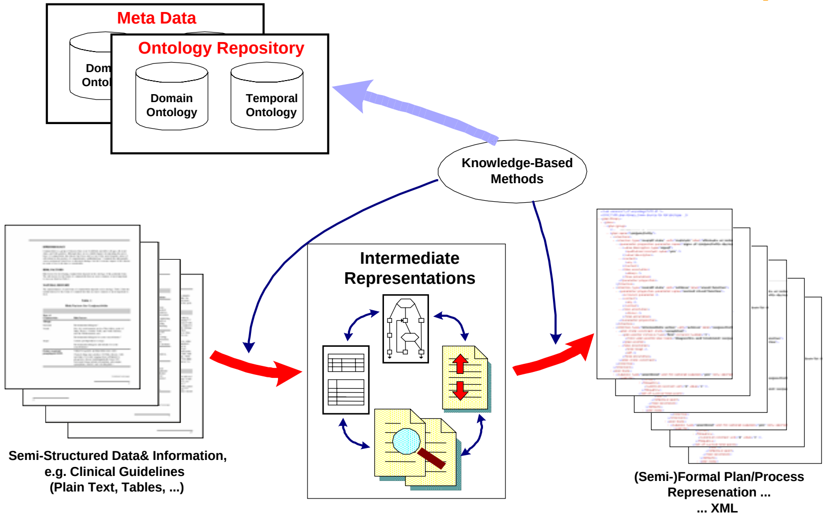
Information Extraction & Integration

[Kaiser, 2004]



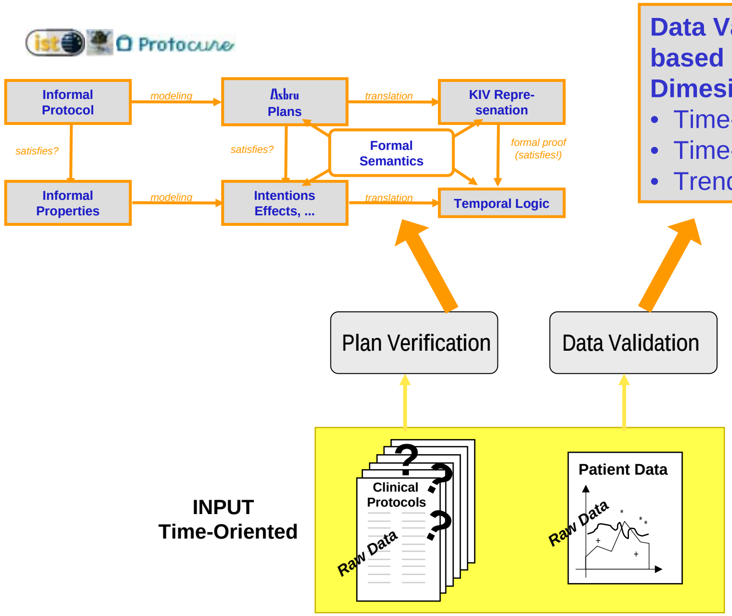
Information Extraction & Integration

[Kaiser, 2004]



More Details …

… Katharina Kaiser's parts



Data Validation Methods based on Temporal Dimesions

- Time-Point Methods
- Time-Interval Methods
- Trend-Based Method

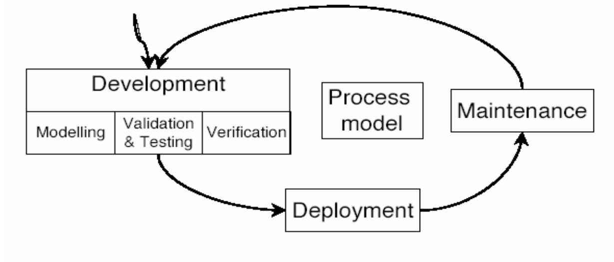
The Protocure Project

Overall Objective

"Support guideline developers in the health-care profession in the construction and maintenance of high-quality and up-to-date living guidelines and protocols."

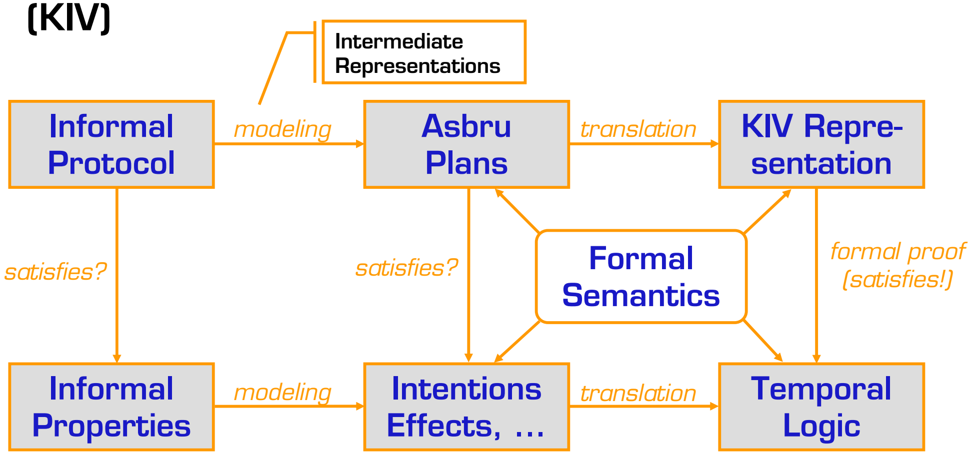
Metaphor:

Guideline & Protocol Development ≈ Software Engineering



Verification: Protocure Project

Improving Medical Protocols by Formal Methods (KIV)



Multi-level Plan Verification

Check for Anomalies Within Several Layers

- Level 1: Within a Single Component
- Level 2: Within a Single Plan
- Level 3: Within a Plan Hierarchy

Goal: to arrive at legal or meaningful plans

Level of Checking

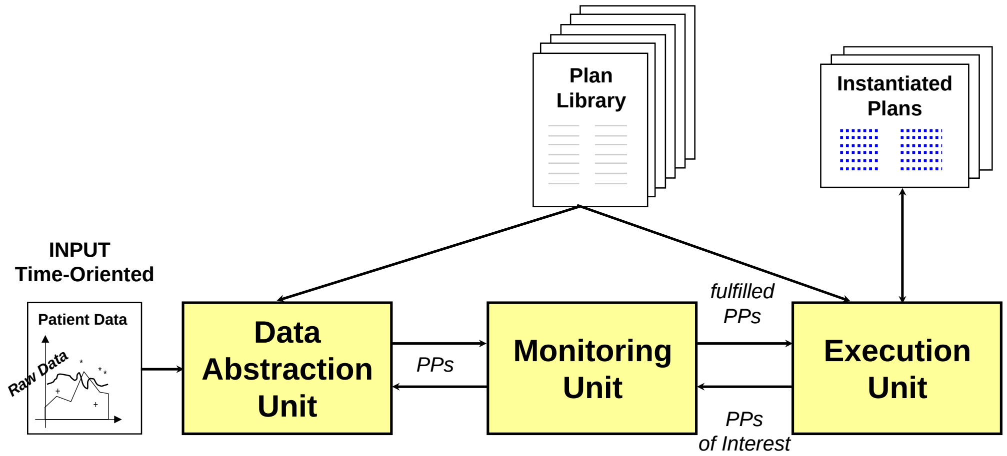
Decomposition	Level 1	Level 2	Level 3
Plan A			
Plan A_a			
Cond. A_1	✓		
Cond. A_2	✓	✓	
…	✓		
Cond. A_n	✓		
…			✓
Plan A_x			
Cond. X_1	✓		
Cond. X_2	✓	✓	
…	✓		
Cond. X_o	✓		

Problem Solving Methods

Selected PSM

- Authoring Protocols
  - AsbruView - SopoView
  - Guideline Markup Tool
  - Advanced Editors: PIXEE
  - Information Extraction & Integraton
- Plan Verification
- Monitoring and Execution
- Information Visualization

Overview: Run-Time Modules



Information Communication

[Aigner, et al. 2003-2006]

What is the problem?

Visualization support for patient data analysis is mostly limited to the representation of directly measured data

Why is it important?

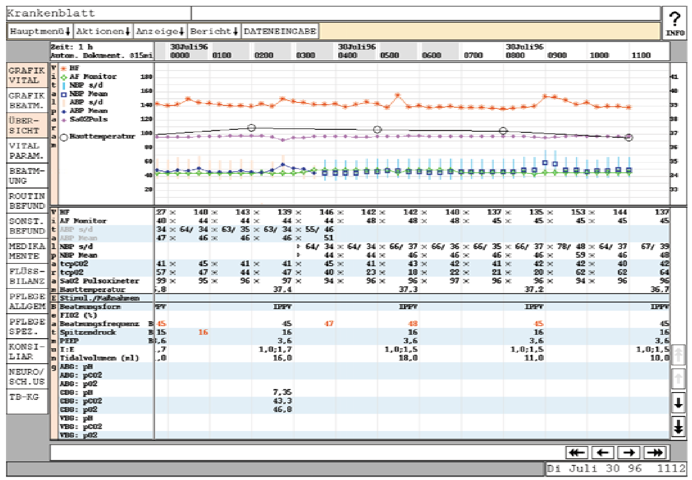
Contextual information on treatment steps could enhance the analysis process

Our solution

Integrated visualization of medical treatment steps and patient data

Use visual representations familiar to domain experts

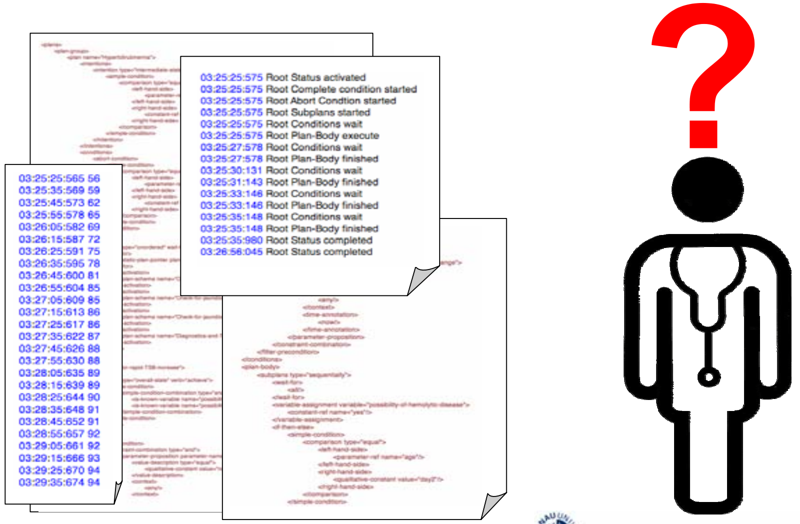
Current Visual Analysis Methods



“data visualization” - no explicit integration of information about the treatment process

The Problem

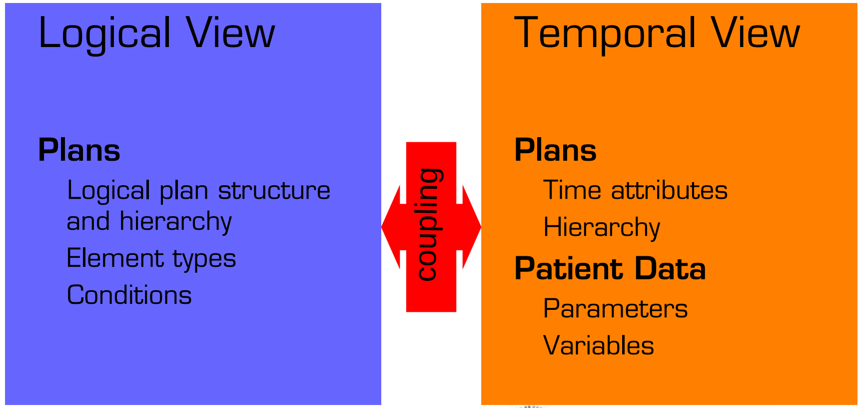
[Aigner, et al. 2003-2006]



Conceptual Design

[Aigner, et al. 2003-2006]

Two-view approach:



Data Characteristics

Treatment Plan Specification Data

Treatment plan execution data

Patient Data

(measured parameters & variables)

Time-oriented Data (incl. Uncertainties)

Logical Sequences

Hierarchical Decomposition

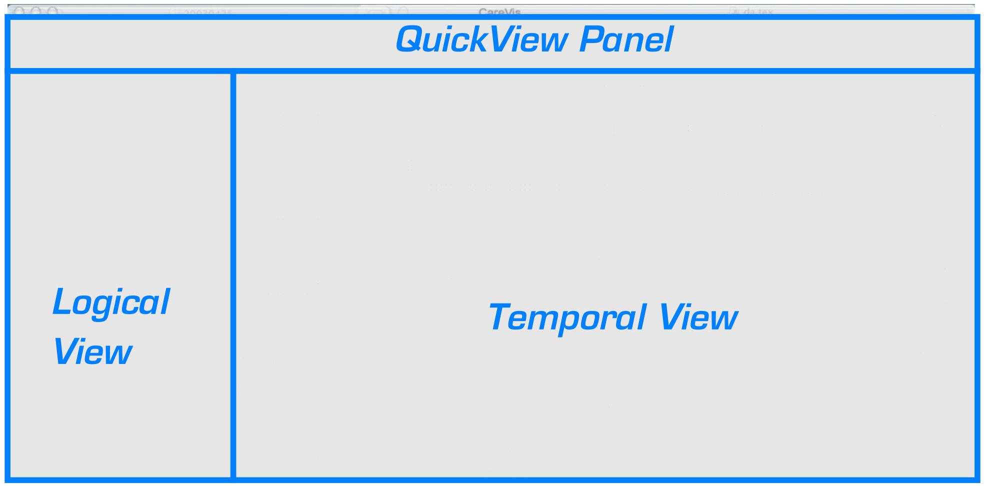
Flexible Execution Order

Non-uniform Element Types

State Characteristic of Conditions

Our Solution: *CareVis*

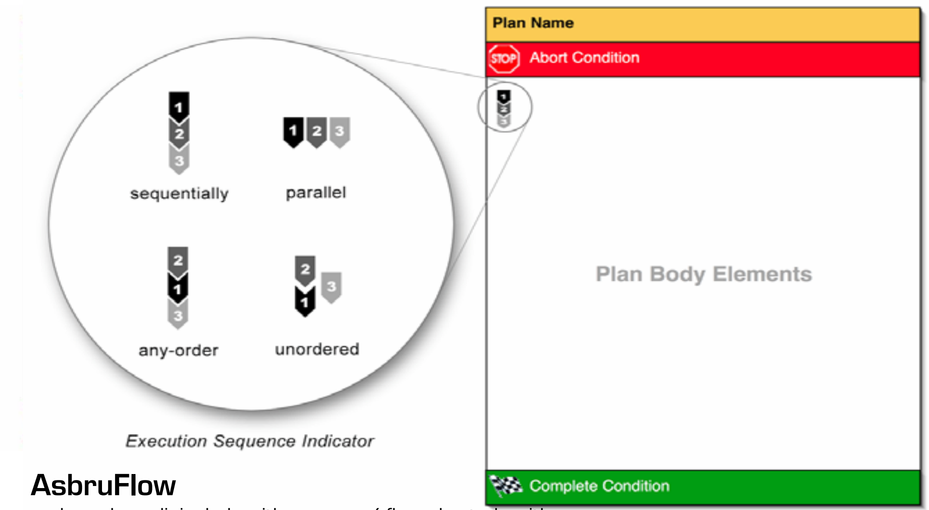
[Aigner & Miksch 2004-2006]



Interactive and Integrated Visualization of Computerized Protocols and Temporal Patient Data

Logical View

[Aigner & Miksch 2004-2006]



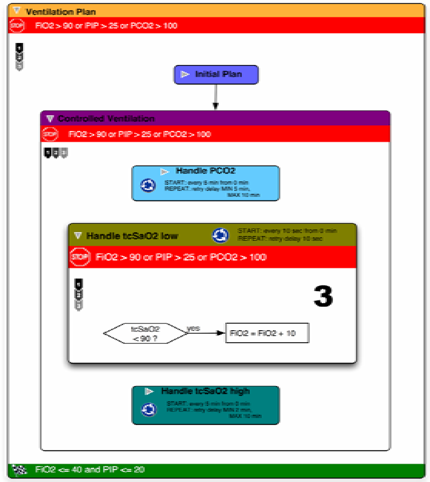
AsbruFlow

based on clinical algorithm maps / flow chart algorithms
[Society for Medical Decision Making, 1992]

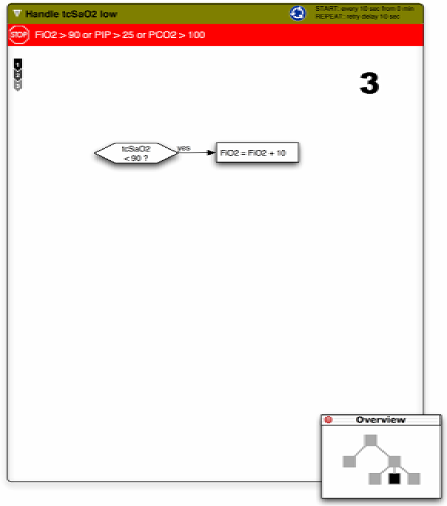
Logical View: Focus + Context

[Aigner & Miksch 2004-2006]

Fisheye Approach

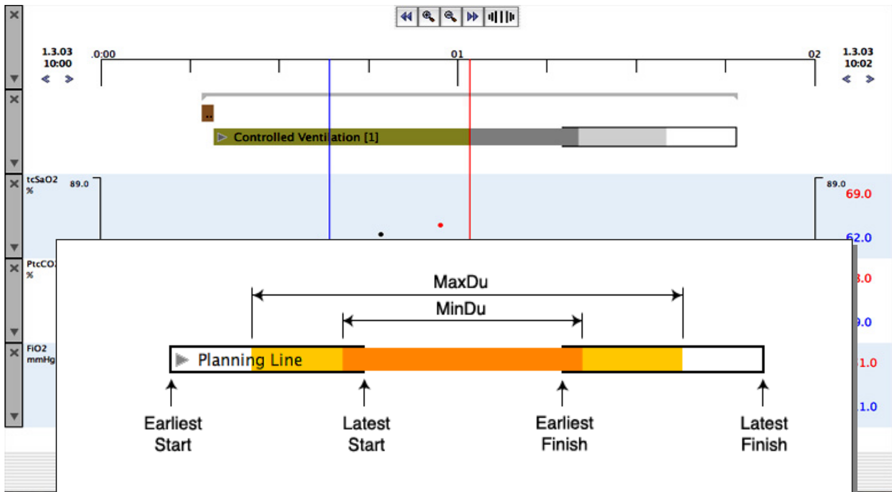


Overview+Detail



Temporal View

[Aigner & Miksch 2004-2006]

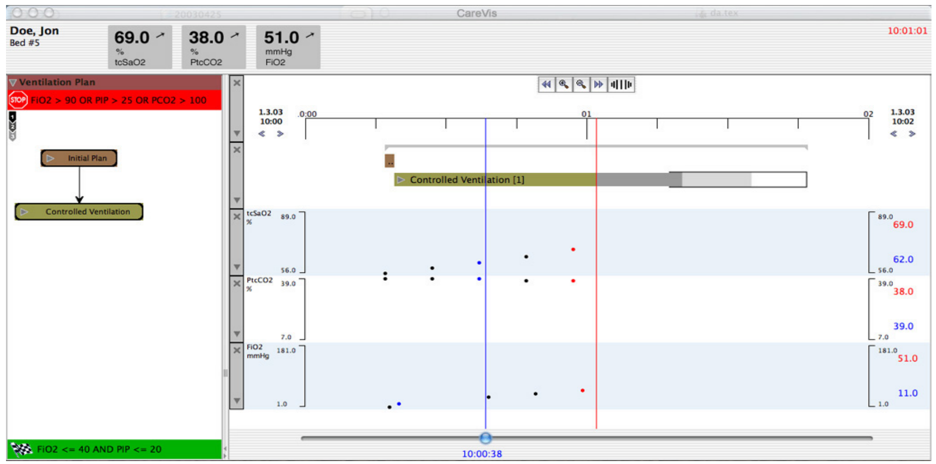


PlanningLines

based on LifeLines [Plaisant et al., 1998]

View Coupling

[Aigner & Miksch 2004-2006]



common color palette for plans
synchronous selection
user triggered navigation propagation

User Centered Design

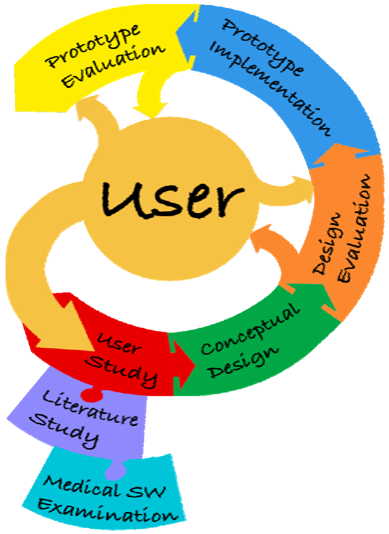
[Aigner & Miksch 2004-2006]

[Aigner, et al. 2003-04]

3-step evaluation process

qualitative

scenario-based



Prototype Evaluation

[Aigner, et al. 2003-2006]

5 physicians

Semi-structured interview

Feedback very positive

- Clear
- Intuitive
- Easy to understand

Mental model for PlanningLine glyph very helpful

Increased interest in contrast to User Study

Conclusion

[Aigner, et al. 2003-2006]

Two-view approach

- Working hand-in-hand
- Helpful interaction patterns for coupling of views

Making complex data easier to understand

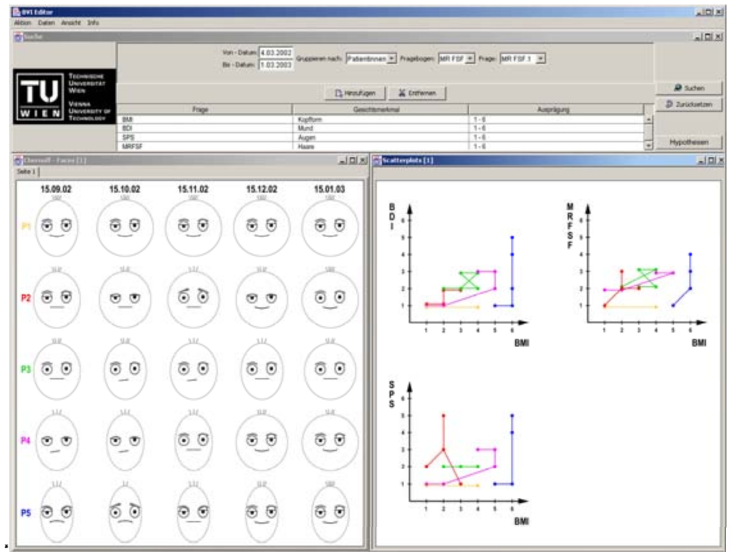
Using visualization techniques familiar to domain experts (physicians)

Development of two novel glyphs

User involvement

LinkVis: Multiple Views

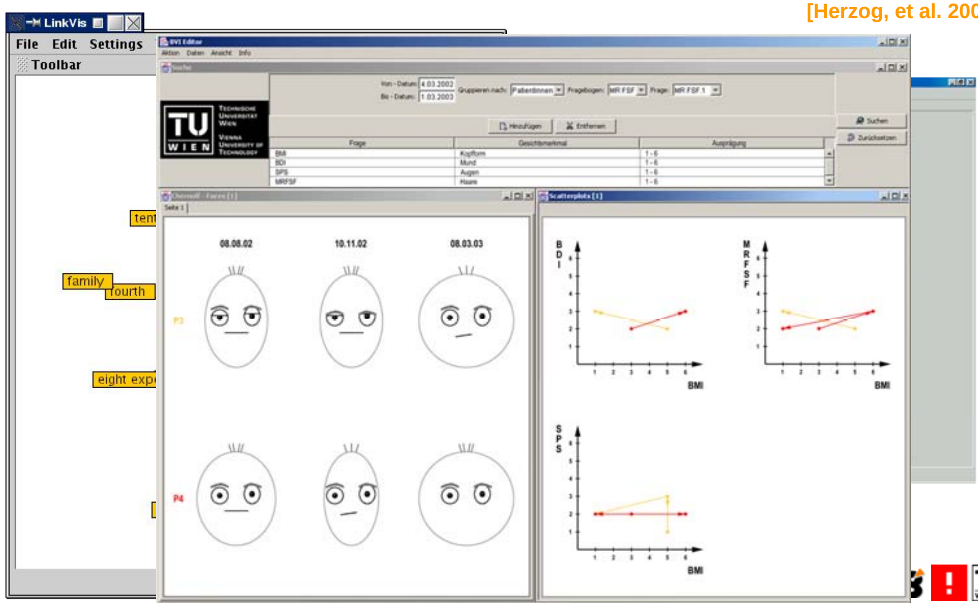
[Herzog, et al. 2004]



LinkVis: l

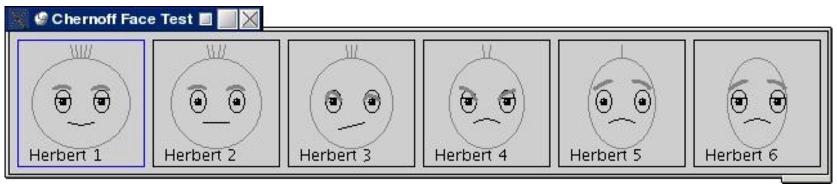
LinkVis: Multiple Views

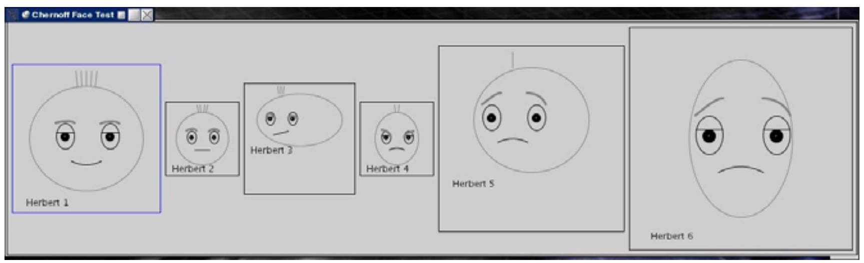
[Herzog, et al. 2004]



LinkVis: Multiple Views

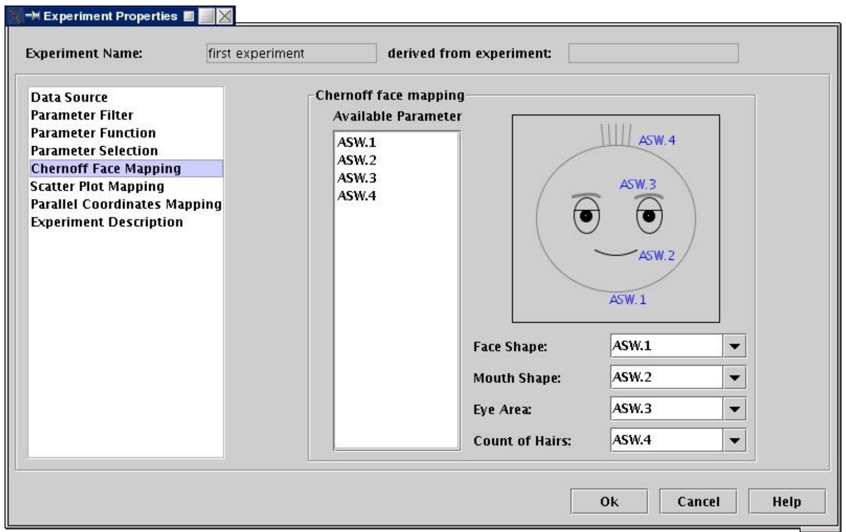
[Herzog, et al. 2004]





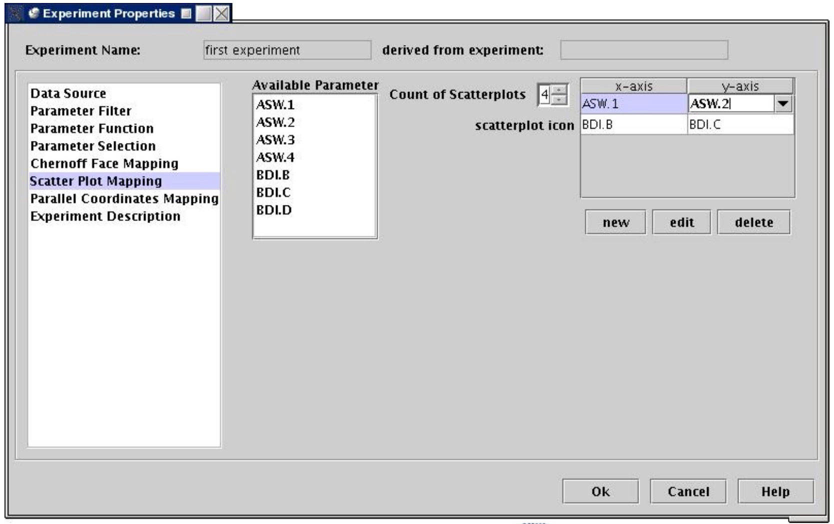
LinkVis: Multiple Views

[Herzog, et al. 2004]



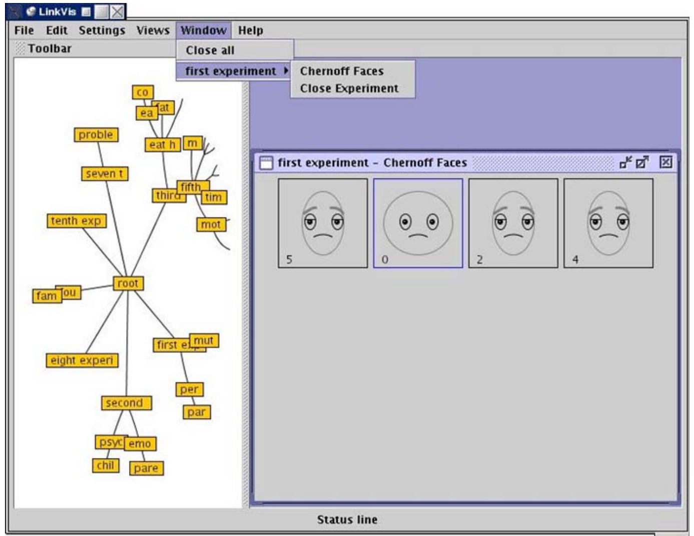
LinkVis: Multiple Views

[Herzog, et al. 2004]



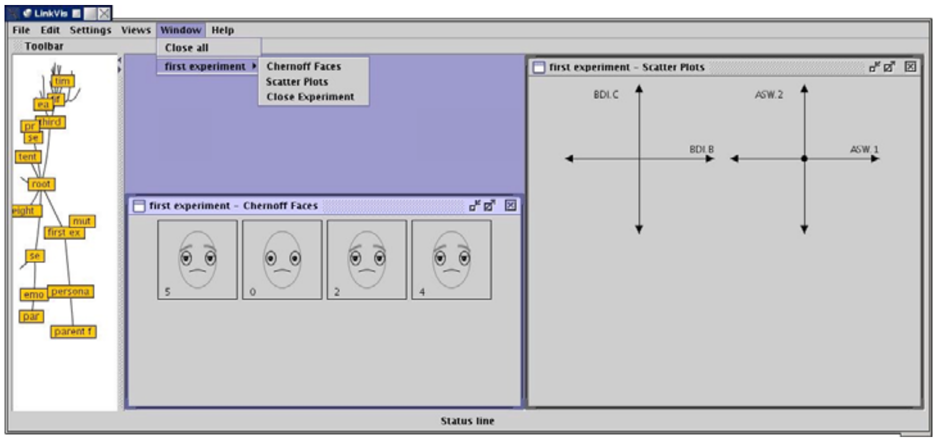
LinkVis: Multiple Views

[Herzog, et al. 2004]



LinkVis: Multiple Views

[Herzog, et al. 2004]



Connecting Time-Oriented Data and Information to a Coherent Interactive Visualization

Ragnar Bade, Stefan Schlechtweg
Silvia Miksch

The Midgaard Project

Aims

Data

High-Dimensional and Time-Oriented Data and Information

Interactive Visualization Techniques

Reveal the Data at Several Levels of Detail and Abstraction, Ranging from a Broad Overview to the Fine Structure

Time Visualization and Navigation Technique

Connects Overview+Detail, Pan+Zoom, and Focus+Context Features to one Powerful Time-Browser

Midgaard Approach

Visualizing Time-Oriented Data

- Qualitative Scales
- Qualitative/Quantitative Hybrids
- Quantitative Scales
- Data Points & Their Dimension
- High-Frequency Data

Interacting with Data

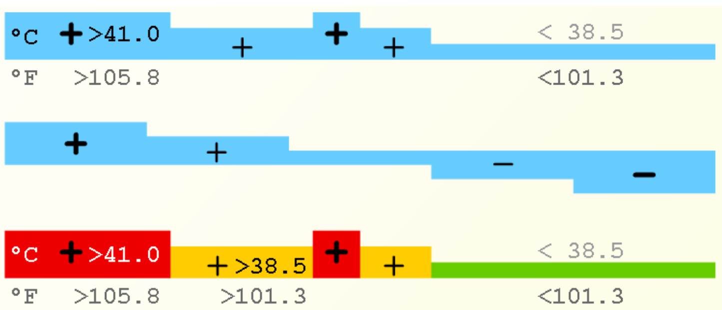
- Browsing Data
- Browsing Over Time

Semantic Zooming
Smoothly integrated

Qualitative Scales

Color-Coded Timelines

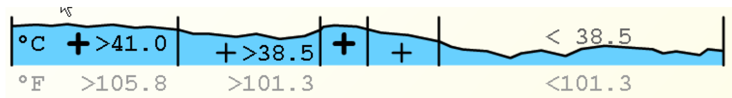
Height-Coded Timelines



Qualitaive-Quantitative Hybrids

Color-Coded Regions

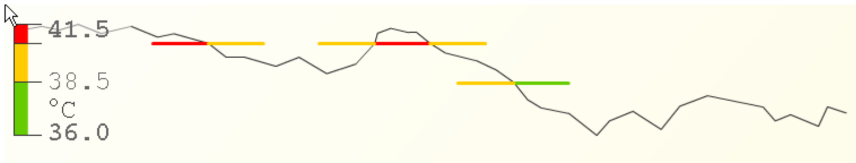
Mark Regions without Colors



Quantitative Scales

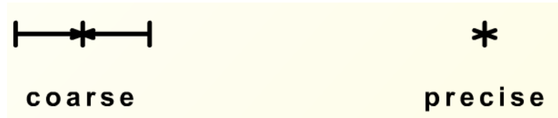
Read Exact Values

Include Knowldge of Qualitative Scales

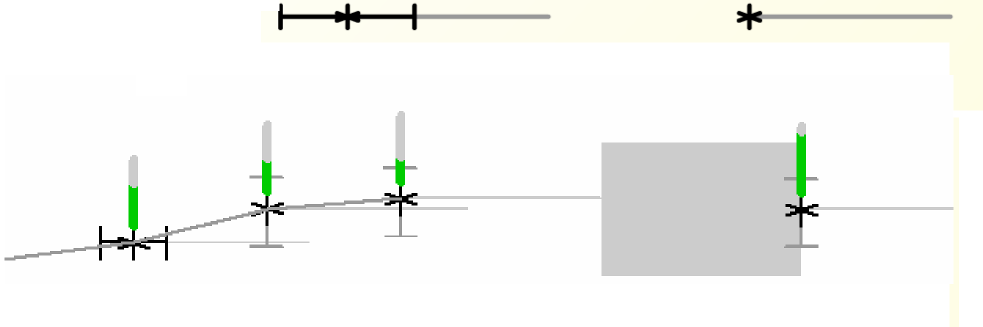


Points and their Dimensions

Occurrence Time & Uncertainty



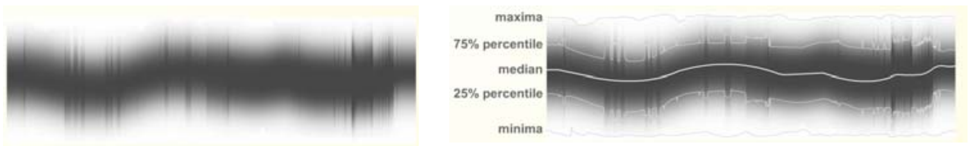
Valid Time



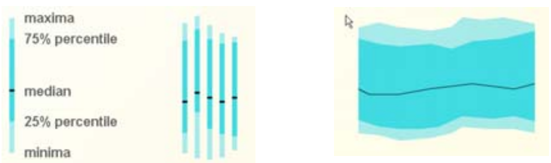
High-Frequency Data

Abstract vs. Expressiveness

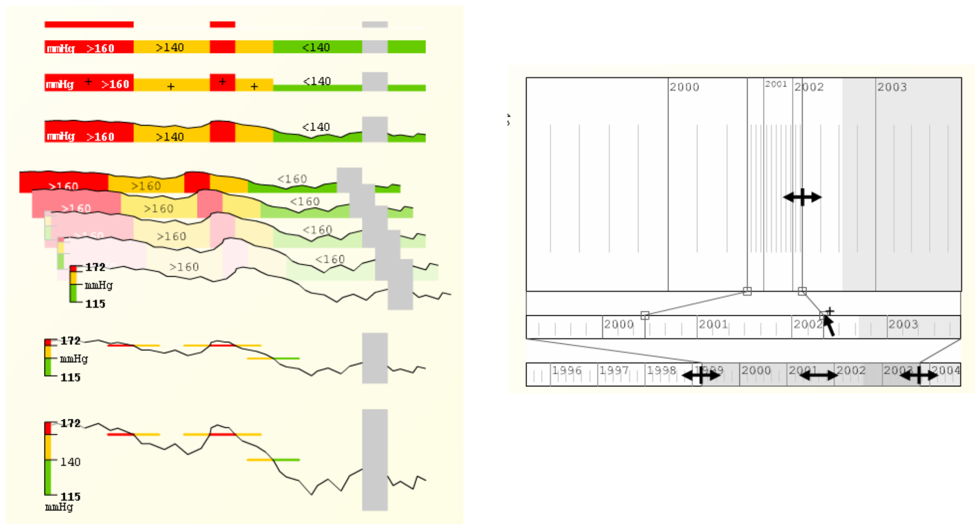
Information Mural [Jerding & Stasko, 1998]

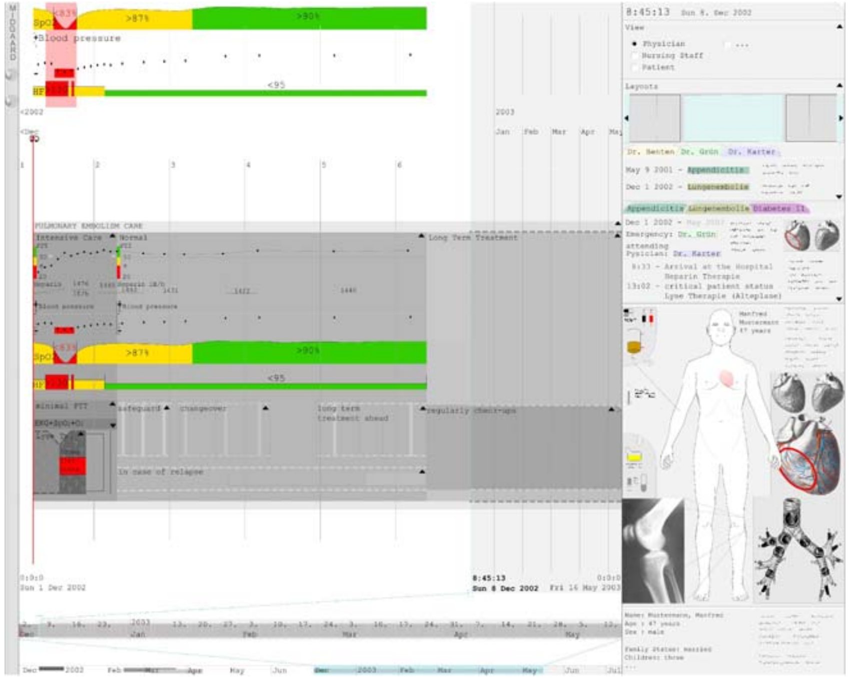


Tukey's Box-Plot Redesign



Interacting with Data & Time





The Interactive Stardinates

[Lanzenberger, et al. 2003]

‚Stars and Coordinates‘

Axes, Scales, Labels

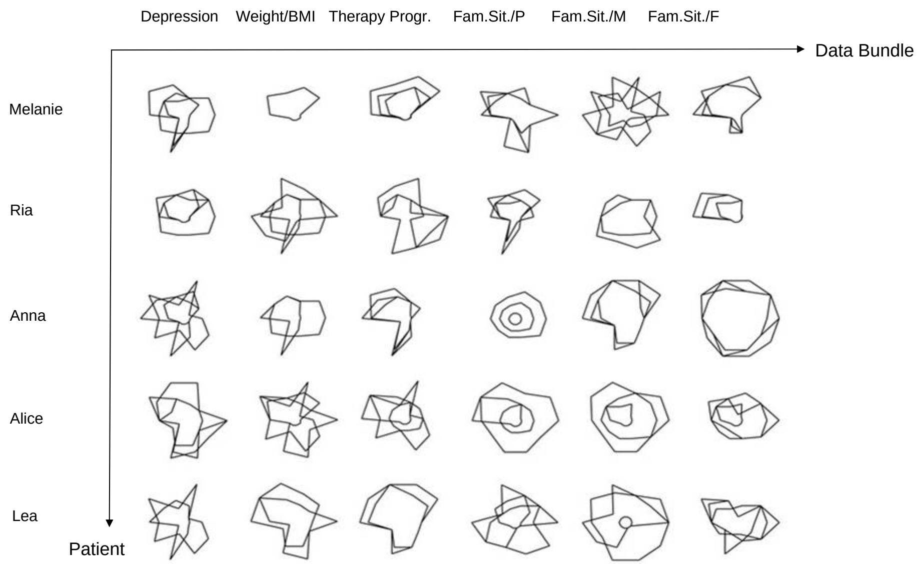
Data Lines, Data Bundles

Pre-attentive Features:

- **Shape**
- **Size**
- **Relative Position**
- **Diversity and Accumulation of Lines**

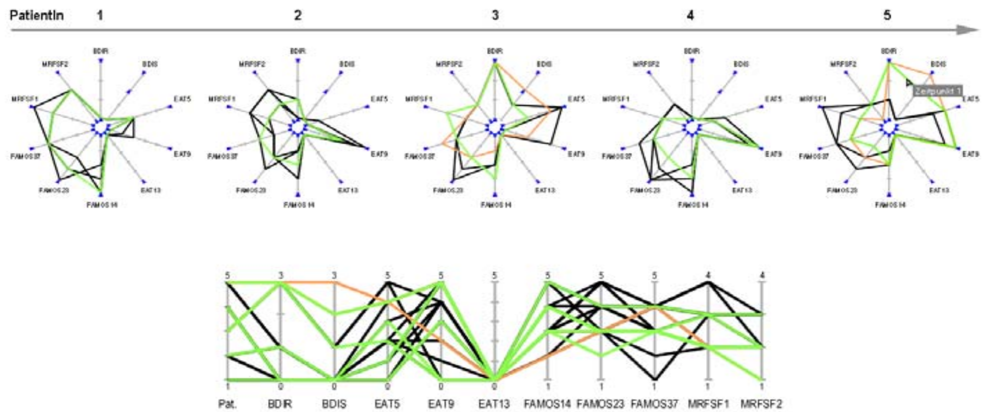
The Interactive Stardinates

[Lanzenberger, et al. 2003]



The Interactive Stardinates

[Lanzenberger, et al. 2003]



in2vis

Interactive Information Visualization: Exploring & Supporting Human Reasoning Processes

Wolfgang Aigner, Klaus Hinum, Silvia Miksch & Students
Margit Pohl, Markus Rester, Sylvia Wiltner & Students
Susanne Ohmann, Christian Popow & Therapists

Interactive Information Visualization of Highly Structured Temporal Data

Fokus: Explorative Methods of Data Analyses

Interactive & Explorative Features
Abstract & Highly Structured Data Context
Task-specific & User-oriented (Personalized)

→ Interactive Information Visualization
Explorative Data Analyses (EDA)
supervised Maschine Learning

Aims & Tasks: in2vis Project

Explore & Compare Different Methods to Ease the Understanding

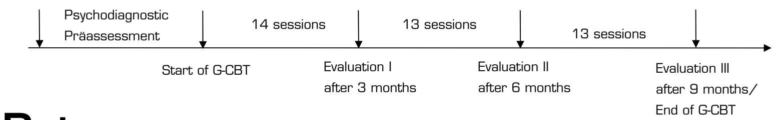
Find their Strengths & Limitations

Estimate How Combinations of these Methods can Contribute to More In-Depth Reasoning Processes

Develop Guidelines How to Explore & Visualize Data & Information Task- and User-Appropriately

Study

Psychotherapeutic Data Acquired during Cognitive Behavioural Therapy of Anorectic Girls



Data

Complex, Different Data Types & Time-oriented

Task

Find Predictors

Data Characteristics

Data from Questionnaires

Each about 40 Questions

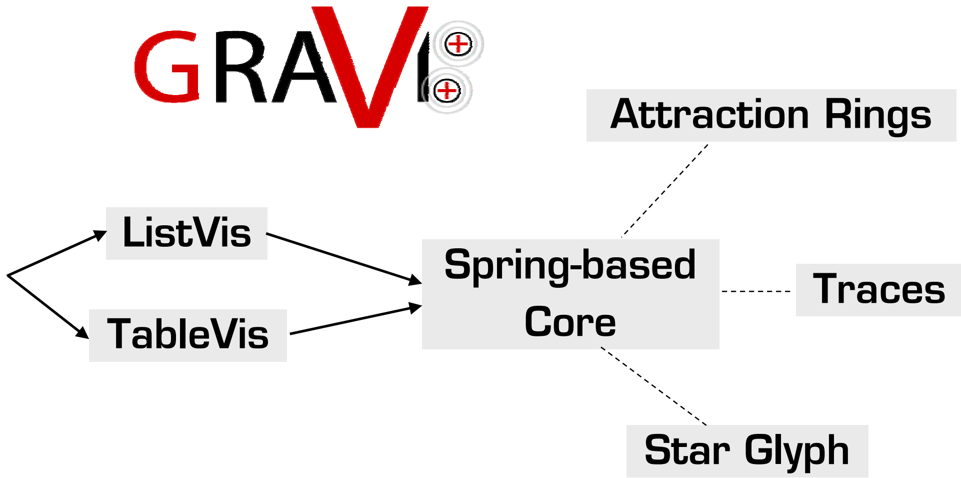
Filled out by Patients, Parents, and Therapists

Answers Range from 0 to 6

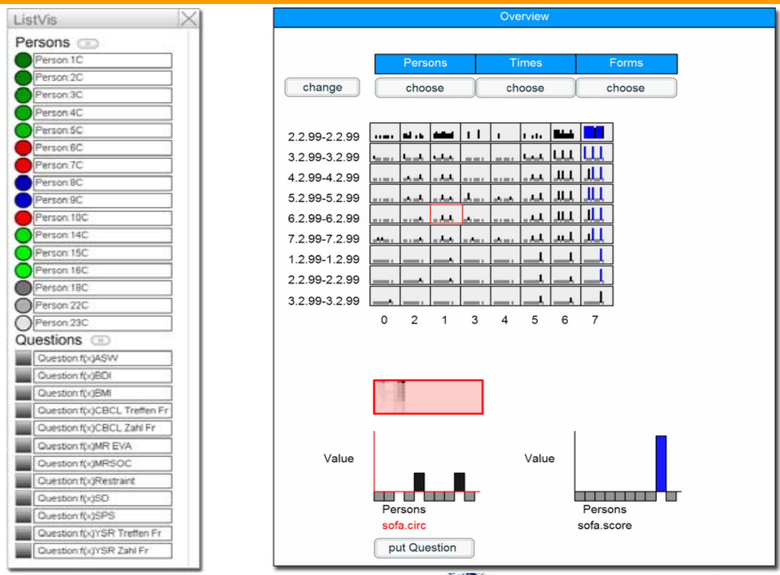
5 Time Steps (pre, eval1-3, post)

➢ Explore Highly Structured, Temporal Data

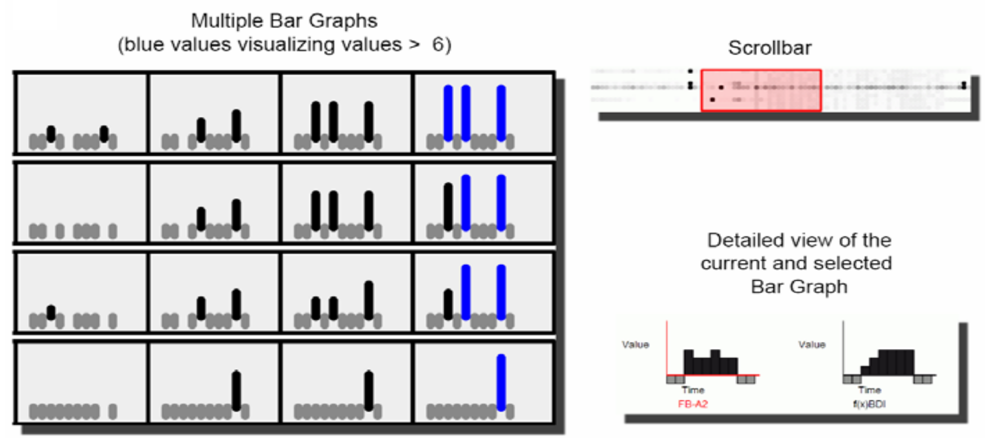
Gravi++



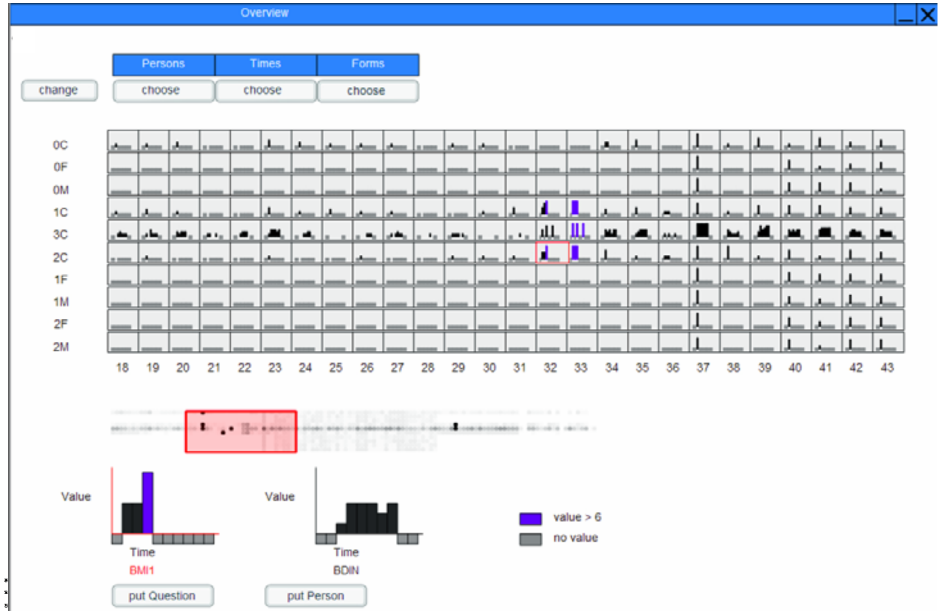
Overview Visualizations



TableVis



Overview Visualization

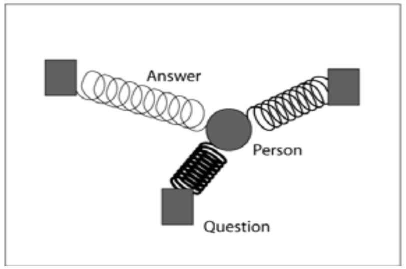


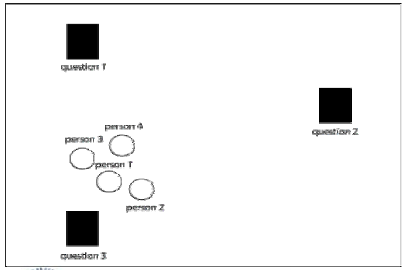
Spring-based Core Visualization

Visualize data by positioning, color, and size of icons

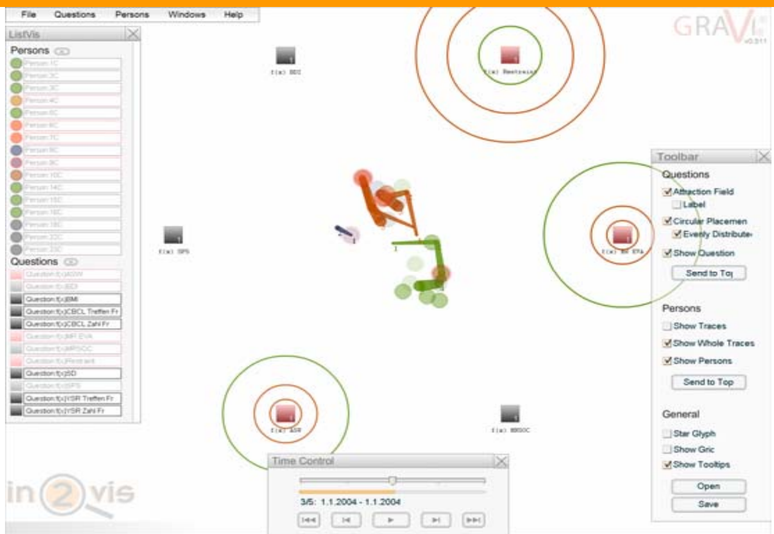
Positioning of persons with spring-based Method

Movement and finding clusters and outliers

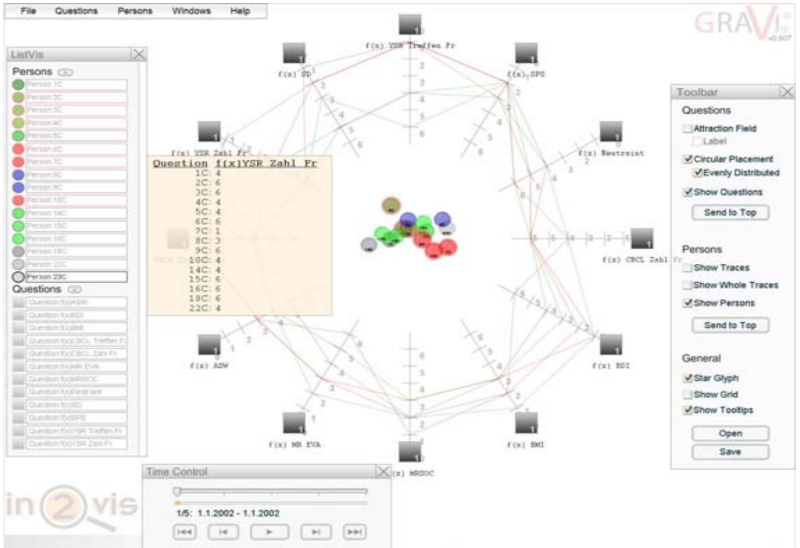




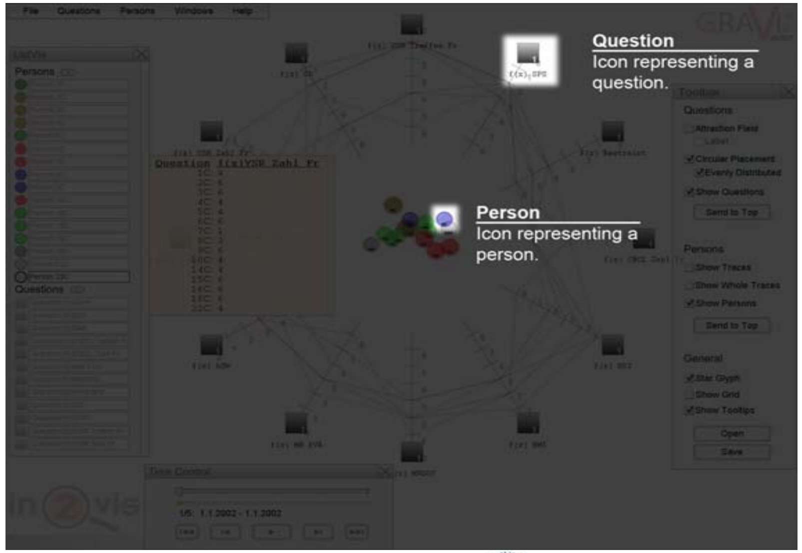
Gravi++: Demo



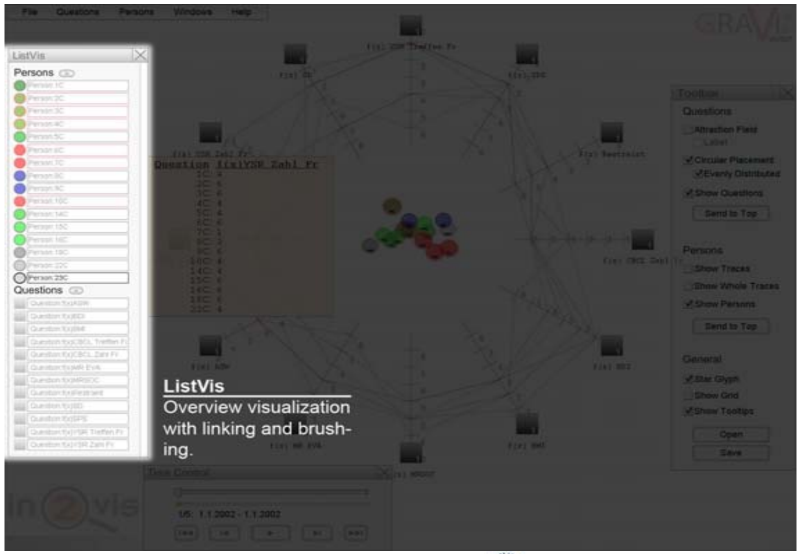
Gravi++



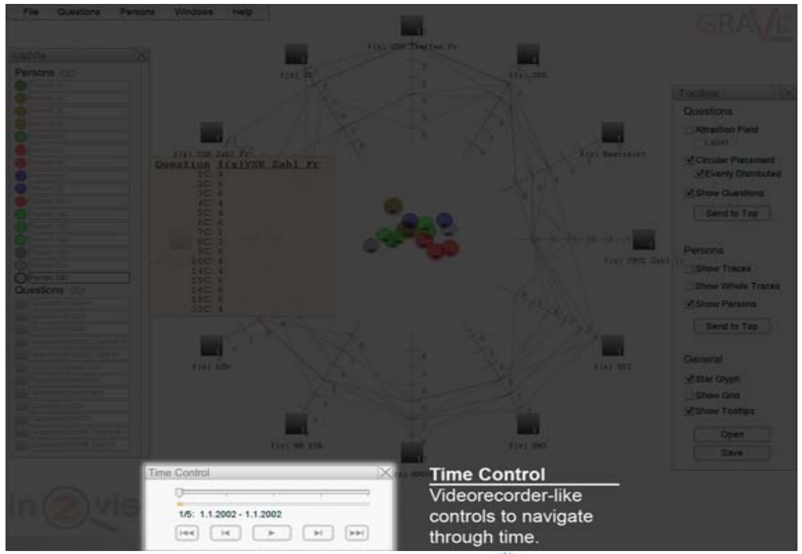
Gravi++



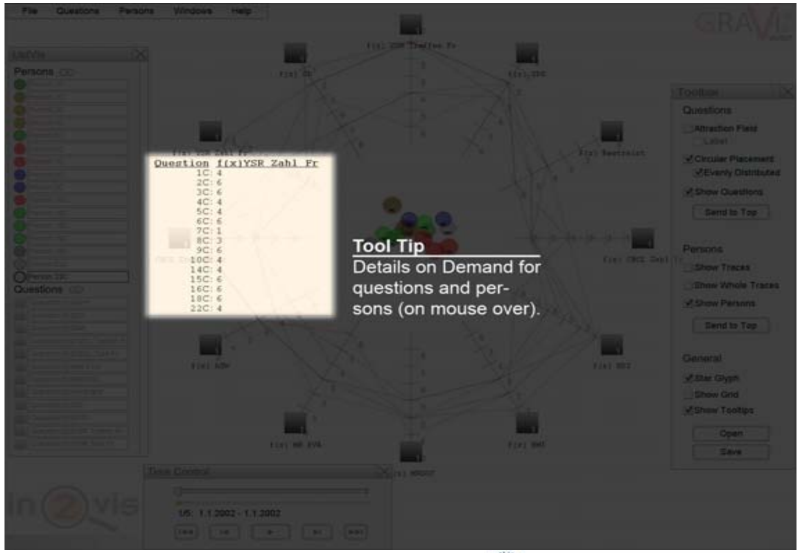
Gravi++



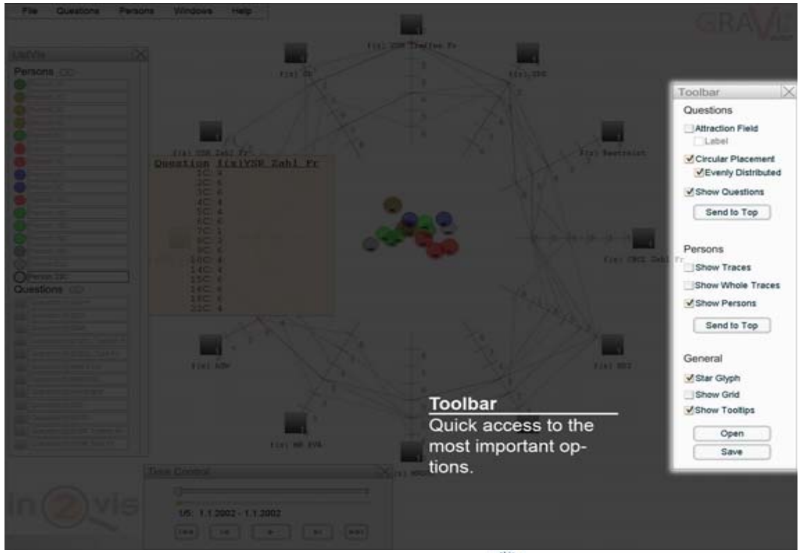
Gravi++



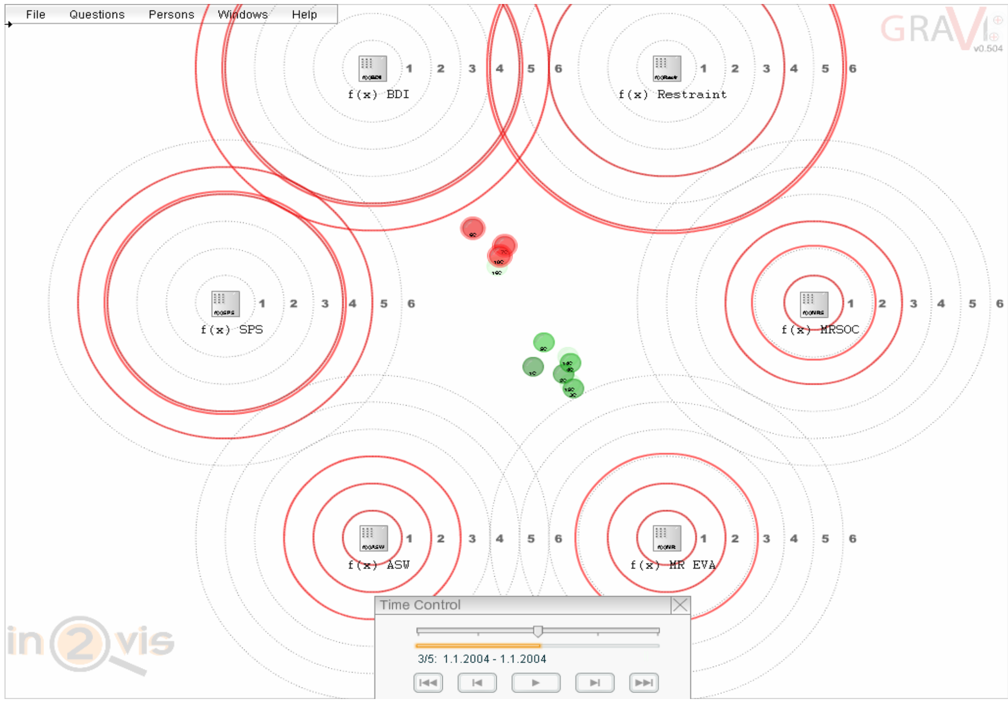
Gravi++


Tool Tip
Details on Demand for questions and persons (on mouse over).

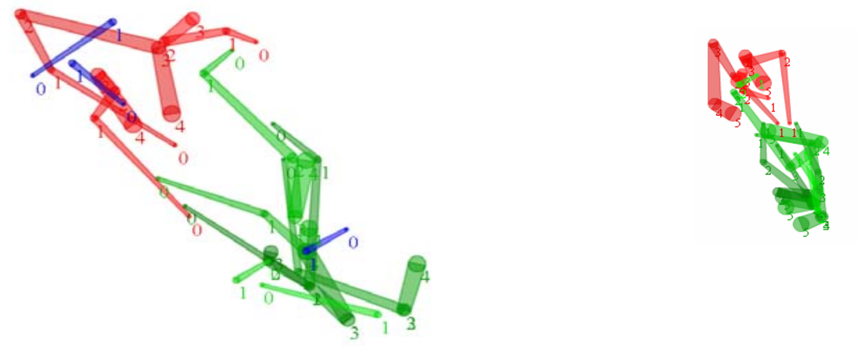
Gravi++


Toolbar
Quick access to the most important options.

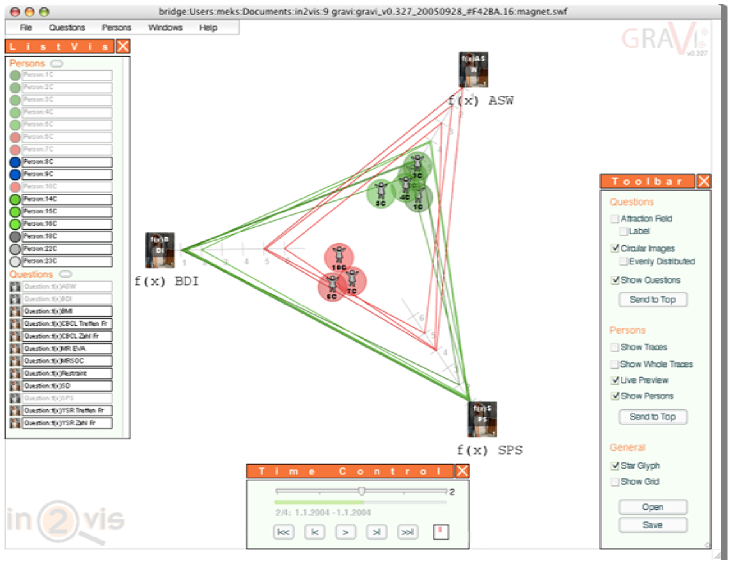

File
Questions
Persons
Windows
Help
GRAVI
f(x) BDI
f(x) Restraint
f(x) SPS
f(x) MRSOC
f(x) ASW
f(x) MR EVA
Time Control
3/5: 1.1.2004 - 1.1.2004
in2vis

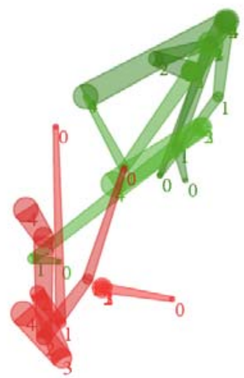

File
Questions
Persons
Windows
Help
GRAVI
f(x) BDI
f(x) Restraint
f(x) SPS
f(x) MRSOC
f(x) ASW
f(x) MR EVA
Time Control
3/5: 1.1.2004 - 1.1.2004
in2vis

Traces: Visualize Movement Over Time

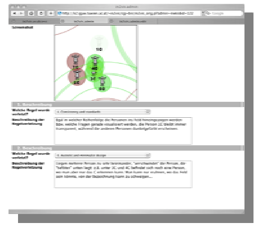


Star Glyph: Visualization of Exact Values





Study - Evaluation



Usability Study

- Informal Usability Inspection/ Guideline Review
- Heuristic Evaluation
- Focus Groups

Contribution Study between

- Gravi++
- Exploratory Data Analysis
- Machine Learning Techniques

Guidelines: Explore & Visualize Data& Information Task- and User-Appropriately

Study

Stage	Method	Subjects	Aim	Outcome
				work in progress

Conclusion

Interactive Information Visualization

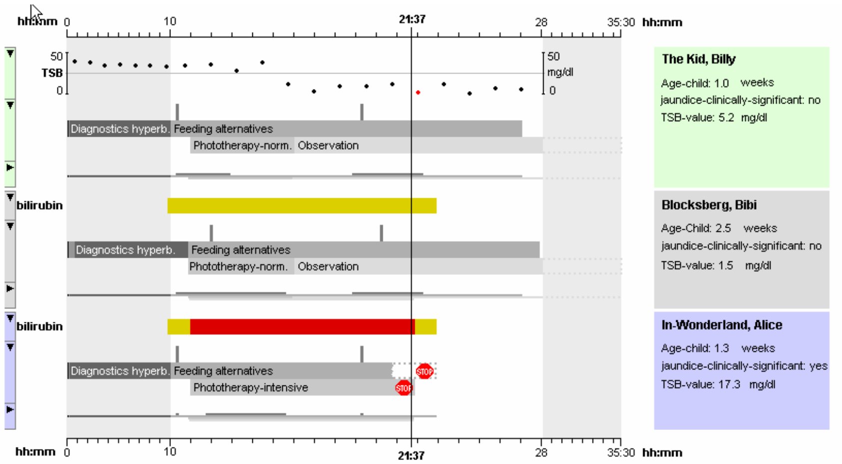
Part of a comparison study with machine learning and statistical methods.

Time is visualized with animation and traces

Find predictors and analyse data

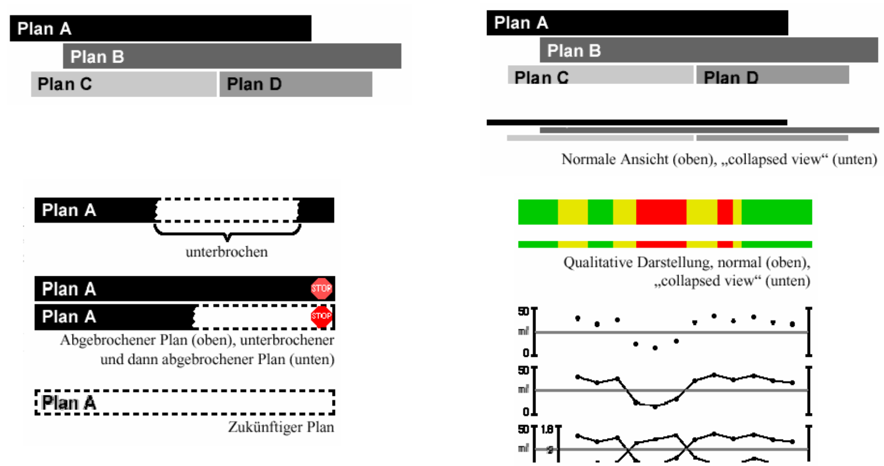
GOT: Guideline Overview Tool

[Wolfgang Aigner, 2001]



GOT: Interactions: Plans & Data

[Wolfgang Aigner, 2001]



Conclusion

Classical Planning not sufficient in Medicine

- Plan Management
  - Time-Oriented Skeletal Planning
- Methods & Tools Supporting the Tasks

User-Oriented Design

Cite-Specific Adaptions

Usability Studies