New Approach for Controlling Complex Processes

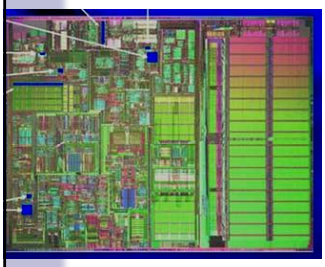
Artificial Recognition System

ARS

Introduction to the 5th generation of AI

Dietmar Dietrich; Dietmar Bruckner

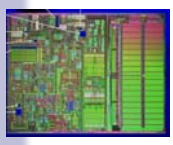






100.000.000 transistors

2.000.000.000 neurons





What is doubtful of the announcement of several newspapers:

(about the Blue Brain Project, 2008)

"We are able to simulate 2 billion neurons. We are able to simulate the brain very soon."

?





Comparison: bad & wrong

1. **Transistor = neuron?**
2. **HW = performance of a computer?**
3. **How important are: structures, functions, levels, ..**

What are "intelligent" systems?
Do we need intelligence or even consciousness?





Many say NO!

Agenda



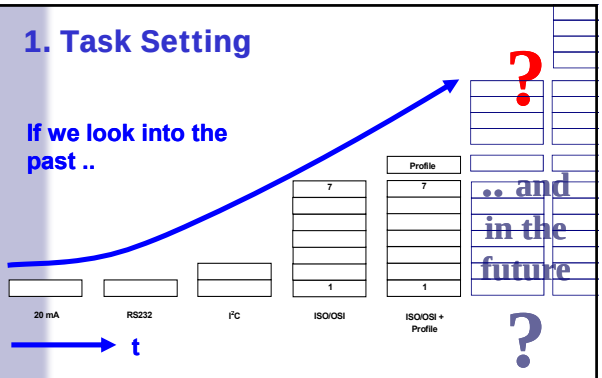
1. **Task setting**
2. **Intelligence regarding bionic systems**
3. **Why Neuropsychoanalysis?**
4. **The new model**
5. **Conclusion**



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1. Task Setting

If we look into the past ..



.. and in the future

?

?

.. the increasing number of levels ..

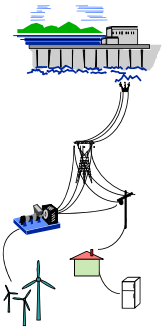
Examples for complexity

- Energy management systems
- Building automation
- Industrial automation
- Process automation
- Air & space technology
- Automotive industry
- Cargo industry
- Safety & security
- ..







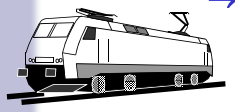


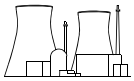
Goal in Automation

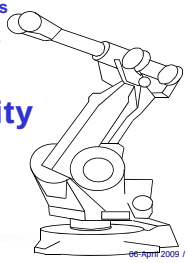


- High-grade networking
- High-grade integration (Embedded Systems)
- Tight networking of numerous processes
- Integration of a huge number of sensors
- Request of precise process description
- ..

→ Complexity







Bottom-up *versus* Top-Down Design
Behavior *versus* Function

Four generations:

Bottom-up

- **Symbolic AI**
  Incoming sensor data → symbolized & manipulated
  Mental apparatus: comparable to lowest functional level



- **Statistical AI**
  Artificial neural networks → Main function: learning
  Mental apparatus: comparable to lowest functional level



- **Behavior-based AI**
  Embodied intelligence → behavior
  Mental apparatus: comparable to lowest functional level



- **Emotion-based AI**
  Valuation of images, scenarios, .. (incoming computed data)
  Mental apparatus: comparable to higher functional levels

%

Approaches in AI up today

(Bionic in information technology)







%

- Bottom up
- Observation & Developing of single behavior phenomena
- Science = mathematics
- Engineers knowledge includes psychology??

Common feeling: frustration
(MIT: let's have a break ..)

Goal: 5. generation in AI = change of paradigm

But what are the constraints?
How?

2 Intelligence

regarding Bionic systems

How can we define intelligence?

How do the experts define consciousness?

What are the constraints?

Which steps in AI/CS/.. have been wrong?

Goal:
How does the *mental apparatus (psyche)* works?

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Computer = brain?



Computer

WORD, Excel, ..
Operating system
BIOS
Hardware

Definition:

System which computes data

Consciousness
Unconsciousness
?
Neurosymbolic
Hardware (Neurons)

Artificial computer **Bio-computer**

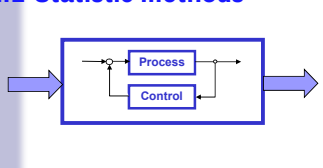
to compute : to store, manipulate, transfer data

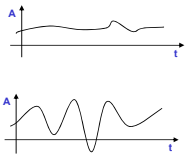
Constraints

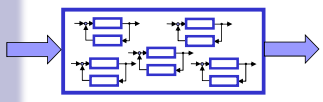
Constraints:

2.1 Statistic methods
2.2 A clear definition of intelligence
2.3 The right model
2.4 Top-down method
2.5 A unitary model
2.6 Differentiation between function - behavior - projection
2.7 Together with the right experts

2.1 Statistic methods





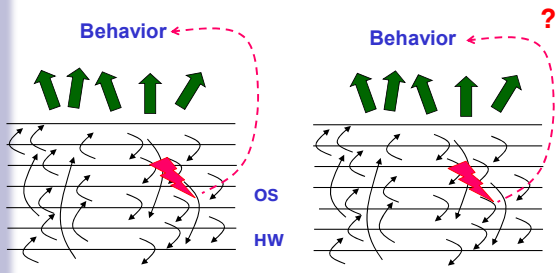


Statistical description only works for special conditions.

Conclusion 1: impossible to describe precisely the behavior of a multiple control system with unknown dependences.

techn. Computer

Brain

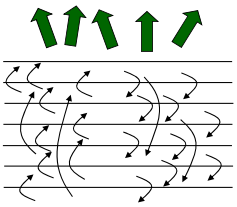


Conclusion 2: impossible to describe precisely the behavior if specific levels are unknown

2.2 A clear definition of intelligence

Techn. Computer

Behavior



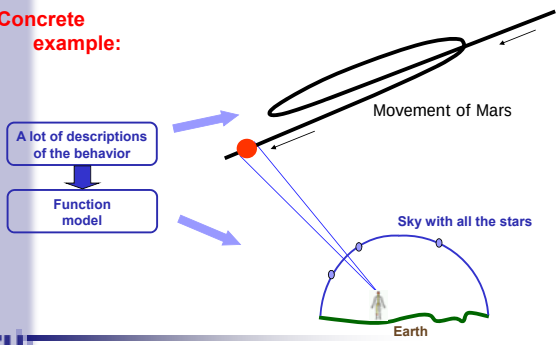
Intelligence n

Intelligence 2
Intelligence 1

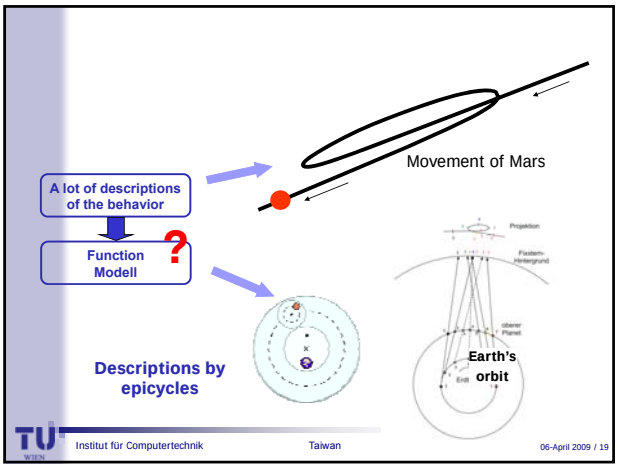
or intelligence concerning a special task

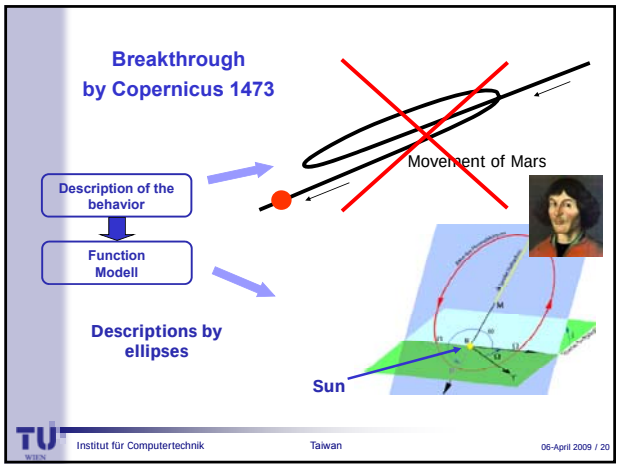
2.3 The right model

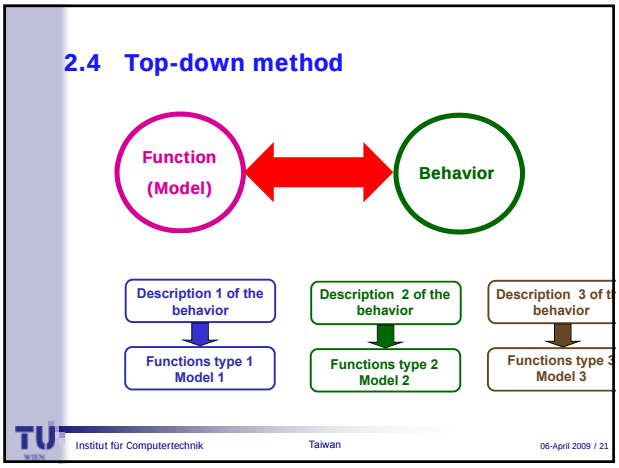
Concrete example:

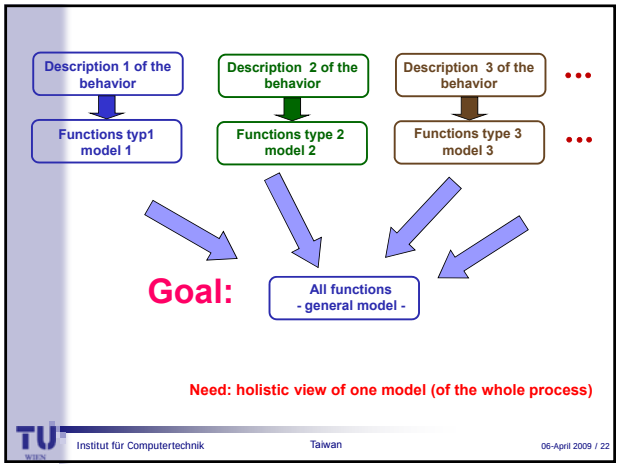


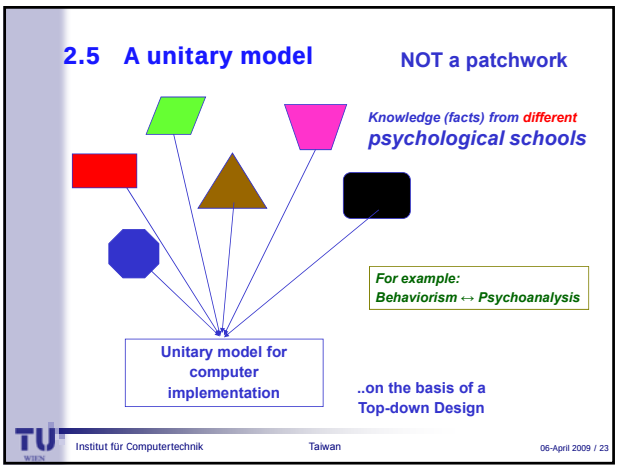
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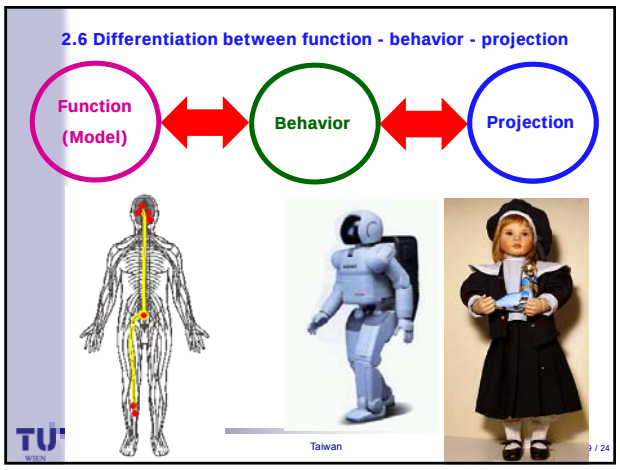

A lot of descriptions of the behavior
Function Modell
?
Movement of Mars
Descriptions by epicycles
Earth's orbit
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Taiwan
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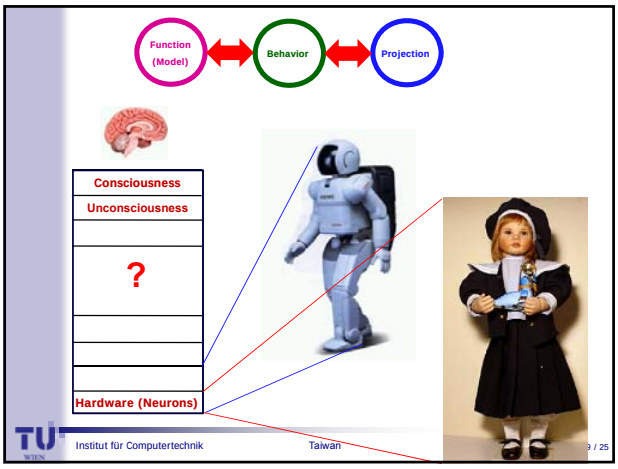

Breakthrough by Copernicus 1473
Description of the behavior
Function Modell
Movement of Mars
Descriptions by ellipses
Sun
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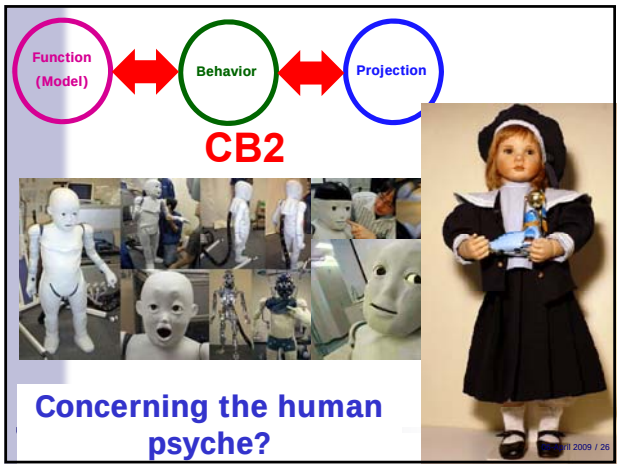

2.4 Top-down method
Function (Model)
Behavior
Description 1 of the behavior
Functions type 1 Model 1
Description 2 of the behavior
Functions type 2 Model 2
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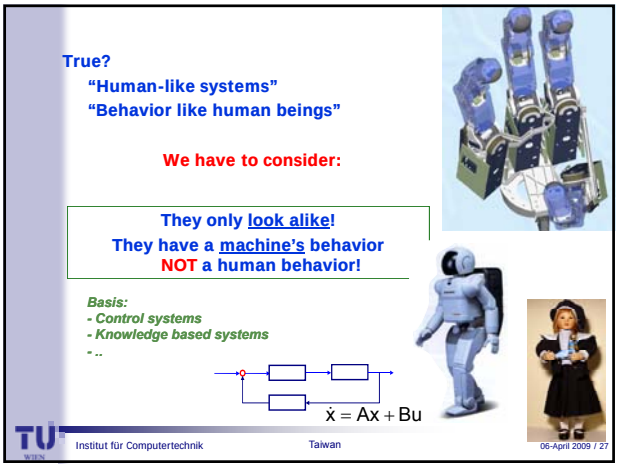

Description 1 of the behavior
Functions typ1 model 1
Description 2 of the behavior
Functions type 2 model 2
Description 3 of the behavior
Functions type 3 model 3
Goal:
All functions - general model -
Need: holistic view of one model (of the whole process)
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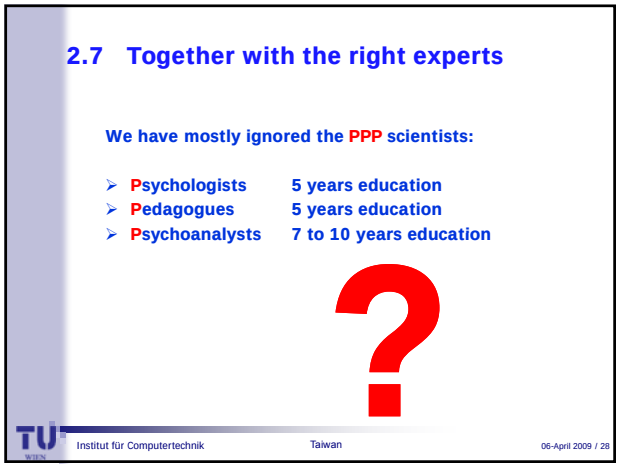

2.5 A unitary model
NOT a patchwork
Knowledge (facts) from different psychological schools
For example:
Behaviorism ↔ Psychoanalysis
Unitary model for computer implementation
..on the basis of a Top-down Design
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2.6 Differentiation between function - behavior - projection
Function (Model)
Behavior
Projection
Taiwan

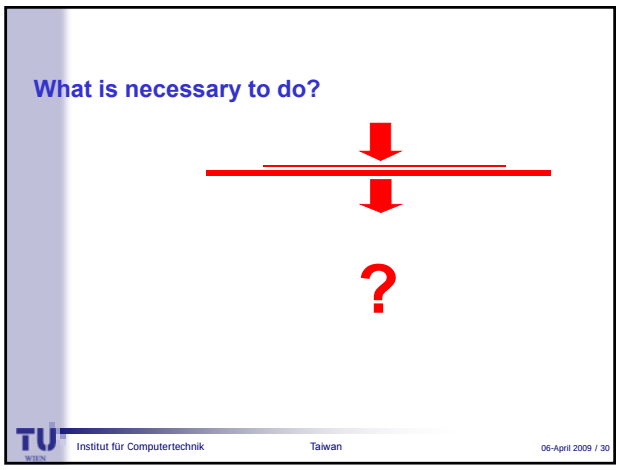

Function (Model)
Behavior
Projection
Consciousness
Unconsciousness
?
Hardware (Neurons)
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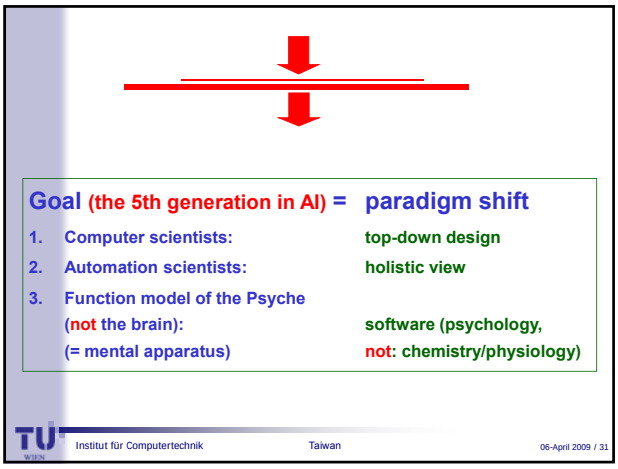

Function (Model)
Behavior
Projection
CB2
Concerning the human psyche?

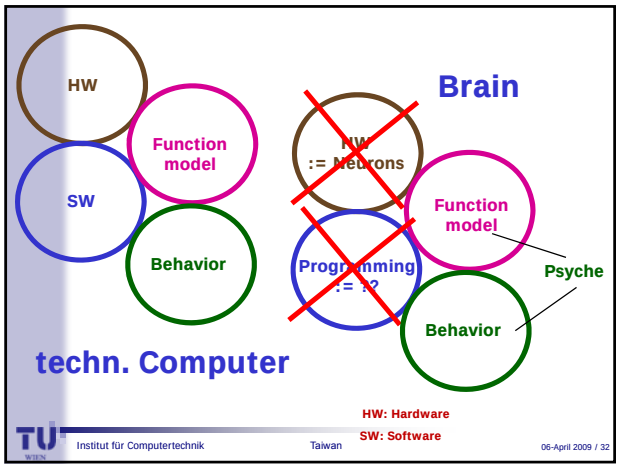

True?
"Human-like systems"
"Behavior like human beings"
We have to consider:
They only look alike!
They have a machine's behavior
NOT a human behavior!
Basis:
- Control systems
- Knowledge based systems
- ..
$\dot{x} = Ax + Bu$
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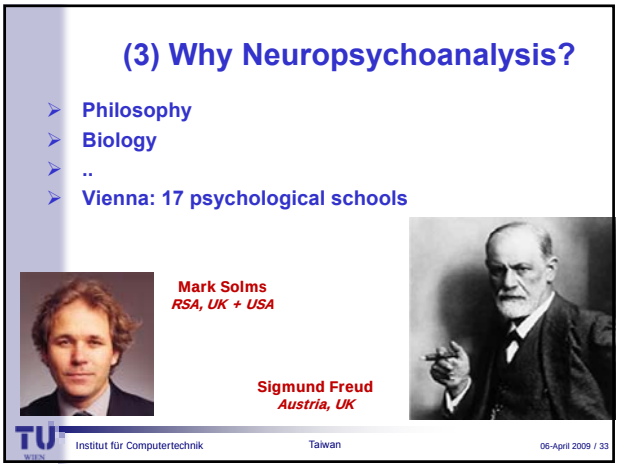

2.7 Together with the right experts
We have mostly ignored the PPP scientists:
Psychologists 5 years education
Pedagogues 5 years education
Psychoanalysts 7 to 10 years education
?
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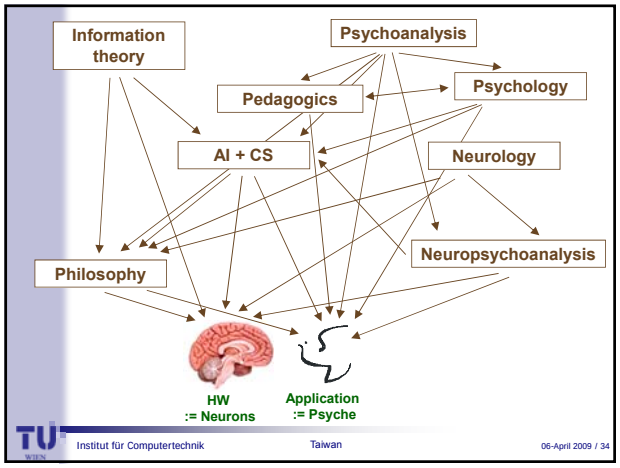

It is necessary that ..
.. in labs, conferences are not only engineers,
.. but together with ..
.. experts of the mental apparatus (psyche)
?
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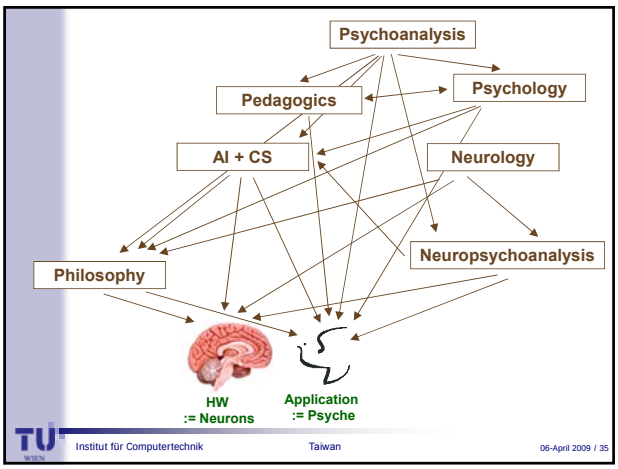

What is necessary to do?
?
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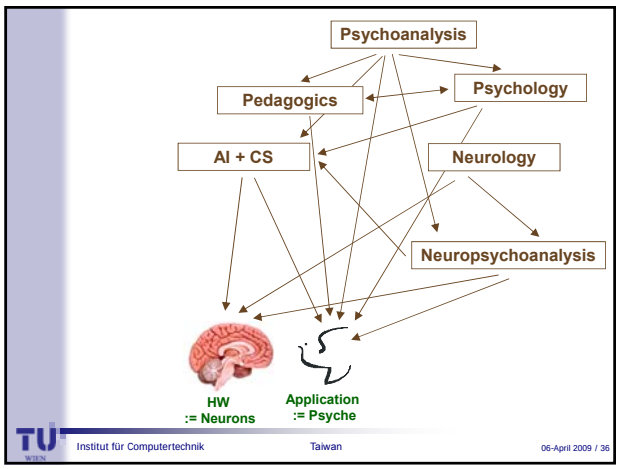

Goal (the 5th generation in AI) = paradigm shift
1. Computer scientists: top-down design
2. Automation scientists: holistic view
3. Function model of the Psyche (not the brain): software (psychology, (= mental apparatus) not: chemistry/physiology)
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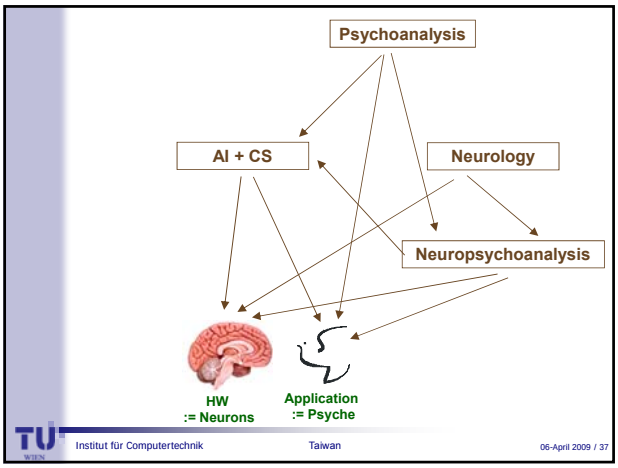

HW
Function model
SW
Behavior
Brain
HW := Neurons
Function model
Psyche
Behavior
techn. Computer
HW: Hardware
SW: Software
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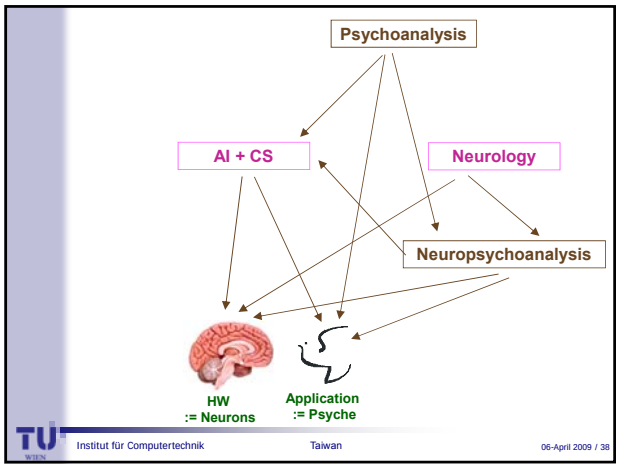

(3) Why Neuropsychoanalysis?
Philosophy
Biology
..
Vienna: 17 psychological schools
Mark Solms
RSA, UK + USA
Sigmund Freud
Austria, UK
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Information theory
Psychoanalysis
Pedagogics
Psychology
AI + CS
Neurology
Neuropsychoanalysis
Philosophy
HW := Neurons
Application := Psyche
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Psychoanalysis
Pedagogics
Psychology
AI + CS
Neurology
Neuropsychoanalysis
Philosophy
HW := Neurons
Application := Psyche
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Psychoanalysis
Pedagogics
Psychology
AI + CS
Neurology
Neuropsychoanalysis
HW := Neurons
Application := Psyche
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Psychoanalysis because

- The only model with a holistic description of the mental apparatus (complete "process" description of the psyche)
- Fulfills the Top Down Design Method
- Fulfills the thinking of a scientist (= Monism)
- ..



- Contradiction in the model?
- Method of the description?
- ..??..

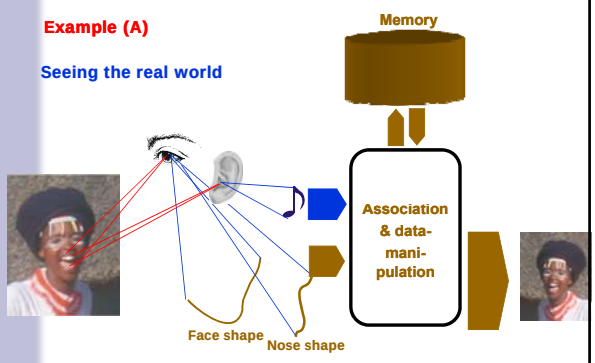
4 The New Model

Advances in the scientific world in recent years:

(A) Seeing the real world
(B) Awareness of scenarios
(C) Model for consciousness

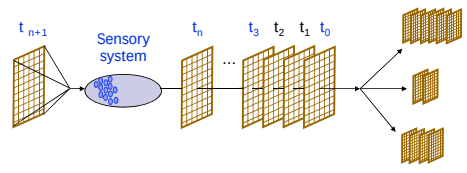
Example (A)

Seeing the real world



Example (B)

Awarness of scenarios



Example (C)

Model of consciousness





Need to understand the INSIDE and OUTSIDE world







Solms + Damasio



Solms, Damasio:



They have an idea of the higher levels.

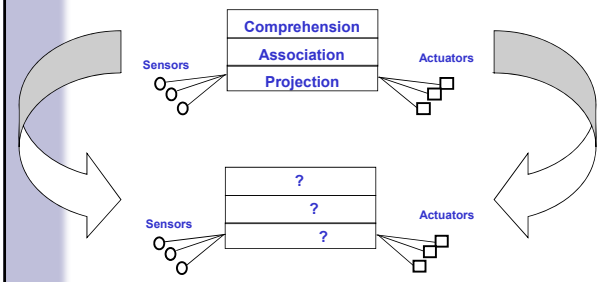
*Their principle idea ► **no theory of probabilities** **(as psychologists, AI, CS, ..)***

If we want a paradigm shift - the 5th Generation of AI then

our load-bearing pillars must be:

(a) Awareness by images & scenarios
(b) 2nd topic model of Sigmund Freud
(c) The lower hierarchical model & the upper distributed function model
(d) etc.

First approach:
Luria's hierarchical model of cortical functions ..

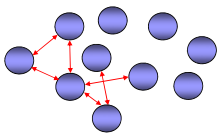


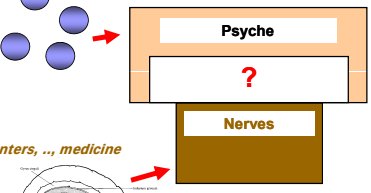
.. and a model of a computer system

Three complementary sub-models

1. Model of psychoanalysis

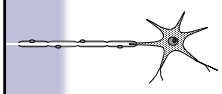
Functions, conversation, ..





2. Model of neurology

Nerves, physiological centers, .., medicine

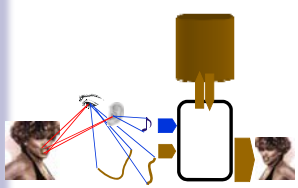


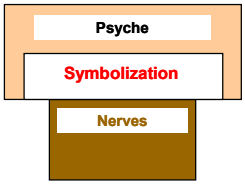


Three complementary models

3. Symbolization

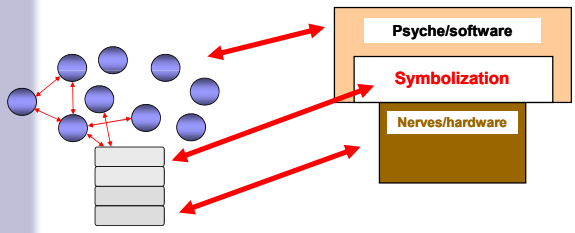
Seeing the inside & outside world by awareness of images & scenarios



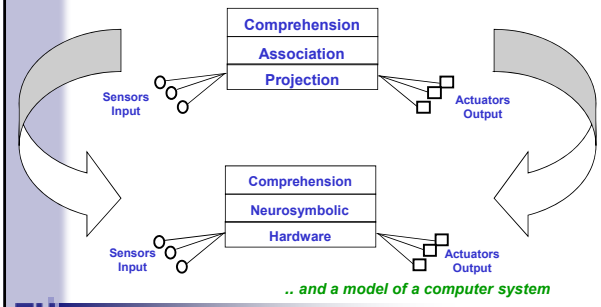


Three complementary models





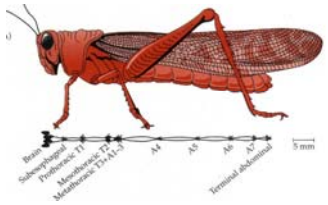
First approach:
Luria's hierarchical model of cortical functions ..



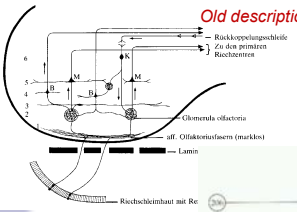
.. and a model of a computer system

Projektionsfeld = Control Field

Comprehension
Association
Projection



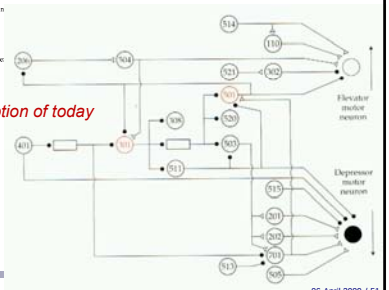
Old description

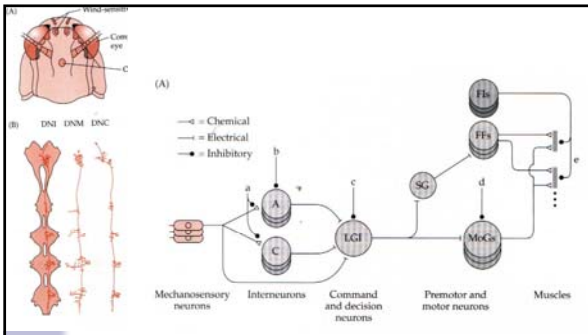


Comprehension
Association
Projection

Description of today







The capability of simulations is increasing.

Problem ► to get the knowledge of the association field

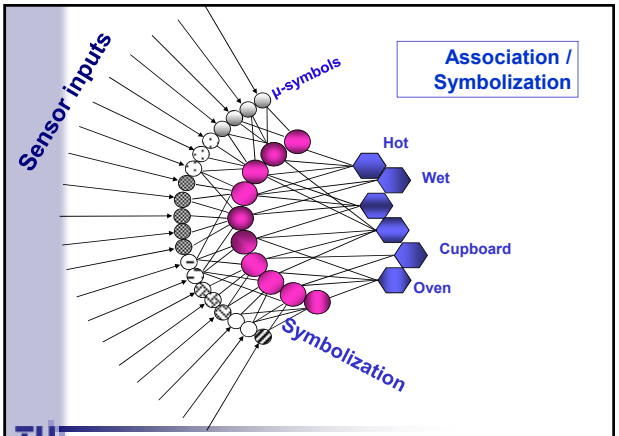


?

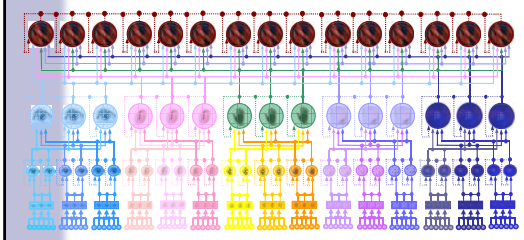
MRT, ..?



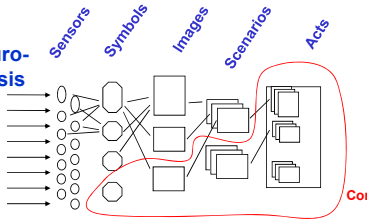
? Comprehension
Association
Projection



From Sensor inputs → "objects" like *hot*, *cupboard*, *human being*, ...

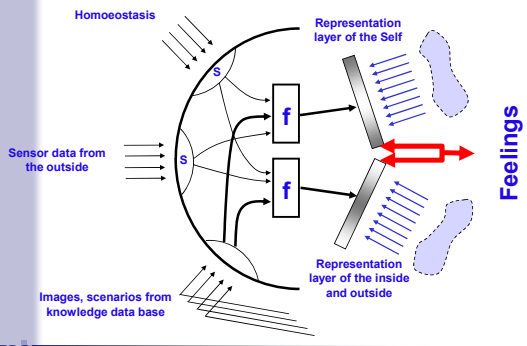


The Unitary Model of Neuro-psychoanalysis

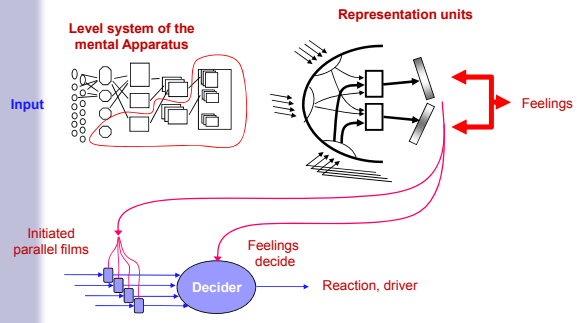


Neurology:	a unitary idea (based on classical sciences such as biochemistry, physics, ..)
Psychoanalysis:	unitary but incomplete model
Engineering:	1 unitary idea for HW + SW

Representation layers of the Extended Consciousness



Mental Apparatus = Controller: function flow?



2nd topical model of Sigmund Freud

External information exchange

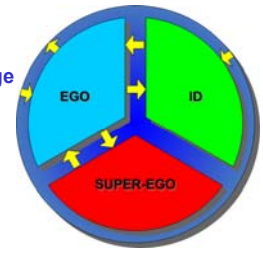
EGO ◄► Body
World ◄► EGO
Body ◄► ID

Internal information exchange

EGO ◄► ID
EGO ◄► SUPER-EGO

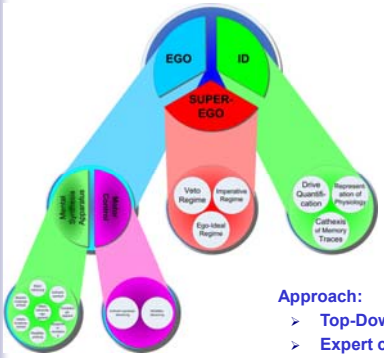
Type of information

- Thing-presentations
- Word-presentations



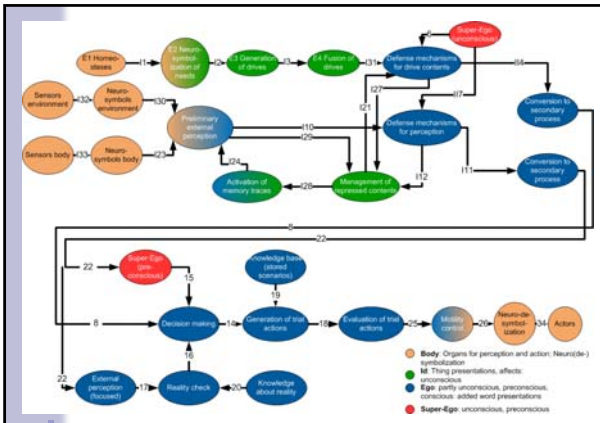
Mental apparatus = psyche

Freud's 2nd topical model of the mind



Approach:

- Top-Down design
- Expert counsel



5. Conclusion

- Central idea: continously competing forces similar to control systems
- Possible to simulate
- Brain: generally a huge data base of images and scenarios
- A huge distributed system
- Admitting to decisive conclusions
  - Reconsidering of several research projects (are they really useful??)
    Saving/Shifting of budgets
  - Allows a paradigm shift in engineering



Conclusion:

1. **Biggest challenge of our life**
2. **Benefits for both sides (psychoanalysts + engineers)**

   for engineers: *model*

   for psychoanalysts: *methods of the description*

What to do?:

Intensive interdisciplinary research topic

Expectations

- **NOT** to copy human beings, **BUT:**
- Take over the human architecture model ***PRINCIPLES***
- Automation on higher abstract levels
  1. To get tools for handling high complex functions
  2. To get machines with high safety
  3. .. and high security functionalities
  4. To save energy
  5. ..



Danke!

ARS Projektteam

Steering board


Dietmar Dietrich


Gerhard Zucker


Dietmar Bruckner

Psychoanalytic advisory board


Elisabeth Brainin


Dorothee Dietrich


Georg Fodor


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