Thinker versus Tinker

“Don't worry about what anybody else is going to do... The best way to predict the future is to invent it. Really smart people with reasonable funding can do just about anything that doesn't violate too many of Newton's Laws!”

— Alan Kay in 1971

“...There is nothing so practical as a good theory.”

— Ludwig Boltzmann

Ludwig Boltzmann (1844-1906)

Alan C. Kay (1940-...)
What is research all about?

Who is doing research?
Knowledge: but which one?

![Diagram showing Theory, Design, Test, Model-T, and Model-D relationships](image)

Alfred Nobel's last will and testament is clear and concise:

"The whole of my remaining realizable estate shall be dealt with in the following way. The capital shall be invested by my executors in safe securities and shall constitute a fund, the interest on which shall be annually distributed in the form of prizes to those who, during the preceding year, shall have conferred the greatest benefit on mankind. The said interest shall be divided into five equal parts, which shall be apportioned as follows:

one part to the person who shall have made the most important discovery or invention within the field of physics;

one part to the person who shall have made the most important chemical discovery or improvements; one part to the person who shall have made the most important discovery within the domain of physiology or medicine; one part to the person who shall have produced in the field of literature the most outstanding work of an idealistic tendency; and one part to the person who shall have done the most or best work for fraternity among nations, for the abolition or reduction of standing armies and for the holding and promotion of peace congresses."

Thinker versus Tinker

Alfred Nobel (1833-1896)
Trends in Nobel Prizes for Physics over 11 Decades

Our Approach: thinking and tinkering
BUILD-IT: discovery

Empirical Results: winning chance per dialog technique

We recorded automatically 9'006 contacts with in total 96'739 moves.
CI = 1'128 player contacts,
MI = 3'645 player contacts,
TI = 2'881 player contacts,
TUI = 1'352 player contacts.
In total 3'801 completed games.

© Matthias Rauterberg, 2005
BUILD-IT: invention

Our Approach: tinkering and thinking
AMME: invention

unknown structure (e.g., mental model)

observable process

main menu level
module level
routine level

structure as a Petri net

The AMME Program Structure

transformation to a syntactical correct engine
automatic recorded process

interactive dialog function

system description

"log"

the analyzing program AMME

state transition net
adjacency matrix
frequency matrix

"net"
"log"
"ranks"
"ps"
"gml"

Path net simulator PACS
Path finder KNOT
Matrix analyzer SEQUENZ

any Postscript interpreter
any text processor

The analyzing program AMME

adjacency matrix
• similarity • learning + MEIS

frequency matrix
• distances • personal styles + MEIS

any text file in PostScript format + interface design + deadlocks

quantitative measures + complexity + module

The AMME Program Structure
AMME: discovery

N=6 men (average age of 25 ± 3 years)

Task solving time

Behavioral complexity

Time structure and knowledge structure are different!

Our Approach: thinking and tinkering

Research Question

Computer Science

Psychology

Research Method

The SmartEx project
Ongoing Research: the adaptive environment

If two adaptive systems (e.g., the human being and the adaptive technology) are coupled with each other, the following aspects have to be taken into account:
(1) the adaptation rate ($R_{sA}$) of the technical subsystem, and
(2) the two different kinds of human influences on the technical subsystem: the explicit control rate ($R_{hC}$) and the implicit adaptation rate ($R_{hA}$).

The main challenge of designing such a coupling is to avoid an unintended acceleration between both subsystems based on the closed loop coupling; with other words, what is the appropriate design for such kind of closed loop coupling?

How should be the relation $[R_{hC} + R_{hA}] \leftrightarrow [R_{sA}]$ established? Secondly, what is the proper balance between $[R_{hC}] \leftrightarrow [R_{hA}]$?

These are two central research questions.

SmartEx: discovery -> invention

Test conditions are:
(1) Standard without displays
(2) Standard with displays
(3) Adaptive displays
Thank you for your attention.