Computer Support for Constructionism in Context

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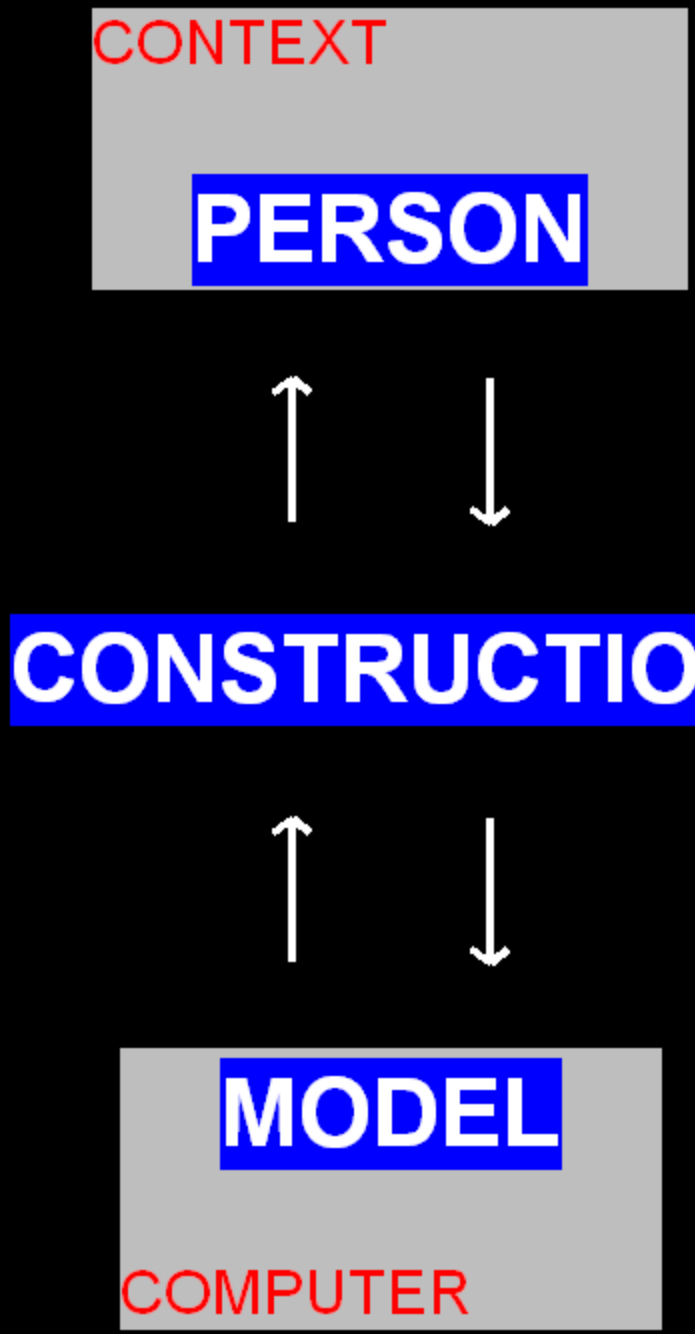
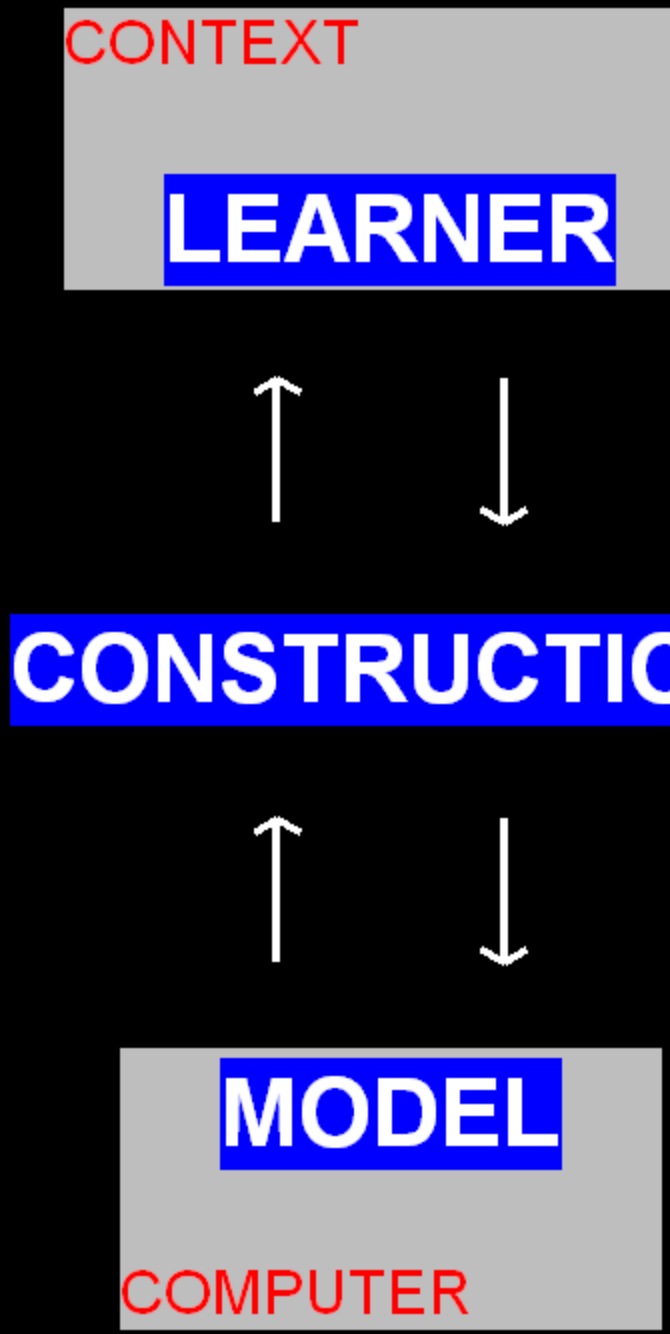
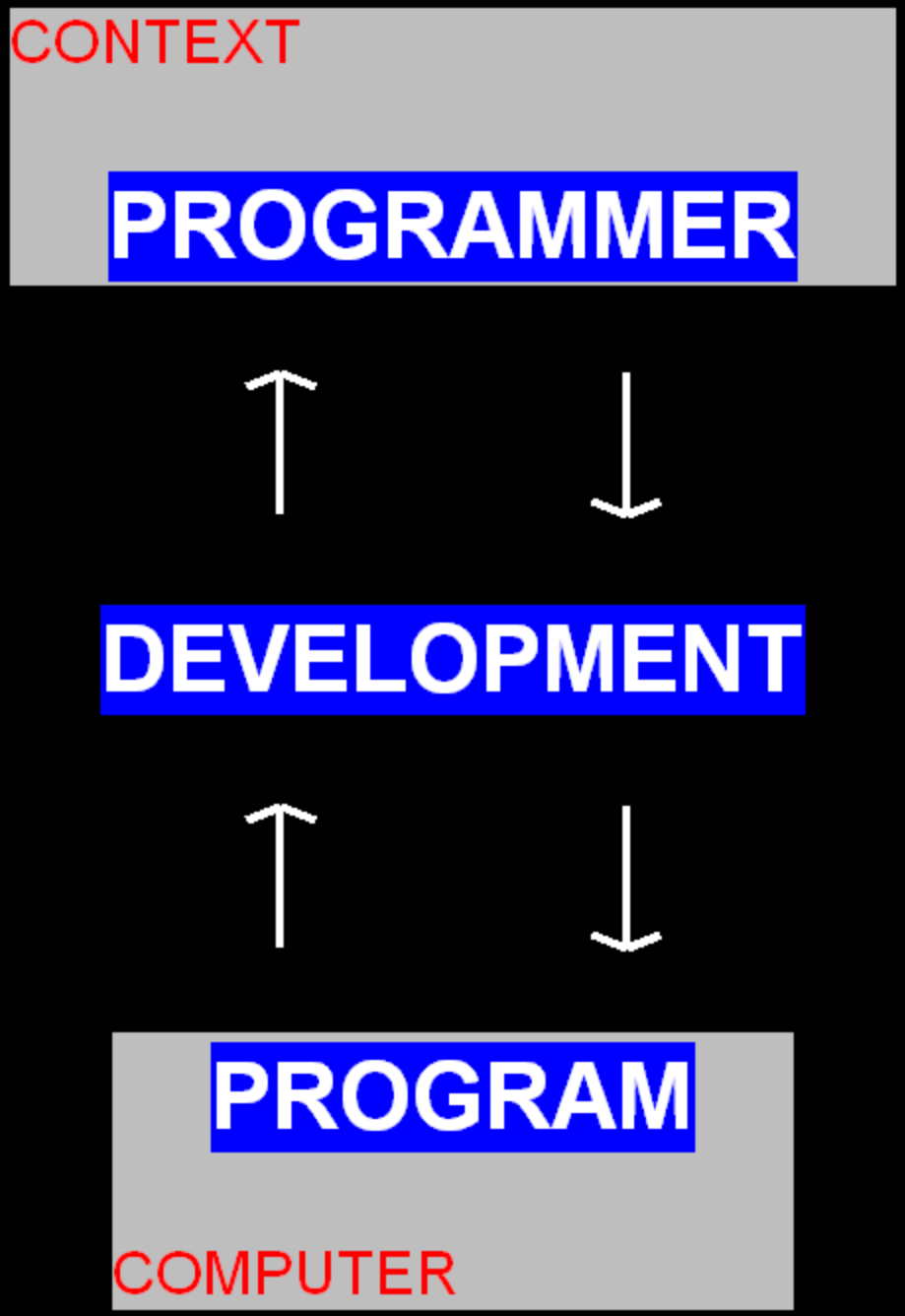
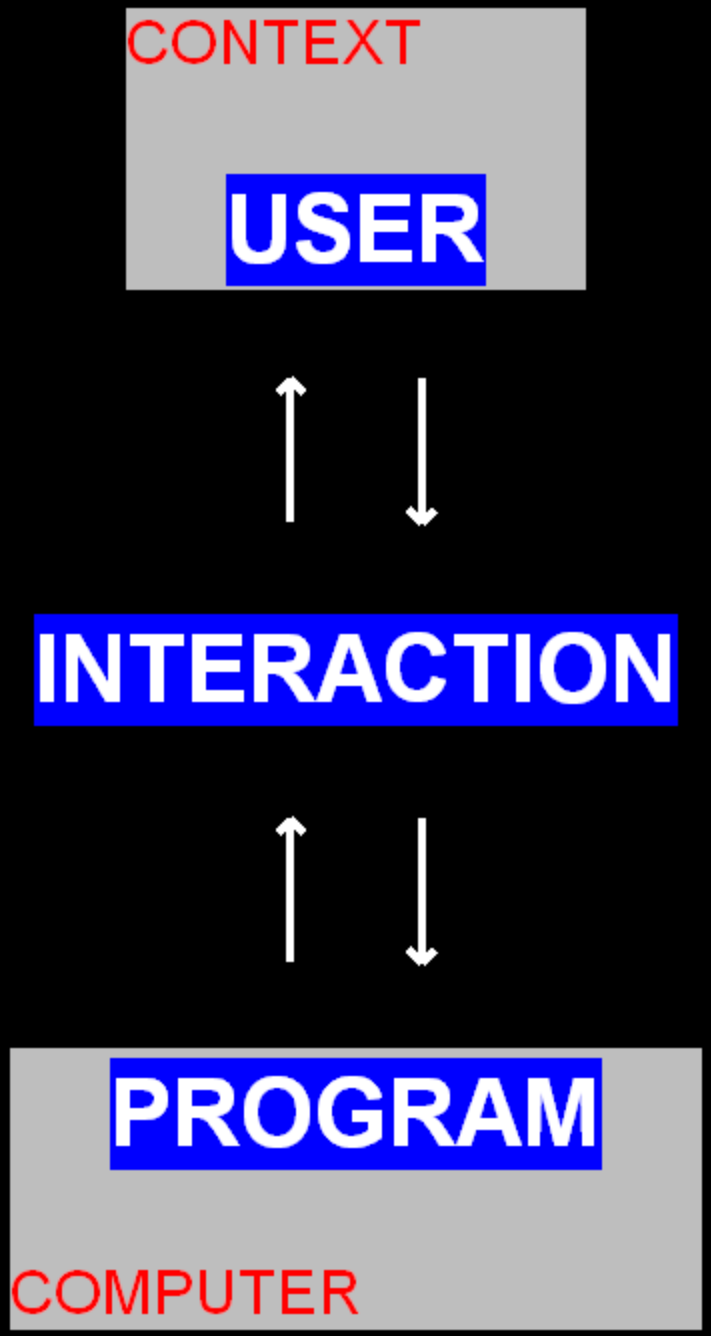
ICALT'04, Joensuu, August 31st 2004


CONTEXT
PERSON
CONSTRUCTION
MODEL
COMPUTER

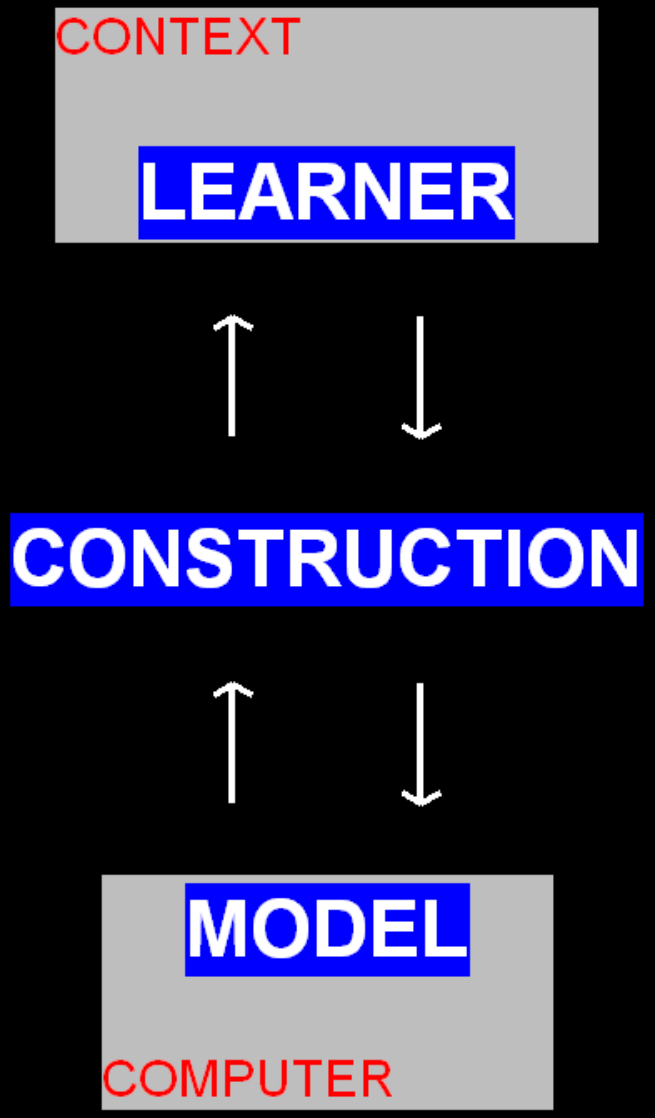

CONTEXT
LEARNER
CONSTRUCTION
MODEL
COMPUTER


CONTEXT
PROGRAMMER
DEVELOPMENT
PROGRAM
COMPUTER


CONTEXT
USER
INTERACTION
PROGRAM
COMPUTER

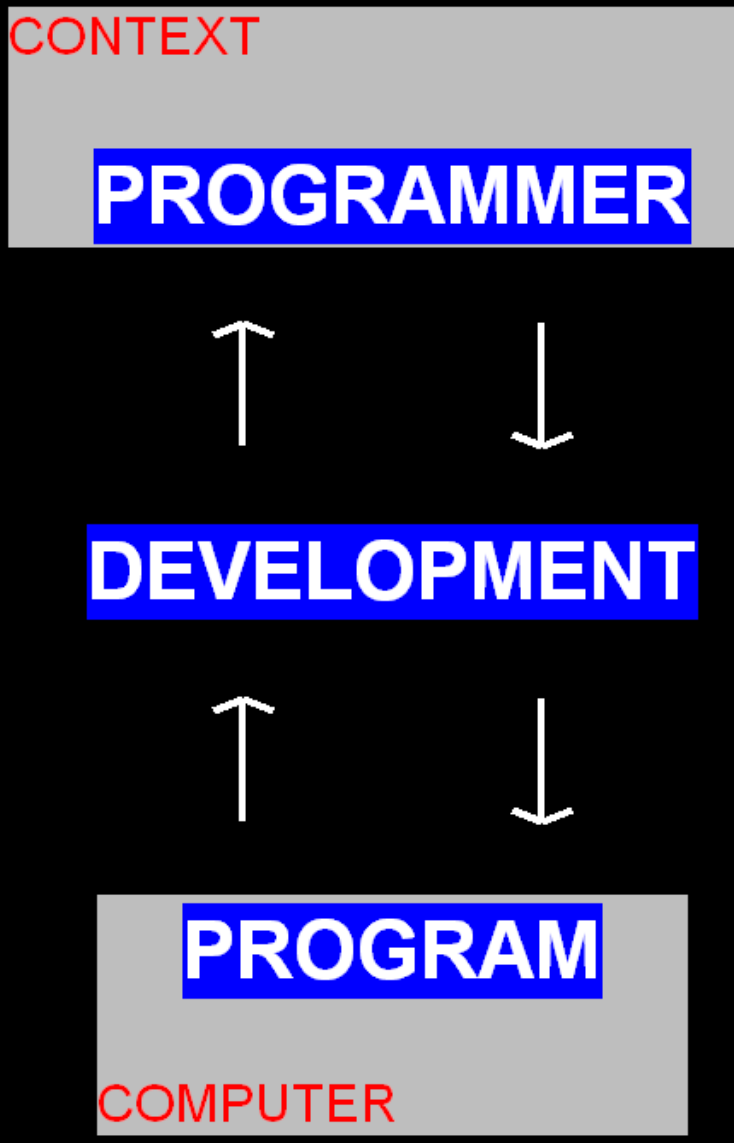
ACTIVE LEARNER AS MODEL-BUILDER

- scope for discovery
- domain-knowledge in foreground
- situated activity
- presuming ignorance
- accommodating confusion



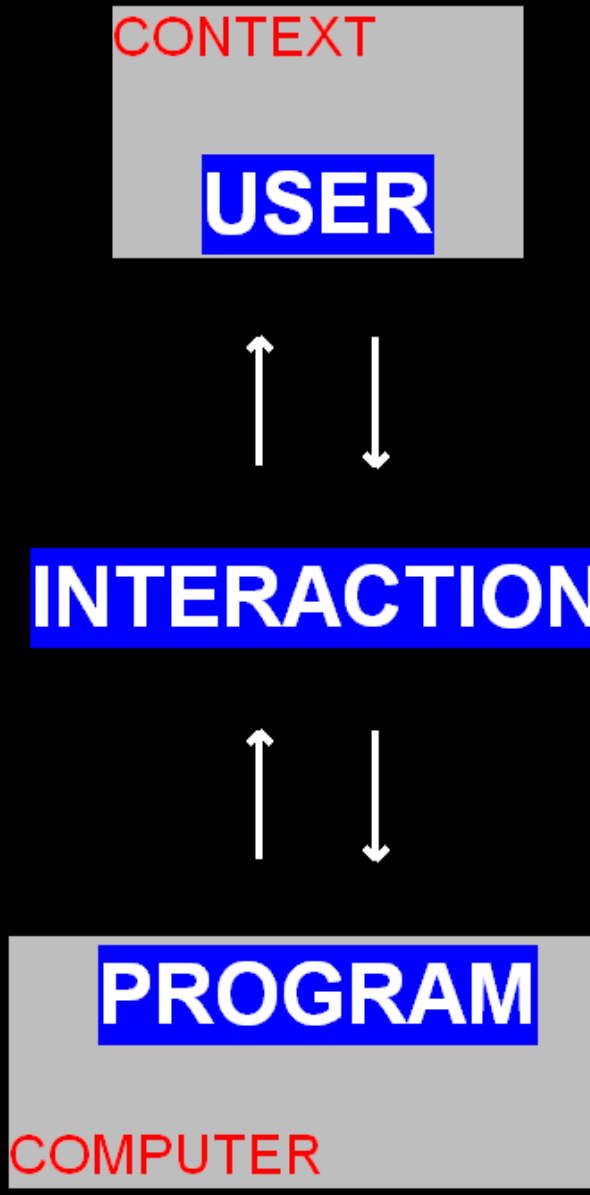
ACTIVE LEARNER AS PROGRAMMER?

- LOGO as the archetype
- 'accidental' difficulties
- limitations re domain learning
- procedural thinking deprecated
- adaptation to context hard



ACTIVE LEARNER AS USER?

- microworld as archetype
- better oriented for domain learning
- admits preconceived context change
- limited to preconceived interaction
- restricted construction / discovery



ACTIVE LEARNING - A HYBRID ACTIVITY

- active learner is programming:

  >> creates patterns of interaction to support domain learning

- active learner acts as user:

  >> revisits interactions devised to support domain learning

- learner also engages in exploratory activities conceptually prior to programming in its narrow sense

ACTIVE LEARNING VS PROGRAMMING

- in traditional programming, the semantic relation is prescribed

- in active learning, the semantic relation is negotiated

- active learning artefact and classical program ontologically distinct

How to support learning-programming-use activities simultaneously?

MOTIVATING EMPIRICAL MODELLING (EM

- Turkle and Papert: "an epistemological pluralism"

- Resnick and Papert: "need new types of programming tools"

- "fundamentally rethink how we introduce programming"

- (re)consider the spreadsheet and the semantic relation

Empirical Modelling as "building construals" …

CONTEXT

PERSON

MENTAL MODEL

CONSTRUCTION

CONSTRUAL

REFERENT

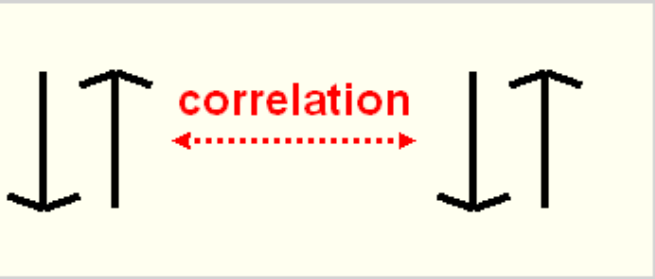
COMPUTER

DOMAIN

CONTEXT

PERSON

MENTAL MODEL



Experiment and observation with construal and referent

CONSTRUAL

COMPUTER

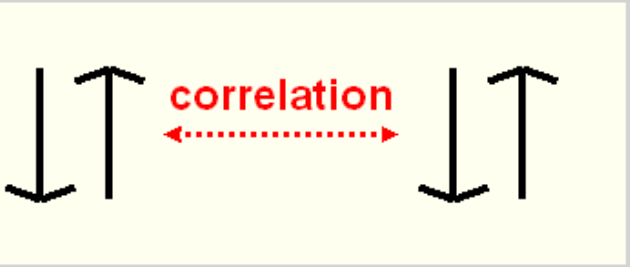
REFERENT

DOMAIN

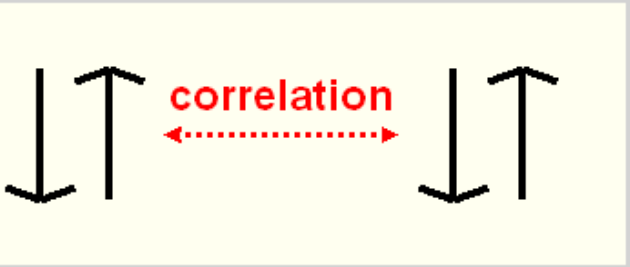
CONTEXT

KNOWLEDGE OF INTERACTION WITH CONSTRUAL/REFERENT

MENTAL MODEL



Experiment and observation with construal and referent



CONSTRUAL

COMPUTER MODEL OF STATE OF REFERENT

REFERENT

EXTERNAL ARTEFACT OR PHENOMENON

FEATURES OF EMPIRICAL MODELLING

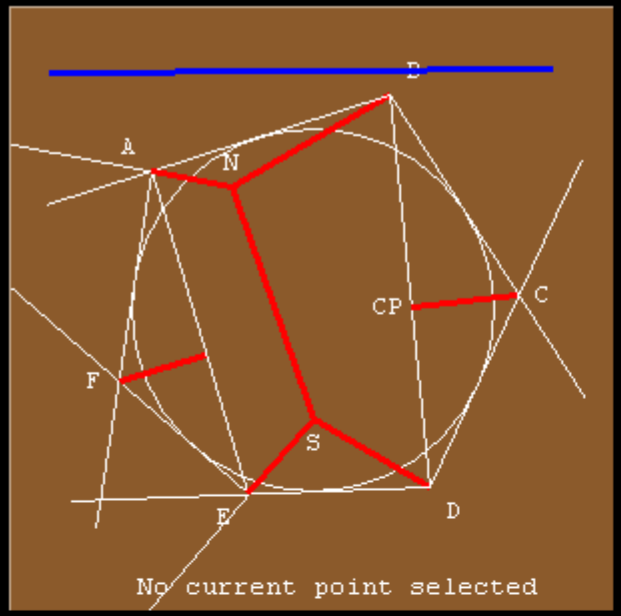
- integrating human and computer agency

- embodying patterns of observation, dependency and agency

- modelling state-as-experienced rather than behaviour

- not primarily targetting algorithmic thinking, but sense-making

- conflating discovery, design and use



5.217952 is total length in radii

Smallest length so far is 5.342567

Beam does not intersect circle.

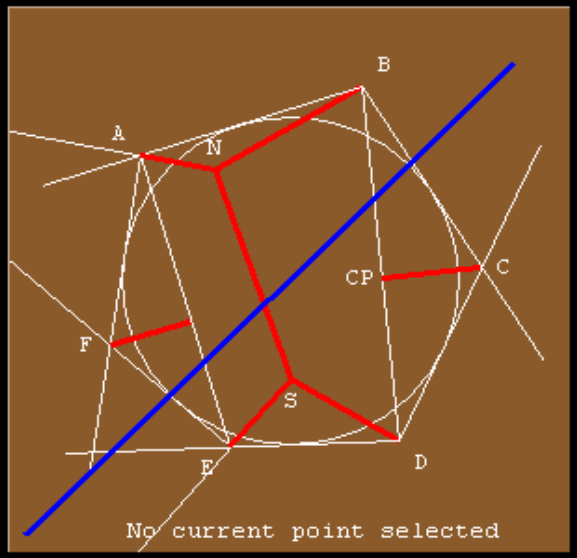
Beam intersects 0 lines

Point	x value	y value
N	365.479000	704.319000
S	500	320.000000
D	694.855716	207.500000
B	627.884697	855.819000
C	841.669003	523.311121
CP	664.127101	504.971134

Angle	Value
BNS	100.708712
BNA	139.291288
ANS	120.000000
DSN	139.291288
DSE	100.708712
ESN	139.291288
BCD	122.328582
CDE	117.206247
DEF	136.691990
EFA	122.060939
FAB	116.696830
ABC	105.015412

- specified as a set of dependencies
- built incrementally subset by subse
- involves re-use of existing model

screen (tkeden 1.66)



5.217952 is total length in radii

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Beam does intersect circle.

Beam intersects 1 lines

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- specified as a set of dependencies
- built incrementally subset by subset
- involves re-use of existing model
- subject to open development and uncircumscribed behaviour

FURTHER INFORMATION

- radically different from conventional programming: cf slides

- cross-platform broadcasting for interactive television
  work of Richard Cartwright at the BBC R&D Labs

- more info about EM, and archive of EM models at
  `http://www.dcs.warwick.ac.uk/modelling`
  `http://empublic.dcs.warwick.ac.uk/projects`