

Cognitive Trait Model and Divergent Associative Learning

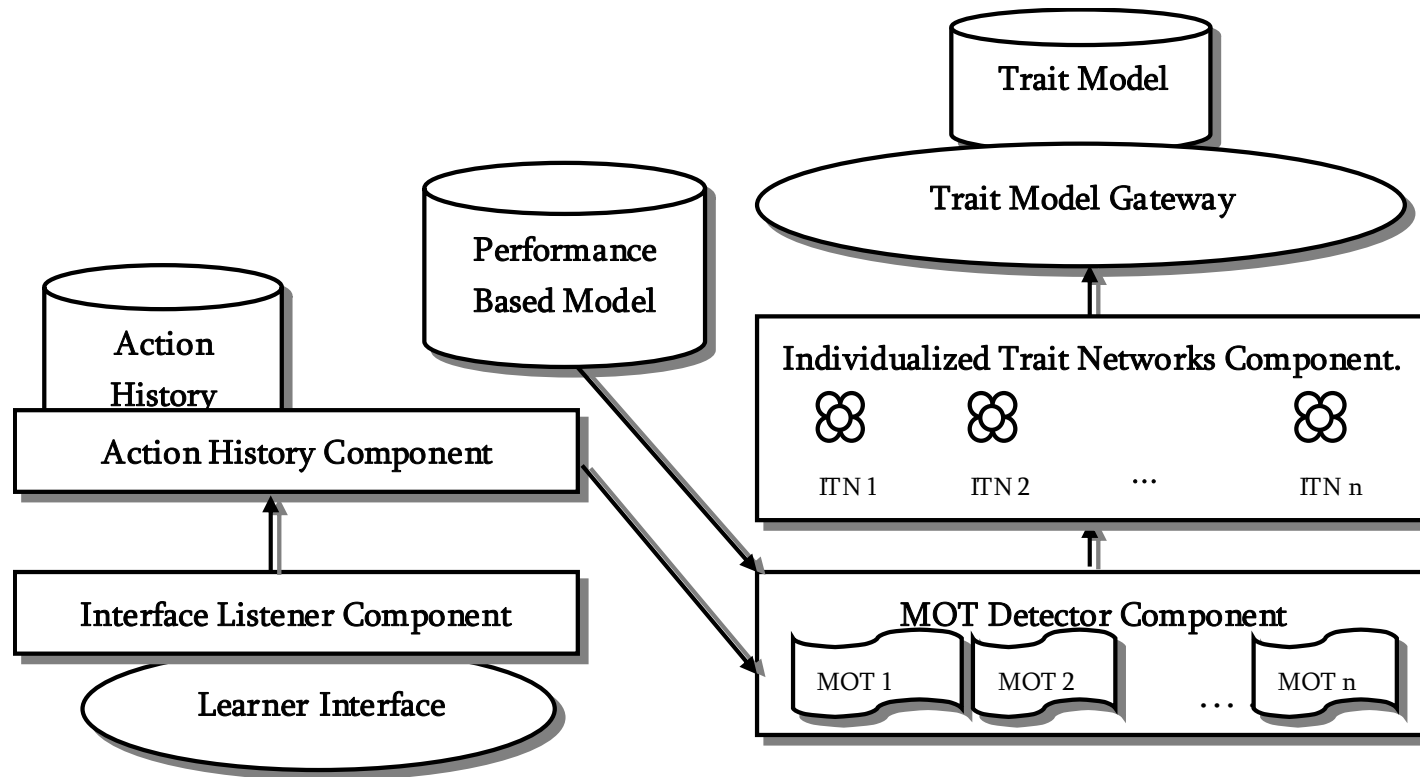
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- Cognitive Trait Model is a student model that aims at creating profiles of learners' cognitive traits by analysing learners' interactions with the learning system
- Information about cognitive traits can be used to avoid cognitive load in educational systems in terms of providing adaptive courses
- Cognitive traits are more or less stable over time
 - CTM can still be valid after a long period of time
 - CTM is domain independent and can be used in different learning environments, thus supporting life long learning
- CTM includes
 - Working Memory Capacity
 - Inductive Reasoning Ability
 - Divergent Associative Learning

Implementation of Cognitive Trait Model



■ Divergent Thinking

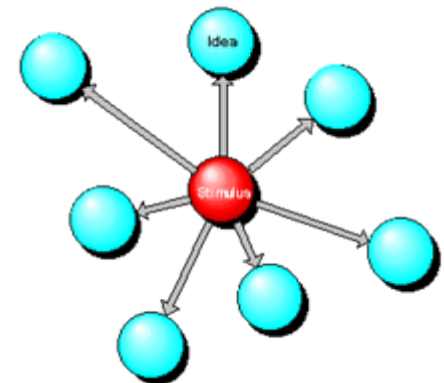
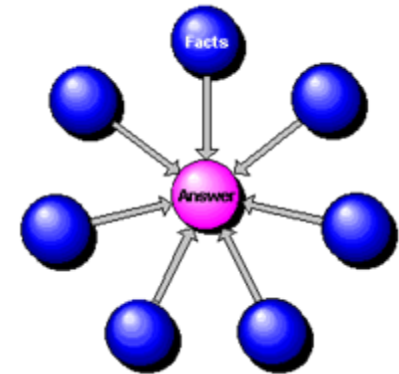
- Hudson, 1966 (thinking style)

- Convergent:

- Good in seeing information leading to a restricted answer or solution

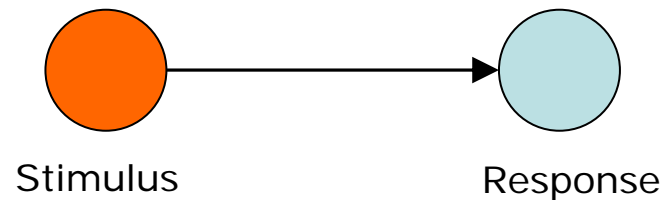
- Divergent:

- Good in creating many responses to a single stimulus (or finding a greater variety of answers to a problem)
- More creative

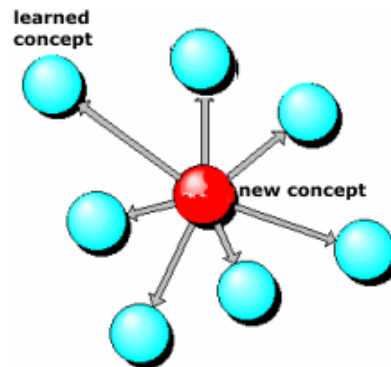


[<http://www.learningandteaching.info>]

- Based on the assumption that association can be formed between simple events or stimuli
- One end of the association is called the stimulus and the other the response
- The stimulus and response constitute a pair to be learned
→ paired–associate learning



- inherits characteristics from divergent thinking and associative learning
- Basic idea: learners develop links between new and existing concepts
- creates divergent-style associations from the new concept to existing concepts



■ DAL & Divergent Thinking

- Divergent thinking results in new concepts or ideas while the “end products” of DAL are new associations between the new concept and existing concepts
- Focus of divergent thinking is directed forwards into an unknown space (novel and original ideas), whereas the focus of DAL is directed backwards to what has been learned before

■ DAL & Associative Learning

- While associative learning is a one-to-one association, DAL supports one-to-many associations

- A instrument was developed for measuring learners' DAL
- Online accessible
- Two steps:
 - Participants learn a new concept
 - Participants are asked to use Web-DAL to write down as many related concepts as possible in one minute
- The new concept should be from a domain that the participants are familiar with
- Measure of DAL:
 - Total number of answer items
 - Originality of answer items
(where the originality refers to the inverse of the items frequency of occurrence in the entire sample)

- Web-DAL is based on commonly used approaches for measuring divergent thinking skills (Alternate Uses Test)
- In contrast to divergent thinking tests, Web-DAL involves learning and asks participants to create divergent associations to existing knowledge
- In contrast to association learning tasks, Web-DAL focuses on long-term associative learning
→ duration between learning and testing takes weeks or months

- Cognitive trait model used six manifests of traits (MOT) to create approximations of students' DAL:
 - Associative hierarchy
 - Classification ability
 - Versatile navigation
 - Relevance filtering
 - Domain performance
 - Working memory capacity

- Aims at comparing the approximation from the CTM with the results of Web-DAL in order to evaluate the proposed approach
- Participants: 14 students from Massey University, New Zealand (studying in Information Systems course)
- Participants used a learning system that tracked their behaviour
 - The new concept was about Information Technology Infrastructure and PHP programming
 - Read the descriptions
 - Take a quiz consisting of multiple-choice questions
- Participants were asked to perform Web-DAL

- Variables
 - Total number of answer items (Web-DAL)
 - Originality of answers (Web-DAL)
 - Approximations of DAL from Cognitive Trait Model
- Correlations between results from CTM and Web-DAL

	rho	p
Number of answers & result from CTM	0.499	0.035
Originality of answers & result from CTM	0.653	0.006

- These correlations support the use of CTM to create DAL profiles of learners

- Cognitive trait model (CTM) aims at creating cognitive profiles of learners based on their behaviour in an online course
- We demonstrated how divergent associative learning can be included in the CTM
- Evaluation was done by comparing the results of CTM with the results from Web-DAL, a psychometric instrument for measuring the DAL of learners
- Results supports the use of CTM to create DAL profiles of learners