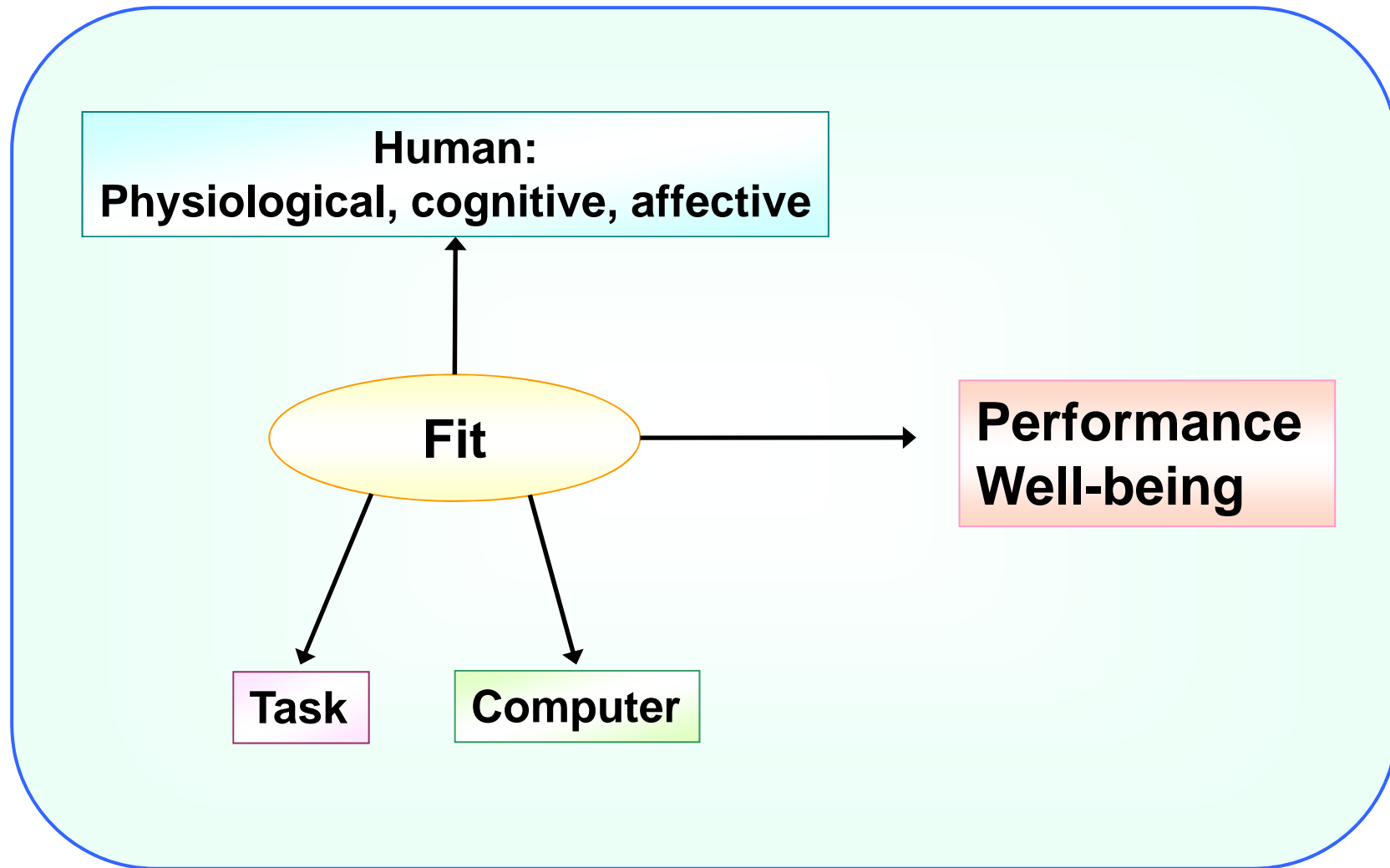
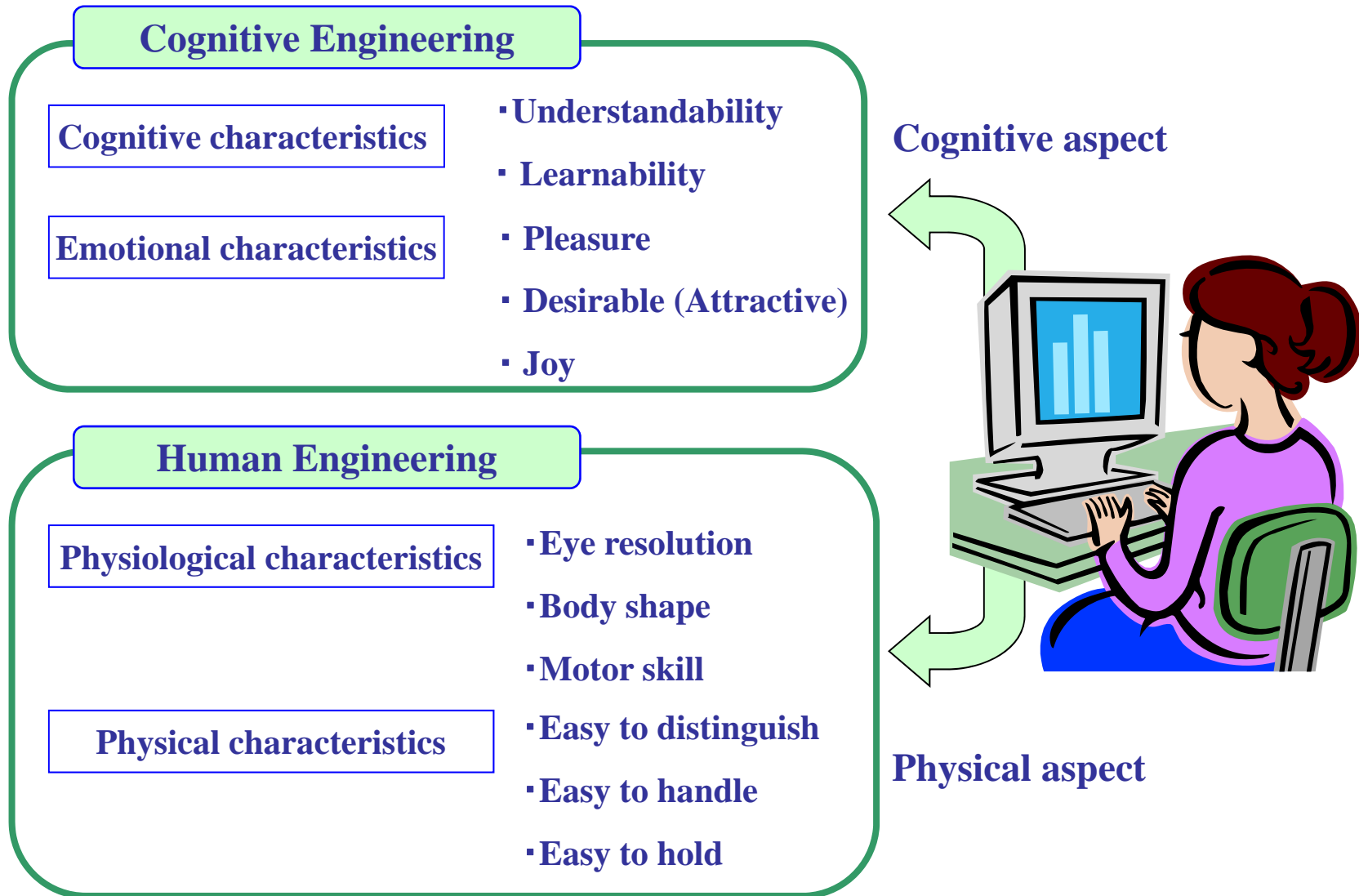


HMI between human and computer (HCI)

Affect, as well as physiology and cognition, impacts both performance and well-being.



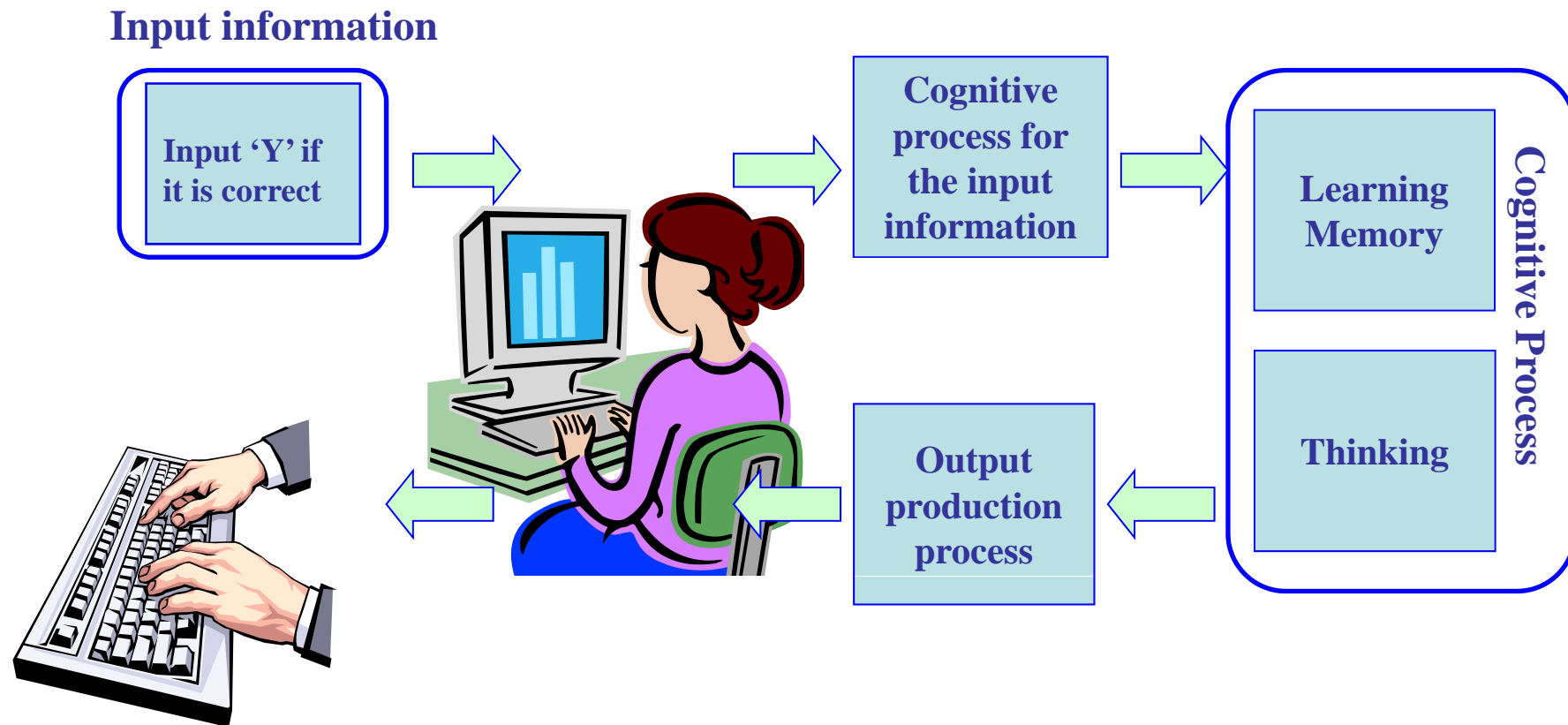
Information processing capacity of human and computer		
Items	Human	Computer
Thinking	Inductive Good at grasping general meaning	Deductive Understanding of meaning by algorithms
Computation	Slow, Error-prone Efficiency reduction by continuous work	Fast, Precise Constant efficiency
Memory	Small capacity, Error-prone Association	Large capacity, Precise Retrieval by location
Others	Not good at simple repetition Capacity is increased by motivation	Good at simple repetition Efficiency is increased by improving algorithms



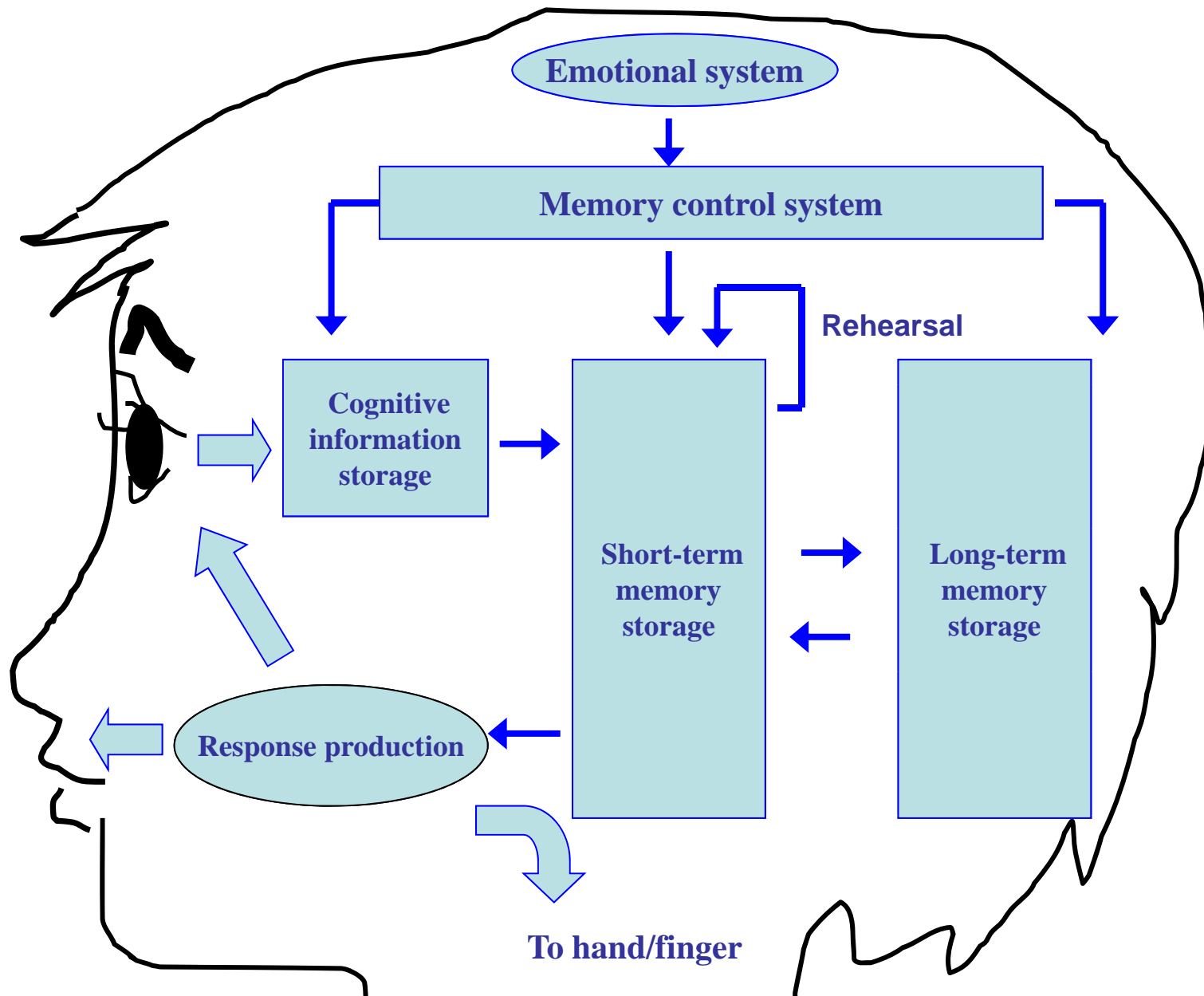
Keywords to understand humans

Examples of measuring items for usability

Indexes	Items
Effectiveness	<ul style="list-style-type: none">Task completion ratioRatio of successful and unsuccessful worksNumber of repetitions of unsuccessful commandsNumber of successes and failuresNumber of times that the user was misleadNumber of backtracksNumber of times that user was interruptedNumber of times that user lost control of the system
Efficiency	<ul style="list-style-type: none">Time to complete a taskRatio of completed tasks per unit timeTime spent in errorsNumber or ratio of errorsNumber or ratio of getting lostNumber of commands usedNumber of commands not usedFrequency of help and document useTime spent in help and document use
Satisfaction	<ul style="list-style-type: none">Number of favorable/unfavorable user commentsNumber of users preferring the systemNumber of times the user found problems during a taskNumber of times the user was satisfied or unsatisfied



Outline of human information process



2-layer memory model

Mental model



User

Work on the system based on
a mental model in mind

Design model

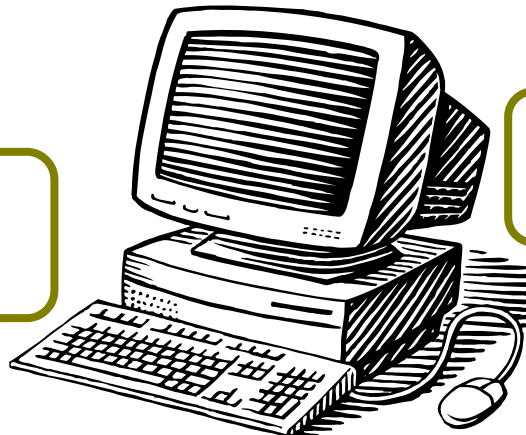


Designer

Design a system image based on a
design model in mind

Make/revise a mental model based
on responses of the system

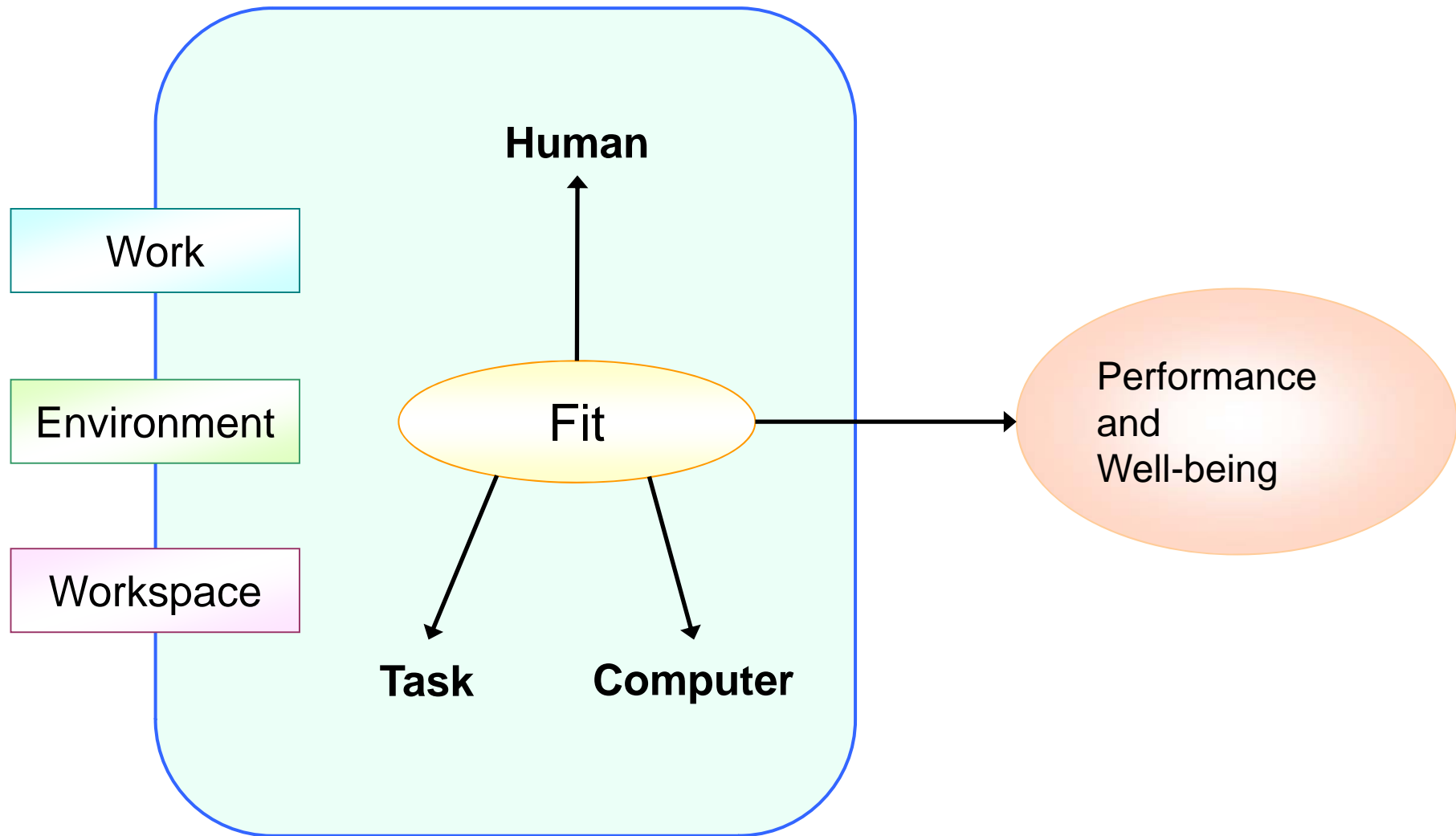
System Image



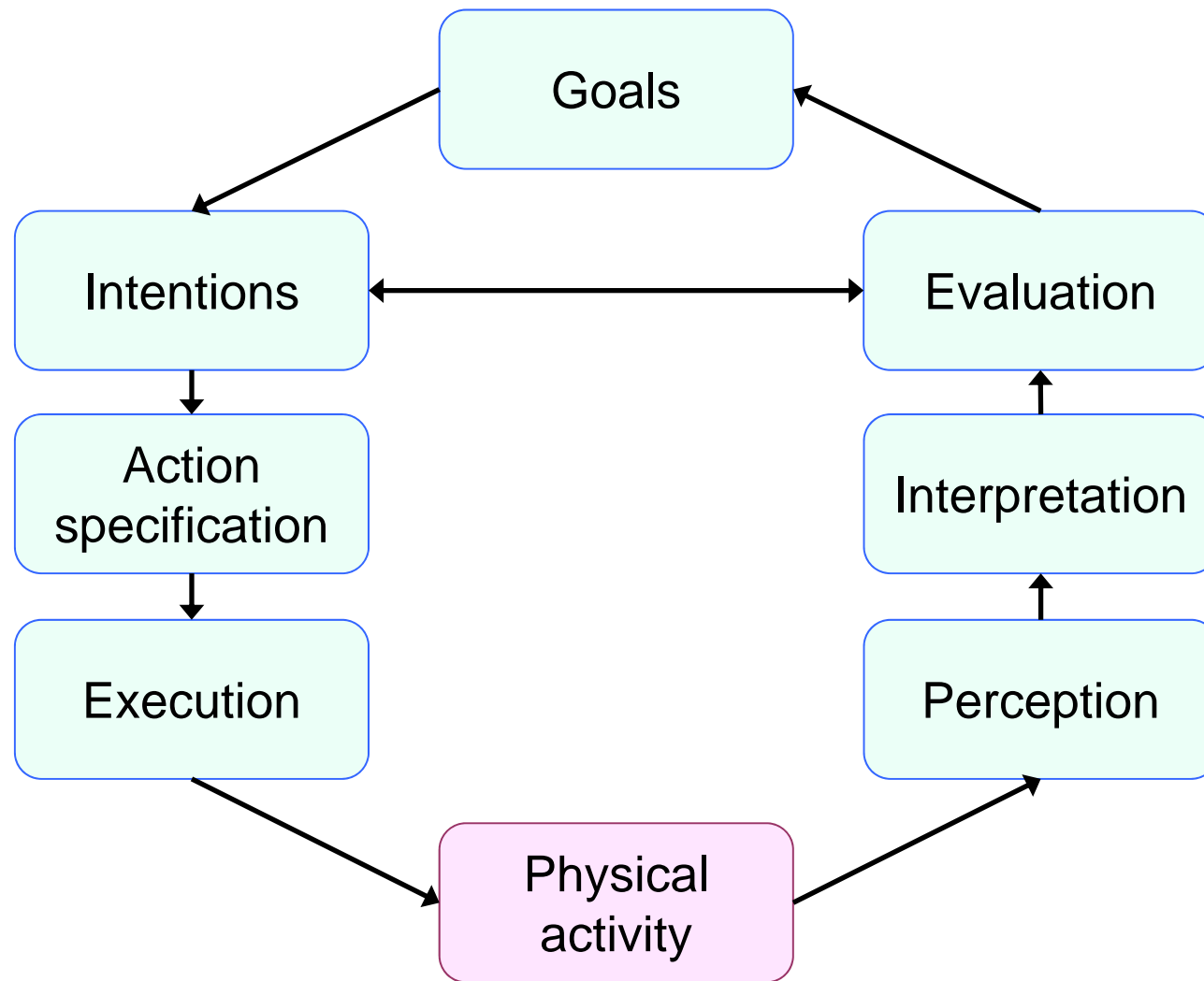
System

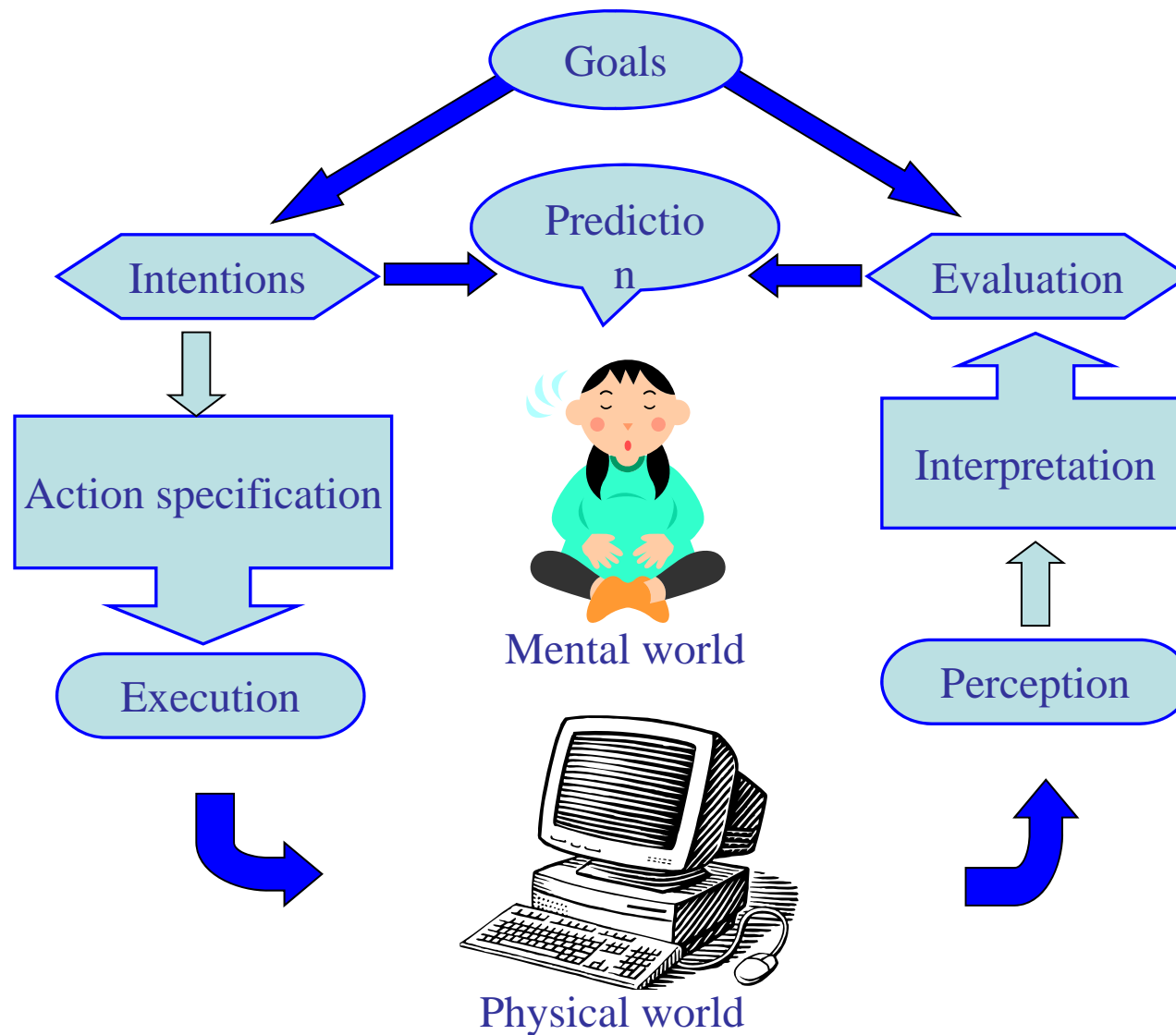
Mental model and design model

The expanded fit between human, task and computer in the work context.



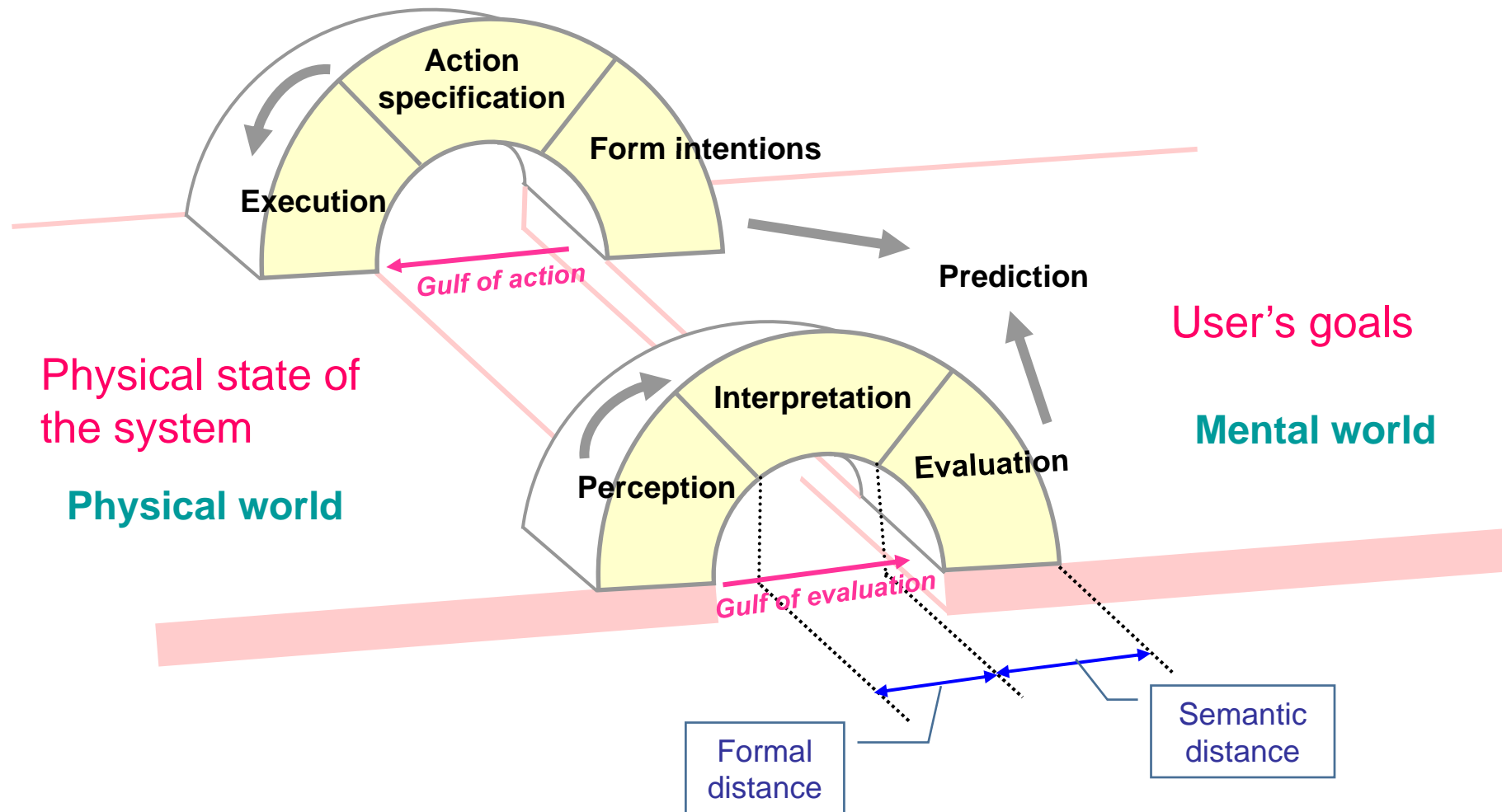
Norman's seven-stage model of user activity.





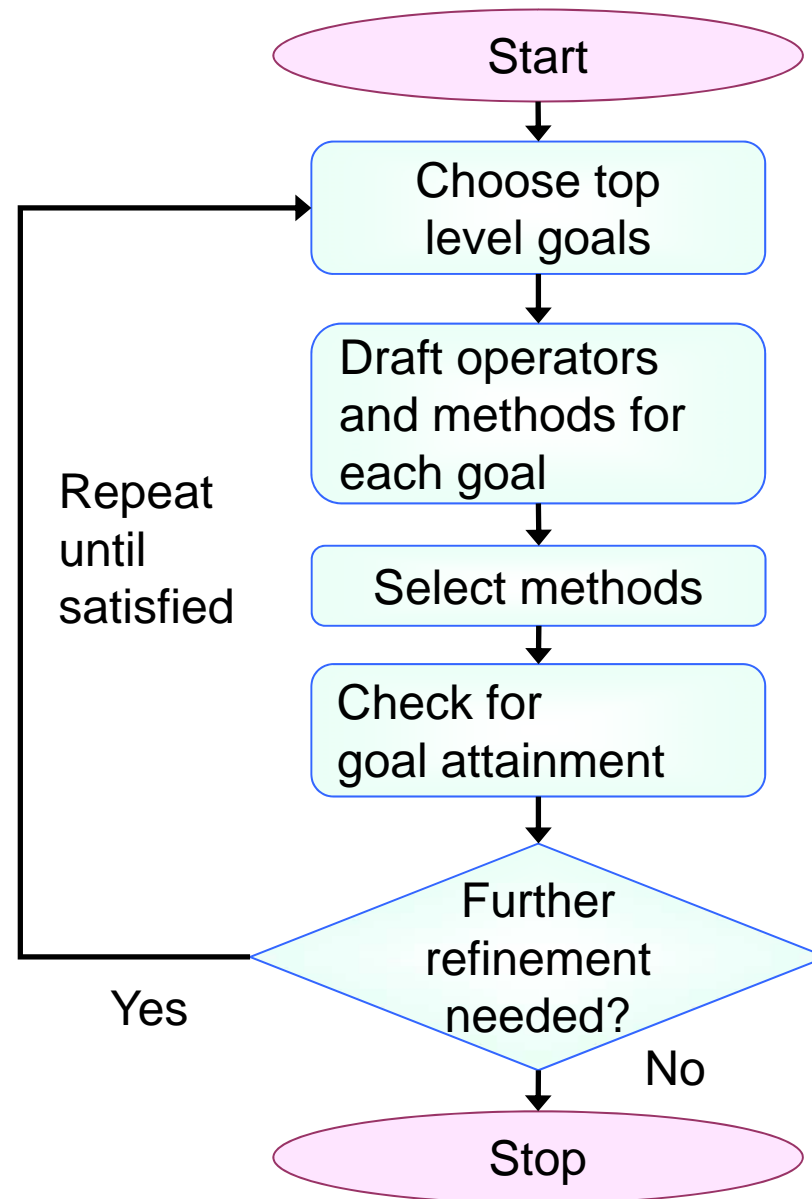
7- stage model of interaction

7-stage model of behavior



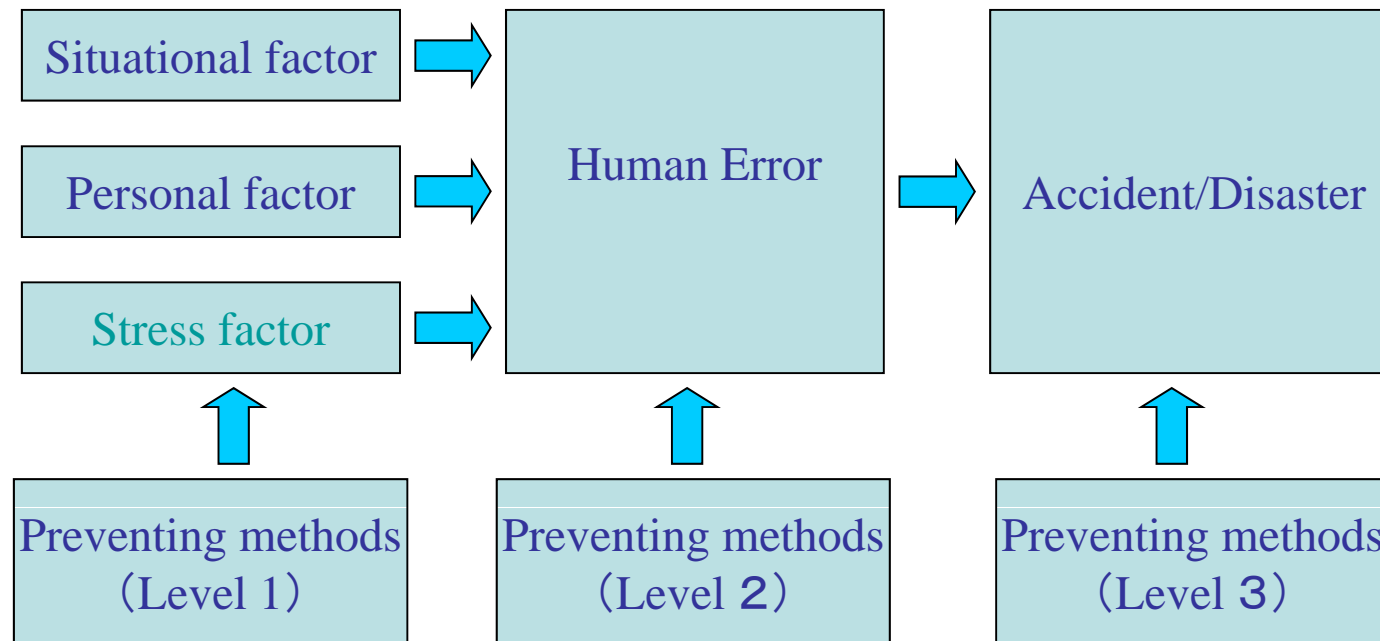
(*Gulf of action* and *gulf of evaluation* can be expressed as 'semantic distance' which represents the correspondence between the user's intention and the expressed meaning of interface language, and 'formal distance' which represents the correspondence between the expressed meaning of interface language and actual phenomena)

A flowchart for building GOMS (Goals, Operators, Methods, and Selection rules)

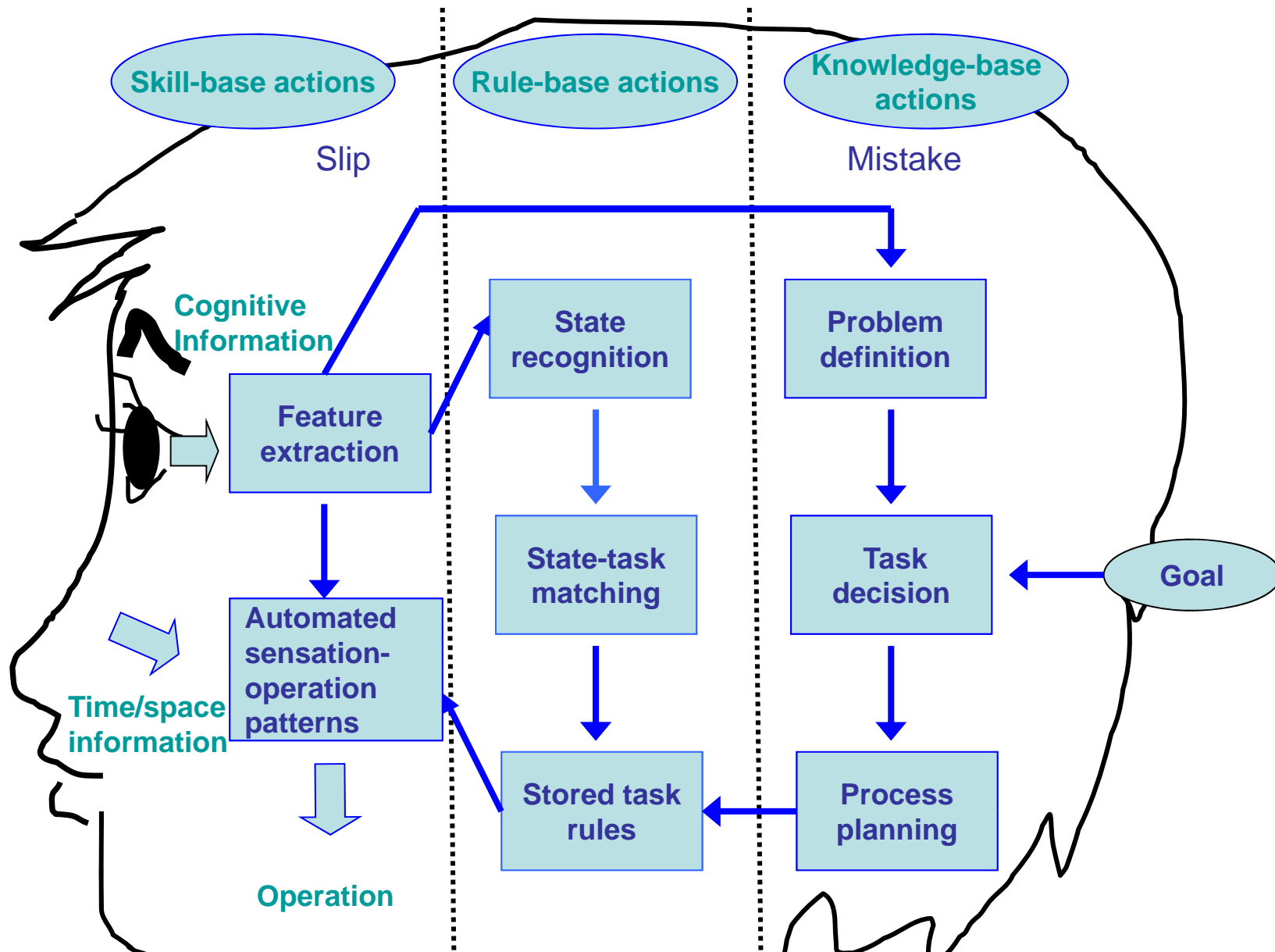


Occurrence of human errors

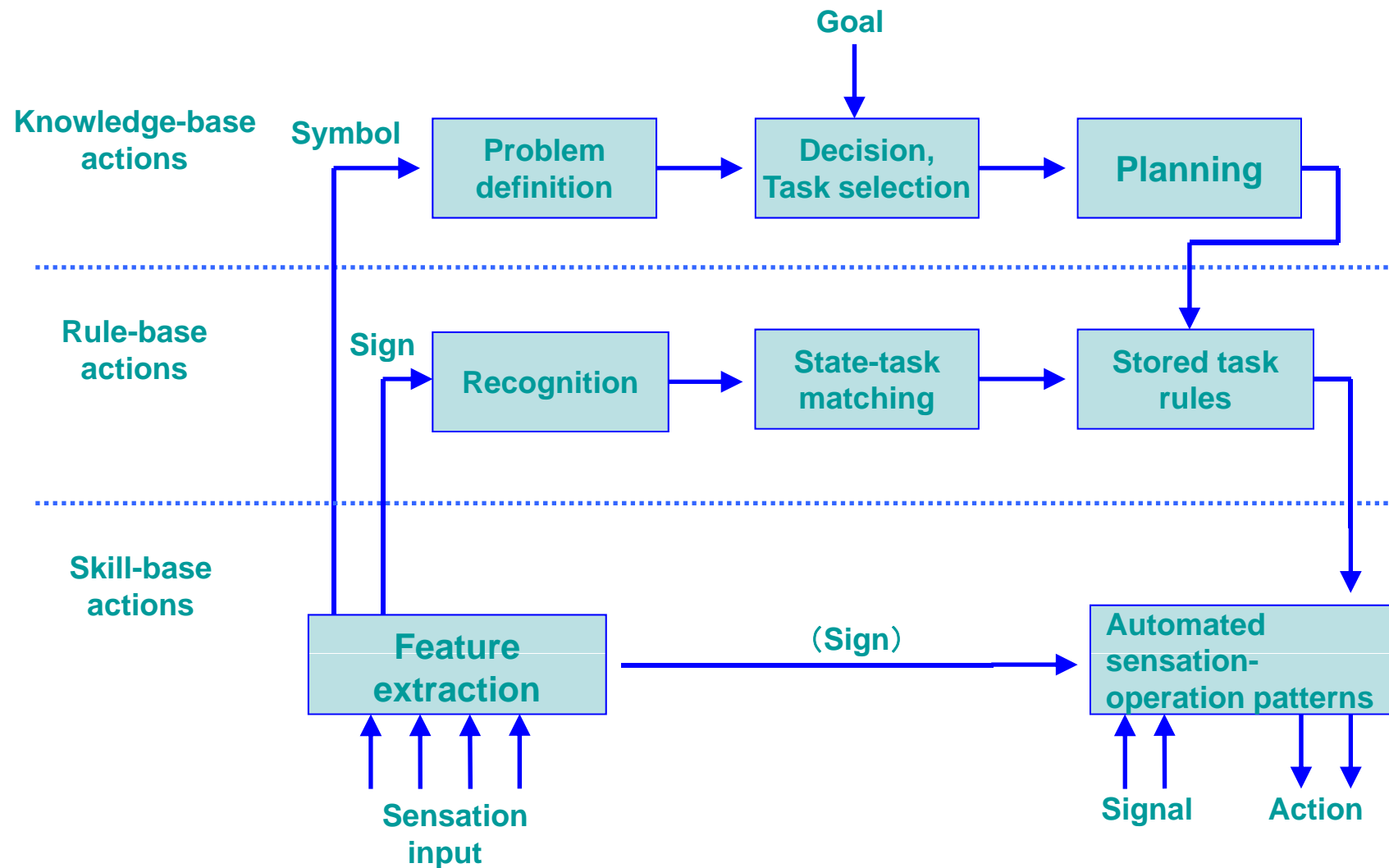
Leading to accident



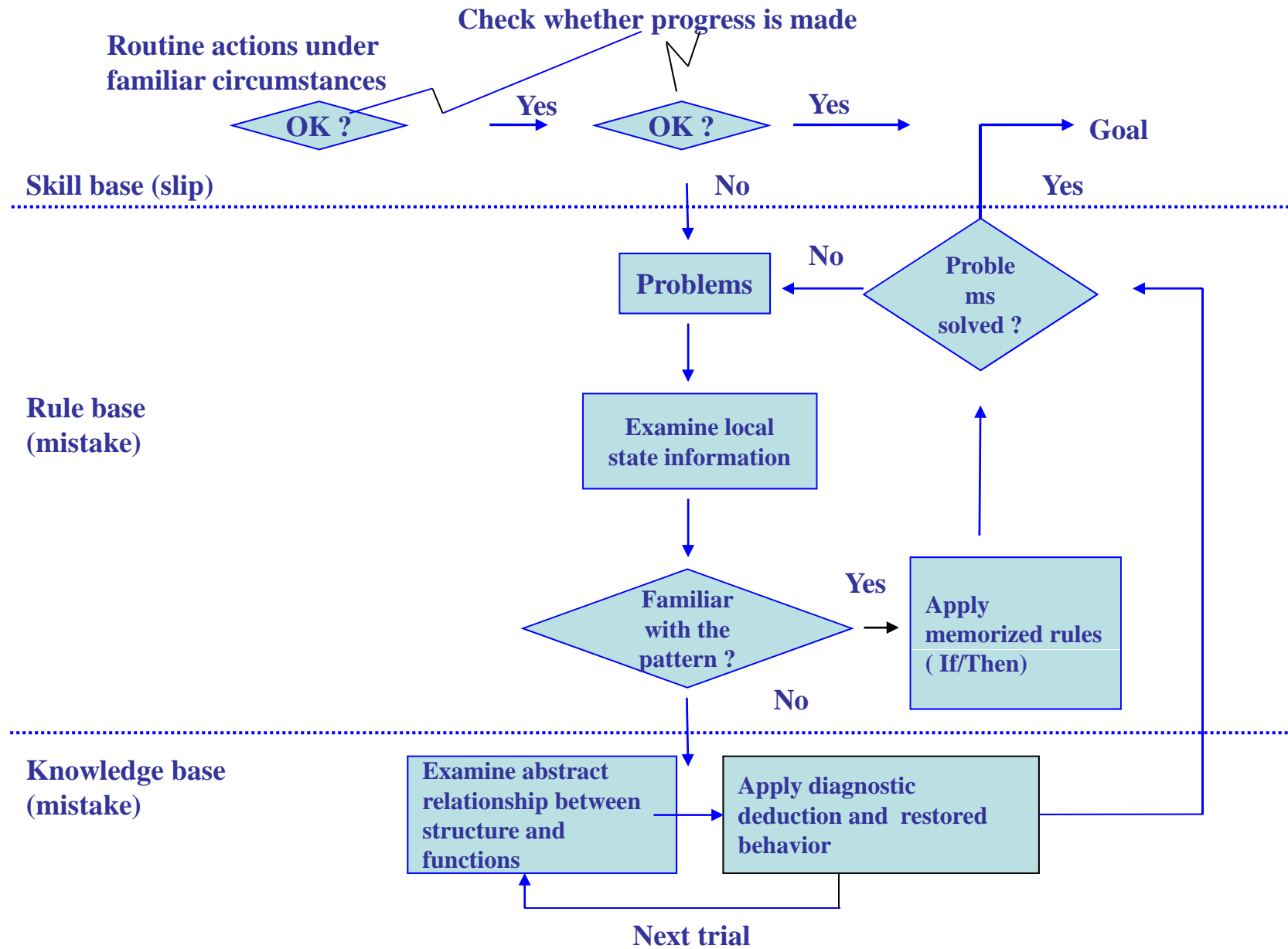
From occurrence of human errors to development of accident



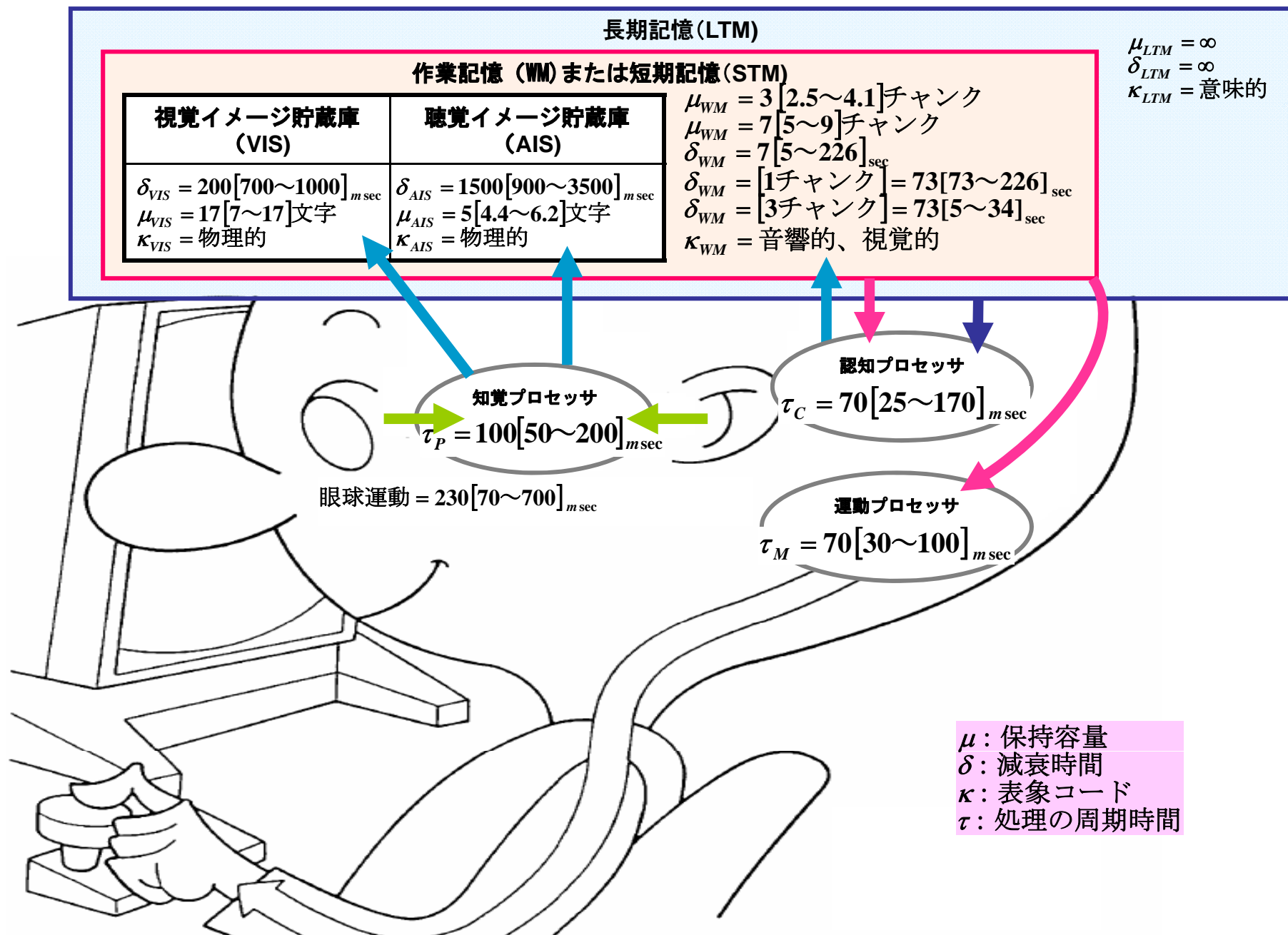
Hierarchical cognition model by Rasmussen



Rasmussen's 3 level human behavior control model



Reason's GEMS model



Model human processor by Card et al. [Card et al. 1983]