VERITAS project

FP7 247765

Cognitive Abstract User Model

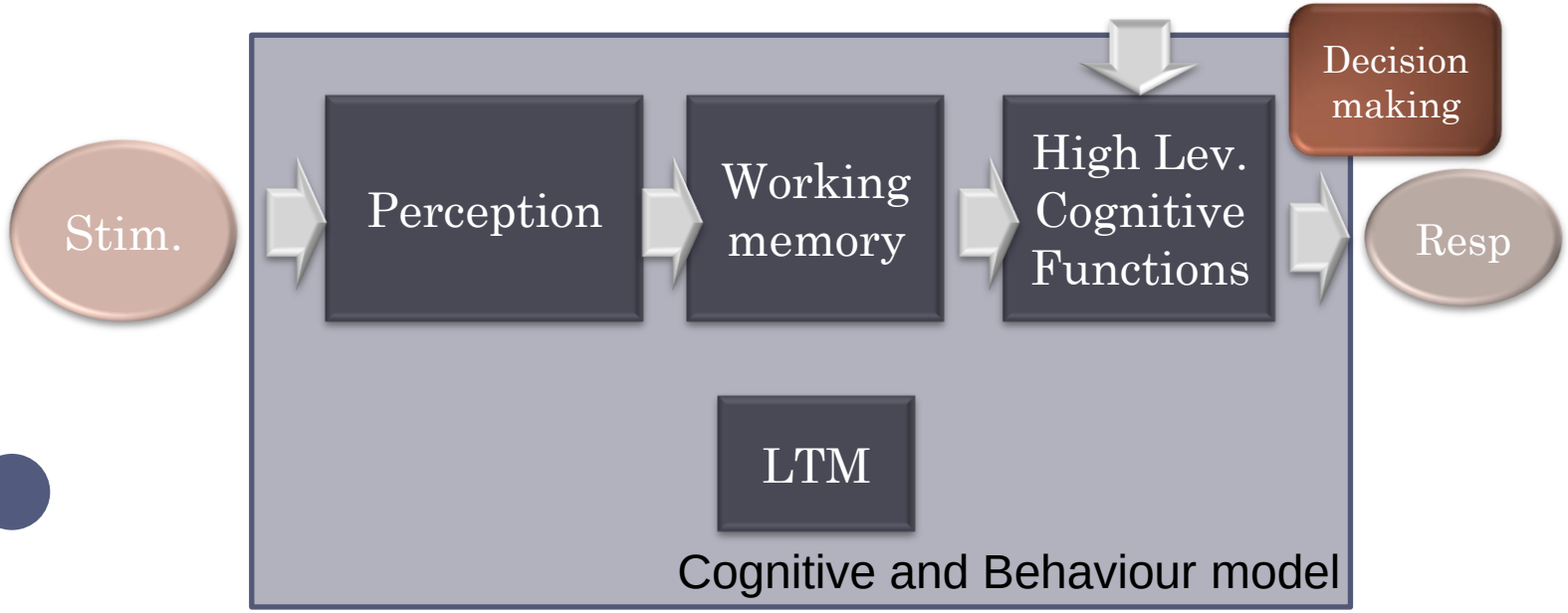
LST-UPM

[Life Supporting Technologies]
LifeSTech
[Universidad Politécnica de Madrid]

ToC

- Cognition
- Identification of congnitive functions
- Basic cognitive fucntions
- Higher-level cognitive functions
- Identification of beneficiaries
- State of the Art
- Analysis
- Parameters
- Abstract User Model

COGNITION


Stim.
Perception
Working memory
High Lev. Cognitive Functions
Decision making
Resp
LTM
Cognitive and Behaviour model

Identification of cognitive functions

- Basic cognitive functions
  - Attention
  - Memory
  - Perception
- Higher-level cognitive functions
  - Decision making
  - Orientation
  - Speech and language
  - Cognitive flexibility

Basic Cognitive Functions

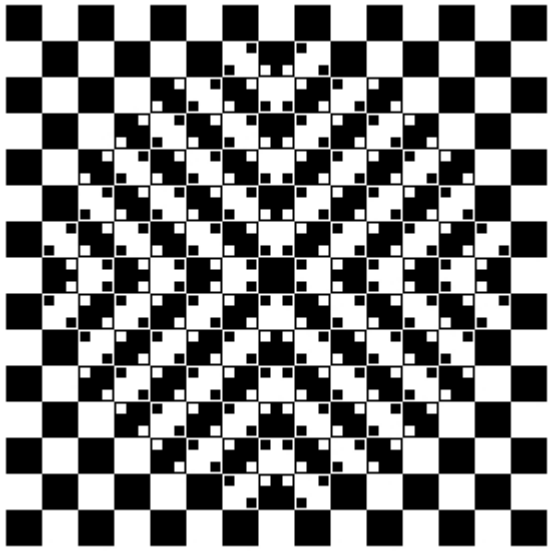
- Attention
  - **Selective attention**
  - **Divided attention**
  - **Sustained attention**
  - Focussed attention

Basic Cognitive Functions

- Memory
  - Sensory
  - **Short-term (working memory)**
  - Long-term
    - Declarative memory
      - **Episodic**
      - **Semantic**
    - Procedural memory

Basic Cognitive Functions

- Perception
  - **Visual perception**
  - **Auditory perception**
  - **Haptic perception**
  - Olfactory perception
  - Taste perception



Higher-level cognitive functions

- Executive functions
  - Problem solving or reasoning
  - **Cognitive flexibility**
  - Concept formation or categorisation
  - Inhibitory ability
  - Ability to plan
  - Self-regulation of behaviour

Higher-level cognitive functions

- **Decision making**
- **Orientation**
- **Speech and language**
- Creativity
- Mathematical calculation

Identification of beneficiaries

- Cognitive impaired beneficiaries
  - Aging
  - Alzheimer
  - Hearing cognitive impairments
  - Visual cognitive impairments
  - Dyslexia
- Physical – cognitive impaired beneficiaries
  - Parkinson
  - Cerebral Palsy
  - Multiple Sclerosis
  - Hereditary Neuropathies and Idiopathics
  - Inflammatory Polyneuropathy
  - Stroke
  - Hereditary Ataxia

State of the Art

- Considering five application areas
  - Automotive
  - Smart living spaces
  - Office workplace
  - Infotainment and games
  - Personal healthcare and wellbeing

State of the Art

- Considering six general beneficiaries groups
  - Blind and low vision impairments
  - Motor impairments
  - Cognitive impairments
  - Hearing impairments
  - Speech impairments
  - Elderly

State of the Art

- Analysis of the 13 cognitive functions in relation with:
  - VERITAS application areas
  - VERITAS impairments and the elderly

Attribute	Sector	Impairments					Elderly
		Visual	Motor	Cognitive	Hearing	Speech	
Reaction time	ALL	Reaction time is a measure of overall performance speed (Bates & Stough, 1998). Reaction time is fastest when there is only one possible response (simple reaction time) and becomes slower as additional response options are added (choice reaction time) (http://en.wikipedia.org/wiki/Reaction_ti).					
	Automotive		For Parkinson disease which is a motor-cognitive disorder, reaction time is impaired leading to decreased driving ability (Heikkilä et al., 1998).				

ANALYSIS

- Analysis of each beneficiary and each cognitive function has been done
  - Aging and attention

Selective attention	• There exists a decrease in the ability to inhibit irrelevant stimuli within a specific context, whenever the task is complex.
Sustained attention/vigilance	• This is altered when faced with situations that require an increase in intentional capacity as a consequence of the subject finding him/herself experiencing a significant number of events, or because of incertitude when faced with stimulating conditions and because the subject is more easily distracted.
Focussed attention	• Existence of deficits in prolonged focus and spatial focus.
Divided attention	• This ability decreases when the tasks are complex.

Analysis

- Results of the previous analysis is the identification of the cognitive functions more affected by each cognitive disability

  - Cognitive Abilities most affected by Alzheimer's disease
    - Perception (Visual and Auditory problems)
    - Attention (Selective attention and divided attention)
    - Short-term memory
    - Language
    - Space-time orientation
    - Mathematical Calculation

PARAMETERS

- Focused on:
  - Reaction time
  - Cognitive tests
    - ATTENTION for elderly
      - FACES Perception of differences (L. L. Thurstone and M.Yela)
      - Continuous Performance Test (CPT)
      - Toulouse-Pieron Test (E. Toulouse and H. Pieron)
      - Dichotic listening tasks (DLT)
      - Trail Making Test (Reitan and Davidson 1974)
      - “Stroop Test” (Stroop, 1935).

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