

# Neuroticism – a competitive advantage (also) for IVAs?

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# Current situation

- ▶ Market for interactive games on PCs, game consoles, mobile phones is booming
- ▶ Semi-intelligent agents steer virtual actors
- ▶ Simple “personality structure”:  
motivation is to win fast
- ▶ Human player only challenged with respect to rational, strategic behaviour

# Hypothesis

## Question:

Is it possible to increase the attractiveness of games by emotionally and/or partially “neurotically” acting agents?

## Necessary condition:

Playing strength of this agent not (much) worse than “rational” one

## Procedure:

Create an emotional bot for a real-time strategy game that can also act “neurotically”

III: Festungszeitalter

Menü

00:21:42 (Schwierig)

Team PsychoBot

PsychoBot: 289

Team StandardAI

Bev. in Produktionsschleife: 9



133 / 160

20 977

6 1004

6 1939

27 66

Husar  
Leichte Kavallerie

+10

Concern Debug:14 - (id:14)

Var[00][ 0]: [gAppraisalMood: 1.000000] Gametime=1299993.  
 Var[01][ 0]: [cConcernKeepFromWood Weight: -0.114286 Sat: 1.000000] Gametime=1299993.  
 Var[02][ 0]: [cConcernKeepFromFood Weight: -0.114286 Sat: 1.000000] Gametime=1299993.  
 Var[03][ 0]: [cConcernKeepFromGold Weight: -0.114286 Sat: 1.000000] Gametime=1299993.  
 Var[04][ 0]: [cConcernCutFromWood Weight: -0.914286 Sat: 1.000000] Gametime=1299993.  
 Var[05][ 0]: [cConcernCutFromFood Weight: -0.914286 Sat: 1.000000] Gametime=1299993.  
 Var[06][ 0]: [cConcernCutFromGold Weight: -0.914286 Sat: 1.000000] Gametime=1299993.  
 Var[07][ 0]: [cConcernDontLoseUnits Weight: 0.000000 Sat: 0.000000] Gametime=1299993.  
 Var[08][ 0]: [cConcernKeepEnemyBusy Weight: -0.164286 Sat: -1.000000] Gametime=1299993.  
 Var[09][ 0]: [cConcernResearchMilitary Weight: 0.000000 Sat: 0.000000] Gametime=1299993.  
 Var[10][ 0]: [cConcernResearchEco Weight: 0.000000 Sat: 0.000000] Gametime=1299993.  
 Var[11][ 0]: [cConcernDefendBase Weight: -1.000000 Sat: 1.000000] Gametime=1299993.



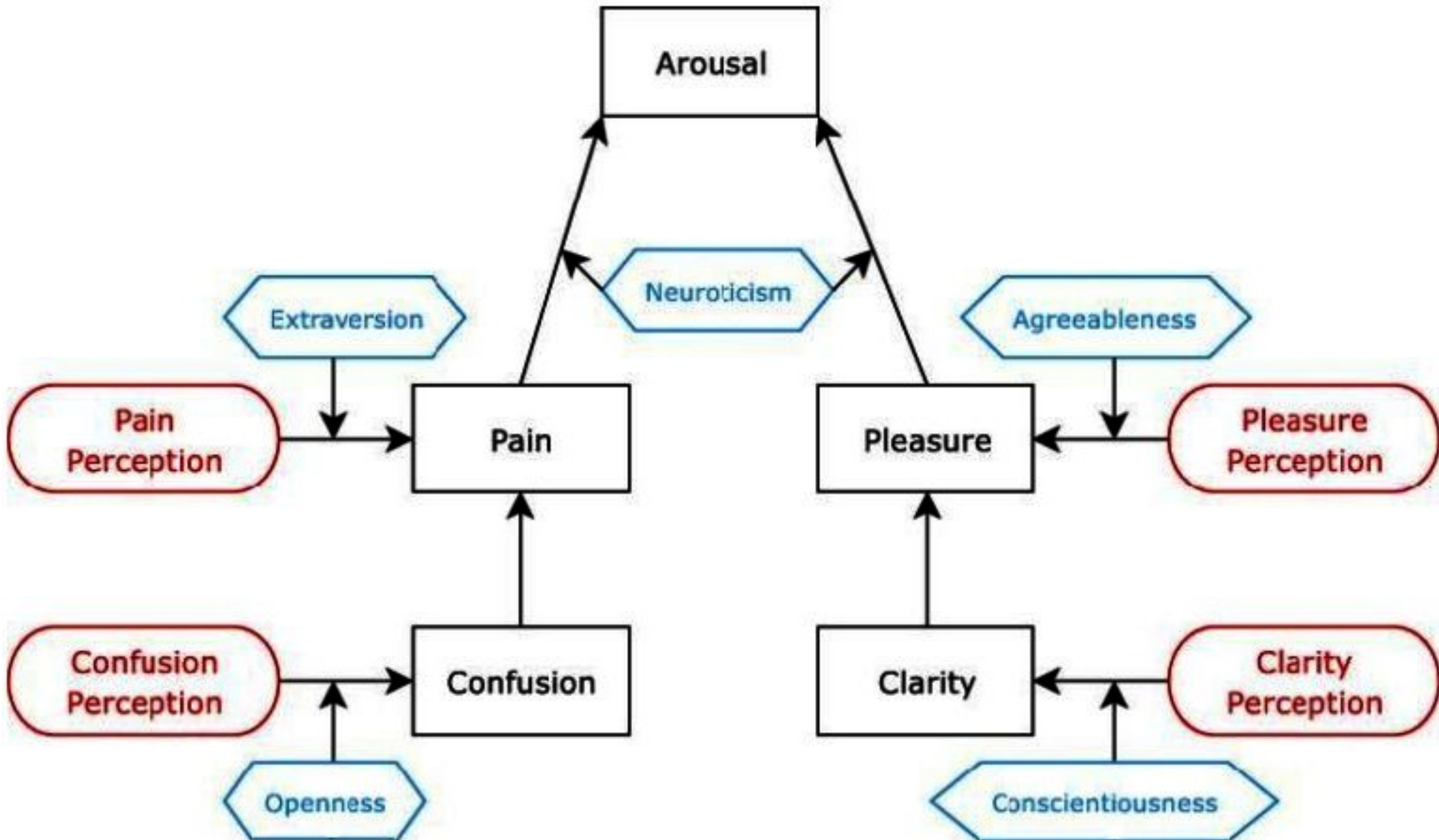
# Game: Age of Mythology

- ◆ Real-Time Strategy (RTS)
- ◆ Economic and military build-up, fighting
- ◆ Scripting system for the Game AI
  - Low-level action (unit movement) available
  - Standard AI exerts control using predefined high-level scripts
  - Sensory information: position/status of visible units, environmental features

# Personality and Emotion Model

- ▶ Emotion model based on
  - Big-Five personality traits (OCEAN)
  - Emotion-Connectionist model
  - OCC model
- ▶ Influence of restrictions of scripts
- ▶ Calculated state variables:  
Pleasure / Pain, and Clarity / Confusion
- ▶ Change in emotion is the result of an environmental factor, a perception
- ▶ Strength of emotional change is influenced by the personality

# Personality and Emotion Model



# Character types

- ▶ Four bot variants with different personality parameters: defensive, aggressive, normal and neurotic
- ▶ Example: Influence of “Neuroticism”
  - High:
    - irrational assessment of resource value  
e.g. amount of available timber is overestimated
    - tendency to resort to extreme playing styles:  
aggressive vs. defensive
  - Low:
    - rational adjustment of assessed resource value
    - use game statistics unchanged



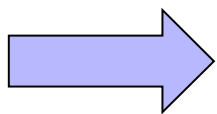
# Evaluation

- ▶ Bot-versus-bot setup:
  - The four defined character types against the default Age of Mythology AI script
- ▶ Conditions:
  - Two players
  - Odin's Vikings
  - Difficulty "hard"
  - Strategy "normal"
  - Map "Alfheim"
- ▶ Each character setting completed 7 test games

# Test results

Each character version scored a minimum of 6 wins out of 7 matches, altogether 26 wins out of 28 games ( $p < 0,0001$ ) → Playing strength at least 232 Elo points higher than the default Age of Mythology AI script

| Setting    | Wins : Losses | Average winning time |
|------------|---------------|----------------------|
| Aggressive | 7 : 0         | 44:35 min            |
| Defensive  | 6 : 1         | 35:17 min            |
| Normal     | 6 : 1         | 40:34 min            |
| Neurotic   | 7 : 0         | 31:45 min            |



In this specific situation, neuroticism is a competitive advantage for an IVA

# Further work

- ◆ Further improve playing strength
- ◆ Adapt an appraisal model of emotion for the specific environment of RTS games
- ◆ Test attractiveness of emotional, especially “neurotic” bots in games with human opponents

The End

Thank you for your attention!