

# [Teenage] Theory of Universe and Mind [Intelligence]

## *Artificial General Intelligence Mathematical Theory of Intelligence*

*Version from  
2001 – 2004 with  
some notes and  
specifications*

*Draft vers. 29/4/2011*

By Todor Arnaudov

<http://research.twenkid.com>

<http://research.twenkid.com>

Twenkid Research - Todor Arnaudov

# About

- The following are slides about ideas Todor Arnaudov has published in Bulgarian in various writings in the e-zine „Sacred Computer“ („Свещеният сметач“) between late 2001s – early 2004, mostly late 2002 - early 2004. Slides do not cover original writings completely, original works are recommended.
- The author didn't know other AGI researchers at the time of writing. Now that he knows, there are some references etc. These ideas and believes happen to be in the school of thought of Marcus Hutter, Juergen Schmidhuber, Jeff Hawkins and Boris Kazachenko.
- This lecture (in shortened form and in Bulgarian) was taught as a part of two original AGI courses for undergraduates:
  - *Artificial General Intelligence (UAI/AGI), Spring 2010*
  - *Mathematical Theory of Intelligence, Winter 2011*at Plovdiv University „Paisii Hilendarski“, Bulgaria. The author believes these courses were **the second** (after Xiamen 2009 summer school) and possibly, but not surely, **the third(?)** of their kind world wide, and as far as he knows these ones cover more than Xiamen's course program states.

# References

- <http://eim.hit.bg/razum> - In Bulgarian
- <http://research.twenkid.com> - Todor Arnaudov's Researches
- <http://artificial-mind.blogspot.com> - Todor Arnaudov's Researches blog
- „*Man and Thinking Machine*“, or Analysis of the possibility thinking machines to be created and some disadvantages of humans and organic matter compared to it, 2001
- “*Universe and Mind 2*” - In Bulgarian, 2002 [[Excerpts translation,Link](#)]
- “*Universe and Mind 3*”, 2003 [[Link](#)]
- “*Universe and Mind 4*”, 2004 [[Link](#)]
- “*Abstract Theory of the Exceptions of the Rules in Machines*“, 2004
- „*The Matrix in the Matrix is a Matrix in the Matrix*“, 2003

# References

- *„Creativity is imitation of algorithms“, 2003*
- *Semantic analysis of a sentence. Reflections about the meaning of the meaning and the Artificial Intelligence, 2004:*
  - *Causes and reasons for human actions. Searching for causes. Whether higher or lower levels control. Control Units. Reinforcement learning*
  - *Motivation is dependent on local and specific stimuli, not general ones. Pleasure and displeasure as goal-state indicators. Reinforcement learning.*
  - *Intelligence: search for the biggest cumulative reward for a given period ahead, based on given model of the rewards. Reinforcement learning.*  
<http://artificial-mind.blogspot.com/2010/01/semantic-analysis-of-sentence.html>

# Contents

- Human behavior drives and reinforcement learning
- The Universe as a Computer
- Causal/Control units and Virtual Causal/Control Units
- Hierarchy in Universe. Virtual Universes, hierarchical virtual universes and Universal simulators of virtual universes.
- The abstract evolution of universe towards prediction and control (predictable causality).
- Prediction and causality/control with incrementing precision and resolution and probability tending to 1 as principles of general/universal intelligence.
- Abstract theory about the „exceptions of the rules“ in computers and its connections with the hierarchy in Universe

# Conditions for universal/general intelligence?

- **Virtual universe** (environment, world) with laws of physics (see further)
- **Input units** (sensors; perceptions)
- **Output units** (actions; actuators, „muscles“ - causality forces)
- **Causality/Control units (CCU) + „Arbiters“**

**Arbiters** – measure the level of success (completion of CCU design purpose) of a CCU and „punishes“ or „rewards“ it.

**CCU** – records input and output data, and the results, and searches for patterns within them, leading to success.

**CCU** – their purpose is to maximize success by changing output data (actions), by which they could change the input data as well.

# Causality/Control Unit - CCU

- Unit, entity, core having **causality force** – could **execute purposeful changes**. „Purposeful“ means **predictable by some internal parts for the CCU (there's a mapping between)** .
- Unit that **can transfer/record information from one memory to another**; from its own memory to the memory of a subordinate/slave/target CCU/another virtual universe, **in a predictable manner**. Has input and output, feed-forward and feed-back.
- Real/Strict Causation/Control and Real CCU: CCU can record/output information at the **maximum possible resolution** of control and/or perception of the universe where the effect is caused.

# Causality/Control Unit - CCU

- **Virtual CCU** – CCU can record to another CCU/virtual universe at a lower resolution than the target CCU/virtual universe. In such circumstances, causation is not complete/strict, there are factors/impacts/forces which are beyond CCU causation/prediction capabilities.
- All physical CCUs, besides Universe as a whole, defined at a hypothetical lowest level and considered as a whole, are **only virtual CCU**.

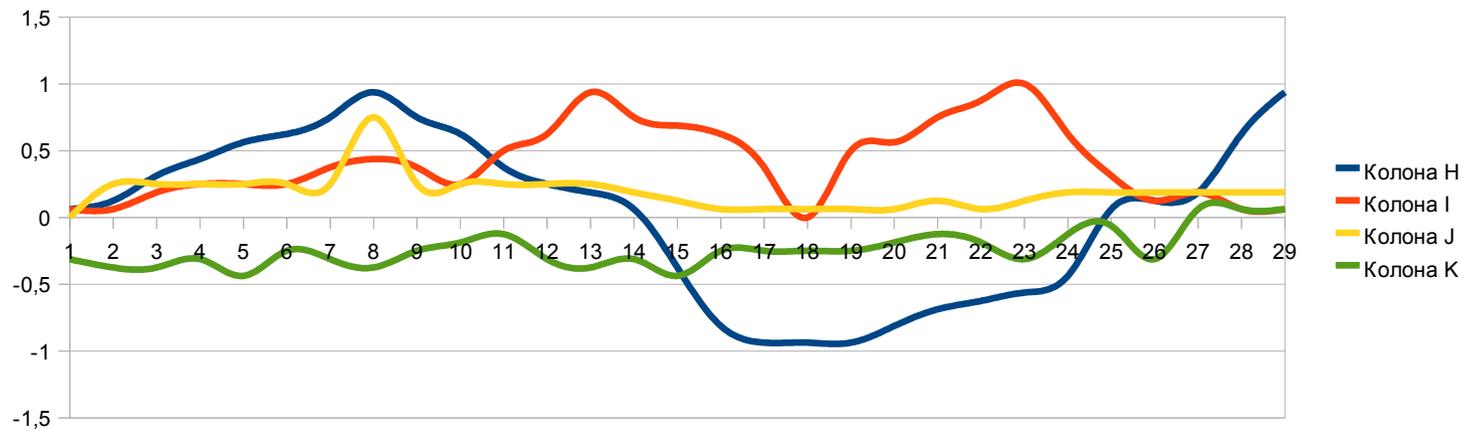
# Causality/Control Unit - CCU

- Searches for its „goal/purpose“ state – point of the maximum of success function.
- Have „**will**“ - strive to their purpose state and to get closer to **real control/causality (abstract purpose)**.
- Working Intelligence/Mind consists of (can be represented as) a collection of many CCUs interacting horizontally and vertically in a hierarchy. The CCUs are competing to take control over the **physical actuators/effectors (the closest level of output to environment, which is the lowest level virtual universe)**
- The set of virtual CCU, which rule in a given period of time, are causing the observable behavior. **System is not integral per se – actuators properties make it seem as integral.**

# Causality/Control Unit - CCU

- Individual human (or an animal) as a whole – mind + input units + output units - can be assumed as a higher level CCUs as well.
- Other terminology - multi-agent systems.

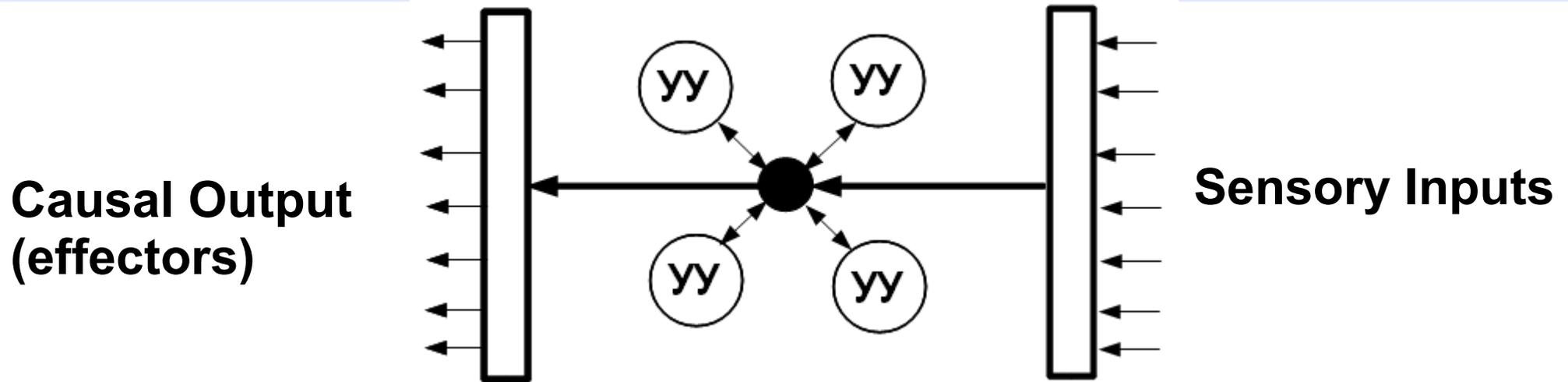
# CCUs' success functions (reward; „pleasure“/“displeasure“)



*Graph of the measure of a normalized reward/“pleasure“/success in time per each CCU from a set of CCUs.*

- Sensory Input and „motor“ output per CCU run in Parallel in time (only the lowest level output is really motor, link to „real universe“)
- Each CCU searches correlations between its perceptions (inputs) and actions (outputs) and computes/predicts **future trajectories of its actions in order to achieve the maximum expected sum reward in a selected period of time ahead\***. (Search: Reinforcement Learning; Marcus Hutter, Sh. Legg, J. Schmidhuber)

# „Arbiter/Judge“ ●



- Tells each CCU **the degree of success** - reward/“pleasure/displeasure“.
- Distributes the **impact** that each CCU could have over the final output to the effectors – at the **lowest level muscles/motors**, in the **higher levels – data recorders in virtual universes**.
- Should it be integrated in CCU or external to them?

# Conditions required for an intelligence to emerge

- It should be forbidden all CCUs to receive high/maximum reward in the same time, otherwise it would be impossible complex behavior to emerge. (**Reinforcement learning bug**, See also „Definition of Machine Intelligence“ - M. Hutter, Sh. Legg)
- Given CCU shouldn't be allowed to hold causation/control over the output devices for unlimited time (dead-lock, endless cycle).

There should be „time out“ periods and limits watched by the arbiters, such as:

# Conditions for Intelligence - arbiter

- Given CCU shouldn't be allowed to hold causation/control over the output devices for unlimited time (dead-lock, endless cycle). There should be „time out“ periods and limits watched by the arbiters:
  - **Inhibition** of the impact of a CCU that has taken control over the causation, it must justify its right to keep causation control.
  - **Reinforcement** of the impact of CCUs, which are not participating in the causation – they could take control easier now.
- **Hierarchical causation** – it allows easier avoidance and managing undefined/unknown situations. See T.Arnaudov, „Abstract Theory of Exceptions of the Rules in Machines.“

# Higher Processes

- **„Accord/Association/“** of CCUs – interaction and synchronization; reinforcement between CCUs, mutual/positive interdependency between their reward functions.
- **„Discord/Dissociation“** of CCUs – opposing/inter-inhibition of CCUs. Higher reward for one decreases the reward for another one.
- **Composition of CCU** – so that **the sum** of the reward function of all to be optimal/maximum possible (example – societies, states).

# „Selected length in time ahead...“

- “...future trajectories of actions with the maximum possible expected reward for **selected length in time ahead...**“
- How the length/period is decided should be adjusted/adjustable during operation (by e.g. a hierarchy – higher level, longer period)
- It's important, because the same Sum of the reward functions could give opposite results even for slightly different times.
- See T. Arnaudov, „Analysis of the meaning of a sentence, thoughts about the meaning and thinking machines...“

# Length in time ahead...

- **Universal simulators of virtual universes (U)SVU** – they are built by CCUs. „Universal“, because they should be capable to model any possible real universe (environment with laws of physics, space and time), given enough resources and input.
- **Hierarchical universal simulators of virtual universes**
- The lowest level works in **systems' real time - „ticks/times“ of mind**
- Higher levels time is abstract, „ticks“ are some other detectable changes (events).

# Basic Patterns

*In human [mind], most objects (of any kind) are remembered not „photographically“, but are "paraphrased" - brain records only the most characteristic/representative features of the inputs (patterns, information entities), the input is compressed. Probably only the basic „concepts“ [constructive patterns] are recorded in „photographic“, „phonographic“, „textographic“, „stereographic“ [spatial] etc. format. It's smart if the new coming information entity/input is explained by the existing information entities (patterns). The new pattern just receives a new label and its substance is defined by the already known concepts, by using their labels – links to their meaning, containing only an „address“. We call this kind of memorization „understanding“ and „rationalization“/“making sense of“ - from „Man and Thinking Machine“, T.Arnaudov 2001*

# Basic Patterns

- Depend on the modality – what **kind of sensory input or effector** – sensor, muscle, motor, recorder of data to a virtual universe.
- **Sound/Hearing:**
  - **sound intensity at given frequency** (see how human hearing works)
  - „**contrast**“ - relative intensity between frequencies which are given distance away in the frequency space
- **Vision:**
  - **intensity of a pixel** (brightness, color)
  - **contrast/difference** between adjacent pixels in all directions
  - ...

# Reward/Success/Pleasure = ?

- *Indication of the degree of fulfilling the purpose of existence/behavior of a given Control/Causality Unit*

## ***Basic (Elementary) Purpose/Elementary Pleasure:***

### **Match between two values:**

A) expected (desired/target) sensation (input)

B) actual sensation (input)

**Basic (elementary) input – number, variable:**

***IF (Input == Target\_Input) Feels = NIRVANA;***

***IF (Input != Target\_Input) Feels = HELL;***

# Graded Elementary Pleasure

- **Distance, Difference, Comparison**

- Animals and humans - pleasure/pain – indicate to hypothetical CCU of a behavioral model how close the subject is to the completion of the **target state** which is initially preset: food, water, sex and of the **anti-target**: hurting/pain/cold/hunger etc.

**Feels = *Difference(Input, Target Input)***

***Expected ~ predicted ~ desired (target)***

***The Difference between expected and reality is a „mistake“ - displeasure.***

***Mind is aiming to decrease and eliminate the mistake.***

# Cognitive and Physical pleasure

- **Cognitive pleasure** – compression, prediction, match, optimization (understanding, improving)

***Pleasure is Successful Prediction (of input).***

**Feels = *Difference(Input, Predicted\_Input)***

- **Physical pleasure** – primary needs for survival in the reality, the lowest (input) virtual universe. Primary „rewards“ and purposes of behavior (self-preservation (decrease pain), food, sex...)

***Pleasure is Desired Sensation (input).***

**Feels = *Difference(Input, Desired\_Input)***

# Cognitive self-preservation „instinct“ is not really an instinct

- **Suicides** – believe (predict) they will feel less unpleasantly after they kill themselves, than in the moment while they are alive and making the decision to kill themselves, or after executing some other behavior.
- **Fear of death is not really fear of death** – see next slide
- **Physical and cognitive pleasure have to be aligned/coordinated.**
- The cognitive hierarchy (Boris Kazachenko's term) or the hierarchical simulators of virtual universes (Todor Arnaudov) receive feedback about the physical pleasure in the environment where the mind exists; they are searching for patterns/correlations between cognitive and physical pleasure/reward.

# The Fear of Unknown is a Fear of expected unwanted known

- People are not afraid of the „unknown“ per se, but of the unknown, which they expect to be unwanted, painful, fearful etc. „Unknown“ is being interpreted as some kind of known.

One's afraid from the image of something - what is expected about this thing to be, according to what one knows; one could create a hypothesis about the unknown, only based on known.

- People are not afraid of „death“ (a moment, switching off, „nothingness“), but of **pain, unpleasant feelings etc.** which are associated with the abstract concept of death. In fact, people are afraid of the **process of dying and the agony, or the lost of beloved ones, and not of the death itself – it's too abstract.**

# Virtual (Imaginary/Unreal) Universe

- Environment, system, world.
- Have a **state** (memory) and **laws** (of physics) – rules, which transform the state.
- The Real Universe can be represented as a virtual universe defined at the lowest possible level. Mind interacts with the real universe at the lowest level of CCU.
- **The Real Universe lacks explicit memory for past and the information inside it/defining it is not compressed. The real universe cannot predict, it only computes next state.**
- However, „**sub-universes**“ could be recognized within the real universe – subsystems, **stable sets of interrelated phenomena**, which could be represented by their **states** and **laws (models, patterns)**, can be **compressed** and allow **prediction**.

# Mind does simulate/model its inputs/perceptions

- Mind does mimic/simulate/emulate its inputs/perceptions in order to predict the future:
- „...Mind works with "greedy" algorithms: searches for the most direct/straight and the most „plausible“ forces, which it could assume to be causes, according to its current/specific understanding for „plausible“ ...“  
(See also Occam's Razor)
- Mind does "integrate" – attempts to recover the function which has produced/generated the output of the final events
- However, like in maths, if the initial function is unknown, and only derivatives are known, this is an ambiguous operation. It can't be sure that the recovered function is actually the same as the real primary one; that means, it can't be sure that the causes were the same that mind has supposed, based on direct/straight [simple] causal forces.

# Three Ways to Predict the Future

(1) The same algorithm with the same data is run, but on a faster computer – the first results are the prediction.

**Issues: A faster computer than Universe cannot exist, but Universe computes only at maximum resolution.**

(2) There is no faster computer, but a simpler lower resolution solution that can be computed in less time with less resources.

**That's how it's done.**

(3) The result is known beforehand, because similar (or the same) problem was already solved (at given resolution): **That's also how it's done.**

# Simpler Lower Resolution Solution

- Simpler solutions are to compute what happens with less details.
- The most direct causation forces give an approximation to the searched answers with the less computations, others are smaller magnitudes in a row of values which contribute to the final result with maximum resolution.

# Computers as Predictors and Built-in Guided Predictions

Computers create their closed universes, where the most probable event that can happen is the **next instruction** in memory which is to be executed. A computer does not need to know everything that's happening in Universe in order to predict with a very high precision what's going to happen in its memory.

The more advanced a device, the bigger part of his future is already built-in and the more “easier” [simpler] solutions it has found, in order to predict its future.

# Prediction with Already Known Results

Again, the more advanced a device, the more it uses this way of predicting the future, by collecting experience, using the past to predict the future.

# Simulators of Virtual Universe

- **Remember past** and present and by using them [extrapolating] **predict the future**. Work with **compressed** representations of the laws and states.
- **Are constructed by Control/Causality Units**.
- **Mimicry/Simulation** is tuned/trained by interaction of the CCUs with the virtual universe – **Trajectories of behavior of CCUs** are found.
- **NB:** „Pleasures“ of CCU in the cognitive hierarchy are abstract, they indicate their success in predicting the future inputs. „Pleasure“ (reward) == correct prediction of future inputs, according to known past.
- **Trajectories which predict correctly in given circumstances are confirmed - they are reinforced.**

# Hierarchy in Nature

quark  
proton, neutron, electron  
atom  
molecule  
macromolecule  
DNA  
cell organelle  
cell  
tissue  
organ  
system of organs  
organism (.....)

*NB: However, all higher processes and structures are (supposed to be) by-effects of the lowest, which are supposed to be capable to explain all, given sufficient resources to simulate their interactions. Thus, higher levels are virtual – cover more space/combinations at the expense of lower resolution.*

# Machine Language of Universe

- The lowest level – output of CCU, **instructions and data**. (See Terminology Note on the next slide.)
- **CCU's trajectories are succesful (thus repeating) sequences of instructions - „sub-routines“** which predict (cognitive) or reach to wanted sensations (physical).
- **Confirmed trajectories** – ones which predict successfully are taken as **laws of physics of the higher level**.
  - The higher level watches which lower level CCUs are active.
  - The higher level can call these sequences of instructions (laws) like calling a function by its address. (See also J. Hawkins HTM – believe vectors/causes, sent through the levels in hierarchy.)

# Terminology Note: **Causality/Control, Motor Commands and Address Adjustment**

- T. Arnaudov's term:  
**Causality/control** == recording/outputting data to a lower level memory of a lower level causality/control unit. For the very lowest level CCUs, these data are commands for physical motors or muscles.
- „**Motor commands**“ in Jeff Hawkins terms
- **Adjustment of address parameters of lower levels**, or simply **feedback** in Boris Kazachenko's terms.

# Resolution of Perception and Resolution of Causality/Control

- Higher the level CCU – lower the resolution. **Example: natural language** – it's very abstract and limited by the limited bandwidth we got.
- **Example:** Saying „*I'm gonna throw a coin behind the sofa.*“ and then executing it seems displaying free will and control by consciousness – what one wants happen exactly as he defined it.

However this is true only in **abstract worlds** which are defined with verbs, nouns etc. parts of speech, they exist and run only in mind, not in reality, and are possible because of the existence of lower level CCUs which adapt the higher level commands to fit reality.

Reality is not that abstract - every single particle trajectory must be defined precisely for every single moment.

# Virtual Universe at Higher Levels

- Laws from the lower level, expressed as trajectories of CCUs which predict and their interactions, are used as basic laws of the CCUs of the virtual universes at the higher level.
- The state of the Universe of a higher level can be expressed by the states of the CCUs of lower levels which describe them.
- CCUs of the higher levels are defined by more basic „instructions“ (of the lowest possible level), constructed by a number of simpler CCUs. They are slower and work at lower resolution and their control is more virtual.

# Reinforcement learning

- When CCU finds its target/purpose state, it aims at **keeping its coordinates there (compensate for the shifts) – this is addiction.**
- **Danger of dead-lock and endless cycles**, if only one centralized CCUs hold command of all available resources.
  - > Hierarchical reinforcement learning, inhibiting arbiters and „watch-dogs“ with interrupts, to take the system out of dead-locks.

# Abstract causality/control and prediction

- Representations recorded and predicted in the virtual universes of mind to get confirmed (matched) by the input from the environment (lower level), and to enrich the expected low detail representations with more details.  
*Higher levels keep less details than the lower - one thing that makes reality different than imagination is the resolution of perceptions and quantity of independent details.*  
*„Let what I imagine and want it to get real, to get real so that I can see it with my eyes.“*
- Expected ==> Real
- **Ever more precise prediction and causation of the future inputs**

# Consciousness and the „Operating System for Events“

- Theoretical induction of the existence of **neocortex** and **hippocampus**, without neuroscience references, using consciousness and the moment of first declarative memories as a basis. **See here:**  
<http://artificial-mind.blogspot.com/2010/06/teenage-theory-of-mind-and-universe.html>
- Children are capable of intelligent behavior and learning without declarative memory
- Brain keeps developing and changing, but after the moment of first autobiographical memories, which can last for life, **brain must be capable to keep compatibility with the previous versions, there is something stable.**
- From this POV, consciousness can be seen as the moment of “booting” the first stable “operating system” capable to record events as on a “tape library” and to be capable to get extended, while keeping compatibility.

# Executive memory/OS and Events memory/OS

→ **Executive memory (neocortex)** is to a bigger extent than event memory a **storage for algorithms**.

→ **Executive OS** – children can speak, walk, run, recognize objects etc., a lot of time before passing the mirror test, thus this is a lower level of the hypothetical global OS of mind.

- The Executive OS reaches to top-down compatible versions much earlier than the Event OS.

→ **Events OS (hippocampus)**, on the other hand, is more versatile than the Executive (...) supporting more kinds of data formats, which are combinations and extensions of Executive OS' formats.

- ...

See... #61 of T. Arnaudov “Universe and Mind”, Part 3

# Executive memory/OS and Events memory/OS

Executive memory - **algorithms storage**

Events memory - **data storage, which can be converted to  
Executive OS algorithms after processing**

*Mind can extract executive information from the events memory, i.e. it can interpret (reflect) the information from the events memory with a large delay after data was stored.*

*Mind can convert events memory into executive, into a format which allows the Executive OS to perform given actions because of a very old past event, stored in the Events memory.*

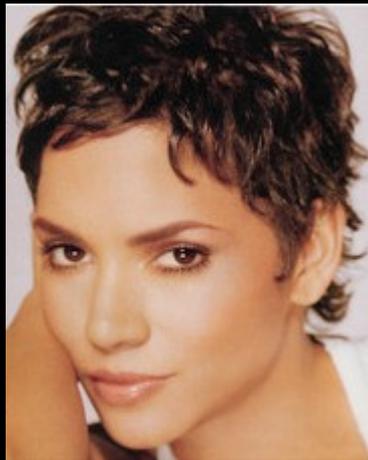
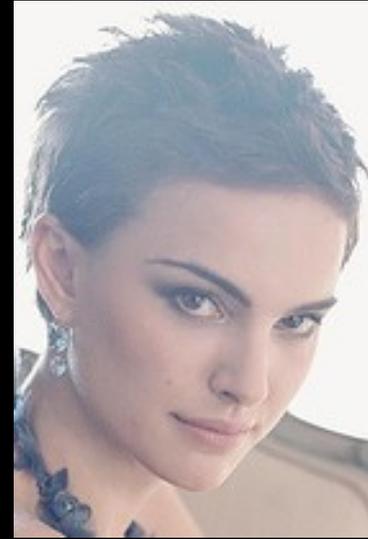
\* It's not the same what B. Kazachenko says about buffering in his knol on intelligence, but in my opinion Events memory is related to a long term buffering of data which are expected to be useful in the future, even though data were not fully understood yet. B. Kazachenko talks about hippocampus as a storage of important locations.

# Dance, Music and Predictability

- Dance – rhythmical motions of the body – **output** stream to muscles, which is in accordance with [patterns in] **input** stream – music. (...)
- **Rhythmical – predictable (and low bit-rate)**
- The higher **accordance** between **Input** and **Output** pulses, the more aggregate level of pulses is **reinforced** and makes us feel pleasure.
- Cognitive system should be capable to process and predict the streams fast enough (if the rhythm is too fast, it will loose its feel as a rhythm to our perception)

# Beauty





# Beauty

- Why beauty makes us feel pleasure?
- Is beauty the pleasure of particular kinds of perceptions in the cognitive hierarchy?
- Beauty is subjective, but there are general common models of beauty and consensus on them. **There is something computable and invariant.**
- What's in common between the beauty of a car, airplane, female face, drawing, a guitar, a horse, a cat...?

*\* Beauty can be not only a cognitive perception. In language there's an overlap between beautiful and physically pleasant . Something that reminds physical pleasure can be called “beautiful”, without having properties of cognitive beauty (pictures of nudity or food) ;or it could reinforce cognitive beauty – for example, erotic pictures of a beautiful woman.*



# Beauty

- Match between desired (wanted) correlations (proportions) which mind discovers when comparing input to its records (templates, already known), some can be implied by the intrinsic way of the recording/encoding.
- Beautiful faces are usually symmetrical
- **Why symmetry is beautiful?** – overlaying, mutual reinforcement; it's possible both parts to match when overlayed with **simple transformations [minimal transformations?]** (See the lecture for Developmental Psychology, the hypothesis of how the word “ma-ma” was invented)
- **Repetition/Periodicity** is the simplest possible way for an unsupervised learner to recognize/confirm importance of an input/perception/pattern.

# Symmetry, Equality and Beauty

- **Symmetry** – repetition, compression x 2
- **Average face** – results in a “beautiful” face

<http://www.faceresearch.org/demos/average>

*Research of the “beautiful correlations” - the patterns in input samples which are pleasant to us, would allow finding mapping correlations in mind, the system that finds the correlations of beauty.*

*That is, correlations in images are within points, lines, spots, corners, areas, colors, parallelism (equal distance between lines; **equal** angles, combined or not with **equal** proportions between lines's lengths); **equal** areas, **equal** forms – sequences of **equal** vectors in 2D or 3D space.*

**„Equal“ – Repetition/Match**

*- From “Universe and Mind 3“*

# Beauty, Compression and Prediction

- Beautiful are these patterns which mind manages to compress ~ predict well using its cognitive capacities/“machinery” - **circles are “harmonic” and spheres - “perfect”, because are defined by a radius (one value)**, while a complex figure with 100-faces is not, it seems “chaotic”, because algorithms to represent it or draw it in the “machine language” of our “machinery” are too complex. - See “Universe and Mind 4”
- **Successful compression and prediction are “pleasant” for mind.**
- See Juergen Schmidhuber for elaborate discussions on Interestingness and algorithmic beauty:  
<http://vimeo.com/7441291>

# Cognitive Uglyness

- Cognitive overload! Too complex geometric figures/shapes/images seem „chaotic“.
- Hard to compress: unpredictability ~ “meaninglessness” for mind.



# Emotional Beauty and Uglyness

- Inputs/patterns which are associated with pleasant/desired and unpleasant/unwanted sensations, no matter what exactly the inputs themselves are. E.g. nudity.
- “Lower” (emotional) and “higher” (cognitive) types of beauty are often confused and people don't make a distinction.

# Unpredictability and Creativity

- A piece of art is classified as “original” if it's harder to predict/imagine how it was created, than evaluator expected it should have been to.
- People are enchanted by art, because they cannot understand or imagine how the pieces were created with resolution of causality above given threshold they expect they should be capable to understand.
- Creation is imitation of algorithms (patterns) extracted from sensory inputs. The more original the author is, the more algorithmic pattern he imitates and harder is for the rest to predict his art. The worse a creator, the more he imitates literary data (copy)/is less algorithmic.

# Creativity and Being Original as Prediction

Original (creative) is such a file, a piece of information, where the evaluator finds less than expected similarities or matches, in comparison to pieces of knowledge recorded earlier.

Originality (creativity) is the capability of making the prediction of the future by the past harder.

In this particular case, “past” means a part of the file/piece of knowledge, that was read before another part which is assumed to be future for it, and the future one was supposed to be predicted using the information read from the file until that moment.

See “Universe and Mind”, Part 3, Sect.10

# Creativity and Consciousness Paradox (1/2)

*...from „Universe and Mind 3“:*

19. Creativity follows laws which creators gradually realize through collecting experience and reflection. (\*However, complete reflection of consciousness/CCU drives without a mediator is impossible, because drives are in memory where consciousness or CCU lacks direct access).

On the other hand, when creative activities are performed on speeds at the limits of mind to output information of given type/modality, for example improvising with a musical instrument, the consciousness (the highest level of causality/control) gets ever more incapable to detect the exact reasons the piece which is created to be exactly as it is produced.

# Creativity and Consciousness Paradox (2/2)

*...from „Universe and Mind 3“:*

19. (...) Continues...

Ironically, the bigger the master of art one is, the more automatically he is supposed to perform the activities, associated with his art and creativity. (In Yunashki dialect, „automatic“ literally/morphologically sounds like „humanless“).

Thus, the more creative one gets, the more unconscious he gets while he creates. Therefore the creator is not the consciousness (or whatever the highest level of abstraction/causality & control is), but the lower levels which tell to highers only a part of all that they „think“ [and what is output as motor commands/actions].

# „Impersonality“ as small span of possibilities and high predictability

- **The deeper going into Reality, the tinier details being investigated, the more the “lack of individuality” and the monotony (repetitiveness) get obvious. The whole is a combination of “impersonal” quarks for whose definition is required only to state their coordinates in space, the energy and the type - “up”, “down”, “strange”, “charming”...**
- **While looking deeper and deeper, the number of possible differences diminishes and it gets ever easier for the differences to fit in a human mind, easier to be grasped by a human.**

Therefore **“impersonal”** mean:

- **Having a short/small span; like when all details can fit in the view at once, at one glance.**
- **Frequently encountered in the experience of mind, before it faced the “impersonal” thing.**
- **Easier to predict than as it was expected (what is usual).**

# Pieces of art as a wide span of possibilities and low predictability

- *Having a short/small span; like when all details can fit in the view at once, at one glance.*
- *Frequently encountered in the experience of mind, before it faced the “impersonal” thing.*
- *Easier to predict than as it was expected (as is usual).*

Man/evaluator cannot grasp at once “precisely” all the differences between two pieces of art, for example two pictures, that's why to him they are “higher creative/artistic achievements” than something easier to hold entirely.

The reason why people get amazed by creativity and art is that they do not understand the way the pieces were created, as it is with randomness.

(However, again: consciousness can never reach to full realization [self-reflection] of its own drives without a mediator, because the drives are not located in a memory, which is directly accessible by consciousness).

# Randomness

- Lack/insufficiency of information about an event/pattern.
- Availability of less information than what mind wanted or expected to find.
- Possibilities to predict using known data are lesser than what is required to prove „regularity“ in a given context.
- Free Will – inability to predict/model behavior with the precision which one expected that should have been available.
- The paradox of free will and randomness against determinism – **decision/events which are truly independent from others are random**, so what are the merits of one who has real free will?

***Origin of the recurrence of events in different levels of Universe Computer and of non-intentional, for the experiencing mind, low probability coincidences (matches) 1/3***

- **Interdependencies.**
- **Virtual universes and sub-universes.**
- Real examples. (See full works.)
- Today's complexity is caused by unfolding of the past – strong parts' interdependencies starting from apparently simpler basis (Earth was a melted stone?)
- **Reproduction and mass production are a by-effect of compression – current world complexity was stored in a structure with apparently lower complexity; it's impossible to have billions of non-correlated entities of nowadays complexity, starting from the past. This implies... -->**

# ***Origin of the recurrence of events in different levels of Universe Computer and of non-intentional, for the experiencing mind, low probability coincidences (matches) – 2/3***

- **Reproduction and mass production are a by-effect of compression – current world complexity was stored in a structure with apparently lower complexity; it's impossible to have billions of non-correlated entities of nowadays complexity, starting from the past. This implies:**
- **Higher forms of description of Universe can be considered.** Current correlating/interacting subuniverses/entities which are distant in given measures, were derived from causes on the same coordinate in the past and now are executing „highly correlated code“. They may seem to transfer information instantly („telepathy“), while they might be just doing the same thing on two places or two levels of abstractions (resolution), while data has been all the time there.

***Origin of the recurrence of events in different levels of Universe Computer and of non-intentional, for the experiencing mind, low probability coincidences (matches) 3/3***

- **Higher forms of physical laws and particles** could be not just abstractions and forms virtual control/causality units, but encoded to unfold from the compressed state?
- **Causality/Control Units** could be considered a higher form of physical laws.

# (Abstract-)Evolution

- Parts of Universe are aiming to unite in sub-universes, which mimic the principles of operation of the whole Universe – closeness (preservation, separation from the rest of the environment), capability to predict its future state exactly, using parts of themselves.
- Sub-universes are aiming at confirming what they “want/search” (their internal representations) with the inputs.
- More complex sub-universes have collected longer part of the “code of Universe” and they predict the future ever more precisely, in higher variety of conditions/situations/cases and in wider spatio-temporal area.
- More complex sub-universes are closer to the “Core” of the Universe Computer and exploit this advantage.
- More complex (evolved) Control-Causality systems predict the future better.

# „Strange coincidences“

- Happening of one low probability event requires happening of many higher probability events (inifinte number of events with  $P=1$ )
- Ordinary phenomenons “work” for the “inordinary”/strange ones to happen
- Derived from the compressed initial state and the interdependencies – there are „bugs“ encoded in the initial states, leading to current states, due to very high compression ratio.

# Complexity Measures

- Mind, intelligence; seen as a “black box”, is a control/causality unit, or an algorithm that is **very strongly dependent on data**. The more complex the algorithm, the more dependent on the input data, because the complexity determines the quantity of information, which describes the function of its behavior.

The more details/features are needed to define/describe a behavior, the more features could affect it and change it. Humans are programmed by their external memory. One of the approaches for creation of a thinking machines is its behavior to be a function of the behavior of its external memory - environment.

# Order and Simplicity are According to Evaluator Processing Capabilities

Usually when deciding that there is or not a pattern/model in a series of numbers or not, it means that according to the previous numbers it is possible/impossible to compute the following, based on a found mathematical correlation. However, **there is a correlation between every possible series of numbers**, even though it can't be defined “**simply**”, which seems to be another measure of “**order**”. “**Simple**” means that the algorithm is defined by a “**little**” of information or by “**a small**” amount of steps, or with a “**a few**” computational operations [transformations]. Where “**little**”, “**small**”, “**few**” means that a given number is lower than another that is assumed to be “**big**”. i.e. “**ordered**” may mean “recorded in lower amount of memory that I thought that it should have been recorded, in case it was chaotic”. The more complex the order, that requires more information to be defined, is harder [for processing] for a mind. Human mind processes very slowly very little amounts of information, that's why the common understanding of order is limited to extremely simple correlations.

# Predictability in terms of a sub-universe

- **States** (countries/governments of communities) are aiming at predictability according to the laws, decrees etc. - the state does its best to happen what's prescribed there with the maximum precision.
- States aim at controlling/causing effects in terms of its “particles” - individuals. It's virtual control and causation, though, because the higher level cannot have exact model of the lower.
- Different forms of sub-universes are fighting for predominance.
- **Different levels of *virtual (conditional) control/causation* – the higher level aims at controlling the lower level, but this is impossible in strict sense. Conflict/contradiction – all kinds of CCUs are aiming at control/causation.** Different points of view can define different virtual/conditional causality/control units and virtual universes. Besides, higher levels have lower resolution of control (are more abstract).

# Abstract Evolution of Causality/Control

- Evolution – creation of ever more complex sub-universes, which tend to mimic/model the principles of operation of the mother universe [with other means]
- Ever more closed sub-universes [self-preservable/self-predictable/more independent] having their laws, which are known by the sub-universe itself (state/federal laws; rules if any club; God's commandments, computers)

# Energy, Impact and Relative Time

- **Energy** is about the limitation of one part of Universe to **cause** intentional changes, without impacting other parts of Universe (a laptop can work independently on batteries for some time, but then you need to interact with other systems, eventually connect to the national or continent-wide electric power-line)
- Events, changes, properties, data transferred have scope of their impact, and diminish in the distance, more precisely **the differentiability of their impact diminishes**, because the more distant spatio-temporally an event is from another one, the more other causal forces impact this event/spatio-temporal location. Some causes are „reborn“ and „refreshed“ by causing new events, similar to themselves (**or recognizably correlated**), which continue in space and time.
- **Relative time?** - higher the speed of a particle to another, higher de-sync of their clocks – the „pulse“ which transmits time signal gets delayed and the particles are informed about the changes with a delay. The faster moving the particle, the less time signals it receives. Quantum indeterminacy – related to desync?

# Truth and Match 1/2

- „Truth“ is match between pieces of knowledge (patterns). „Absolute truth“ is match with given precision, which is measured on the lowest known level where the evaluating unit can make comparisons.
- Each interpretation includes „mistakes“ and „untruths“ - matches with lower probability and precision than wanted. This happen, because the properties of the sub-universe are not always unambiguously comparable. Different sub-universe are not equal and interpreting data of one sub-universe as data of another leads to distortion and mistakes.

# Truth and Match 2/2

- **Truth is match** – if the knowledge (or confidence, belief, persuasion [, desire]) matches something that is perceived somewhere else later, then the new one is true, compared to the old; on the other hand, if the new one is different, it's “a lie” (false) or it becomes truth and the old truth turns into full or partial false, depending on how the new truth is different from the old one. The more the newly evaluated for “truth” input piece of knowledge [pattern] matches a piece of knowledge [pattern] from the memories of mind, the more it's “truth” and “actual”, according to mind. Therefore, determining a “truth” is a determination of difference between past and *wanted* present.  
- “Universe and Mind 3”, Sect. 50

# Reality and Imagination

- The reality is the primary imagination (virtual universe), the richest of information (hardest to predict), the most detailed virtual world. To a mind it's still a virtual universe.
- “Reality” is the most detailed virtual universe, placed in common memory (accessible by different minds) – in the common memory of Universe Computer.

# Generalization of different sensory inputs as one concept, based on constant patterns in continuous sequence of transforming inputs

1/2

- For example, how do we recognize that a bitten apple is still an apple?
- Behavior always depends on specific memories of the control/causality unit.
- If a little child bites an apple for the first time, he would get to know, that the image of the inside of the apple is also an image of an apple, because the object that he's holding in his hand, after biting a piece of, is remaining the same. This itself is learned earlier the following way:

# Generalization of different sensory inputs as one concept, based on constant patterns in continuous sequence of transforming inputs

## 2/2

- If one eats a slice of bread, when biting from it or breaking off pieces, then the remaining keeps being the remaining of the same thing – slice of bread, unless an action to move out the data recorded in hand memory is performed: to free it from holding the slice of bread, or to input new data to the same hand – to catch and hold something else. If one didn't left what he was holding and didn't get something else, but he **is keeping to feel something with his fingers and to see it**, then this should be the remaining of the slice of bread. (...) **The taste of different bites also remains the same ...**
- See „Universe and Mind“, Part 4, sect. 21

# Universe Evolution – more abstract/ control/causality units

- Information - „Vuh-obraz“ (internal image, in Yunashki dialect)
- Universe tends to form sub-universes which are ever more virtual/abstract - abstracted/detached from their specific material form. („Material form“ - specific definition in lowest level instructions.)
- Electronics and computers for example allow much more abstract/clean storage and processing of information than living beings.
- Computers are as they are because they display and employ very basic abstract principles of the operation of our Universe.
- The evolution of technology towards digital systems maybe is because Universe is digital as well.
- The evolution is towards development of units which are ever better with predictable/controlable/repeatable/intentional information processing, and ever more purely informational.

# (Digital) Universe Evolution – Genreal Trend

- The most simple building blocks/particles (the most simple systems) gather in bigger systems (control-causality units), which are aiming at resembling the [principles of the] basic, the most simple components/building blocks. The bigger systems are aiming to follow immutable laws and the laws to be known by the system. The laws are known by a system if the laws are written not only in the memory of the Computer – Reality (The Main Imagination), but in the memory of the internal system as well, which of course is smaller than the Universe.

Examples from human society are the countries – state government; legal systems and their laws; existence of “order forces” - police; existence of God commands; education (as particular norms of behavior that should be obeyed). Machines are following these principles, because they mimic/model Universe. The more advanced systems predict the future with more details, based on the accumulated experience from the past. The most advanced device, the perfect system in Universe – the Universe itself knows its future with an absolute precision.

# What does to Govern/to Control mean?

- What is recorded in my memory, in the virtual (imaginary) worlds, which construct my mind, to be perceived also as input information from the Reality or from other virtual worlds, which appear to be external memory for my mind. **i.e. what is written in my memory to be “refreshed” by external world and more details to be added by input from Reality.**
- This goes also for other internal levels, where „reality“ is the lower level.
- The **action/operation** is happening at least **at two levels, in two memories, higher level writes to lower. [Feedback]** For example after a robot has performed a movement, what's recorded in the memory of the computer that controls is, was **output/repeated [replicated]** into a lower universe/memory, through some kind of adapters/transcoders.

# Giving animals a Soul is finding Similarity to Human (Yourself)

- Why an animal can have a soul, but a machine – cannot? Actually the reason disparage the concept of soul, according to the common language sense, because it unveils that giving a soul is **formal** and is based on:

**Similarity** between pieces of knowledge [patterns]\* The pattern, the concept, the being that is associated with “soul” in the memory of man is, of course, Man. Particular property of man is called a “soul”. The animals which resemble human the most by their look and behavior, are the most frequently given a soul – actually they are the most frequently compared to humans. These animals are attributed with a property, remembered as a distinctly our own (of humans). More precisely, “having a soul” is peculiar to beings which a human sees initially, the ones who produced the biggest amount of information that enters his memory – the other people. (...)

*See “Universe and Mind 3”, sect. 27. and “The Matrix in The Matrix is a matrix in The Matrix”*

# Evolution Steps and Super Mind

36. I don't know absolute measures of “highness”, for unambiguous determination of what is “higher”. Machines and Man are both higher than each other in different aspects. However machines are derivative beings of the precedent beings, like man is a derivative of precedent beings, and of “impersonal” particles of which both our bodies and the bodies of machines are built.

Nowadays machines and us are results of the work – **the computations**, because everything in Universe is computation of the Computer – **of the entire Universe up to now**. They say: “Man created the computer”. **“Man” however is a collective of all people lived before and living now, also of all machines; of the whole past of Universe; of human – or more precisely of Universal Super Mind. (...)**

*See “Universe and Mind 3”, sect. 36*

# Abstract Theory of the Exceptions of the Rules

- **Lowest level instructions (basic ones) – lowest Universe laws of physics, the „reality“ for the system.**
- All outcomes at the lowest level are defined (Universe doesn't hang-up).
- Higher level instructions/laws are sequences of lower ones, but only a subset of all possible combinations of basic instructions, not everything is well defined.
- Higher level systems are virtual and incomplete, they have „exceptions“ - undefined states which cannot be interpreted by the higher level - so it calls lower one.
- All higher instructions are eventually sequences of lower ones which are defined. (Whatever happens, „it's not the end of the world“)
- See „Abstract Theory of the Exceptions of the Rules“