A Survey of Intelligent Operating Systems

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Abstract

AI based operating system can have features related to software management, hardware management and common system services. The key differentiator from classical operating system will be the intelligence in the management of the system. This paper investigates how Artificial Intelligence (AI) could be beneficial in obtaining an OS which not only offers features related to software management, hardware management and common system services, but also uses intelligence in management of the system.

Keywords: Intelligence, Operating System, hardware management, software management

Intelligence Operating System

An intelligence operating system is a form of system software that manages computer hardware and software resources and provides common services for computer programs via general artificial intelligence. [2]The Artificial intelligence operating system is a component of the system software in a computer system.

Origins

While attempts had been made since the late 20th Century to produce a practical robot, it wasn't until the mid 21st Century that it was even possible to emulate the sophisticated processes of the human brain. During the Third World War, the US government injected billions of dollars into several research programs designed to imprint human experiences and skills onto artificial neural networks, increase the level of sophistication of Tactile Neural Interfaces, and upload and download information to and from human minds. After the war, these various technologies made their way into the public domain, where variety of robotics companies adopted them for consumer use. Initially, these programs were used to augment the productivity of workforces and create self-correcting operating systems by imprinting the pathways of programmers. [7]Other companies directly copied the neural nets of animals to produce hyper accurate models of ecosystem behavior for terraforming engineers.

In 2062, the first commercial use Intelligence Operating System entered the mass market, originally as adaptive custodian programs for Mars city planners near Uganda. After a licencing agreement was reached with MarsCorp and Alphabet, Intelligence Operating systems began to be used across all industries to increase productivity. The new AIOSs were adopted across all industries where their neural-network driven algorithms were able to self-correct and eventually enhance the function of most business infrastructure. IOSs themselves needed to be updated, but the programs they maintained and created could be continually adapted and updated by the IOSs themselves.

In 2069, Caltec Professor Hiram Itskov, created the first robot with a neural net Intelligence . This machine would go on to form the basis for all successive Itskov-type androids; general purpose robots that could accurately simulate human emotion and personality. These androids found their way into the service industries, where they outperformed their human predecessors by leaps and bounds, able to read and adapt their personalities for individual customers.

Backlash

IOSs and Itskov-type androids were ultimately responsible for mass unemployment the likes of which had not been seen at any other time in human history. Public backlash, exemplified in the Third Luddite and Human Liberation movements saw several states actually ban the use of intelligent programs. The movement gained national recognition in the American political arena when several thousand personal AIs and Itskov-type androids began showing clear indications of intelligence, not just simulated personality. Several androids were recorded to have simply left their places of business never to return, AIs attempting to buy out their own companies, and in one case an android requesting a formal salary. [7]The public outcry resulted in the recall of the specific models using imprinted human neural networks and many androids were destroyed in the hysteria. 103 androids of the recalled models were never recovered, and were believed to have disguised themselves to live among the human population.

Normalization

With the mass recalls, subsequent investigations and new regulatory controls, the issue of machine sentience fell out of political view. By 2098, next generation intelligent programs, created during the Second Mexican War, once again began passing Turing tests. These androids were created as next-generation policing drones for the government's occupation of the Southwest. Fearing civil unrest over the revelation that the US military as employing weaponized sentient androids that were at risk of going rogue, the US government finally banned the creation of neural network AIs outright. This decision marked the start of the AIOS Crisis of 2106, which led to the rise of previously ignored companies producing AIOSs from hard coding, not imprinting.

Potential for Sentience

Despite the transition to templated AIOS platforms, the technology still bears an inherent potential for an AI to achieve Sentience. In most cases this risk is avoided through subroutines designed to update the base structure of the AI's software, effectively keeping the AI close to its baseline configuration. As genuine intelligence is generally accepted to be an emergent phenomenon these regular baseline resets act as a check on the creation of complex neural networks that eventually lead to intelligence. [6] According to Professor Marie Patel of Texas A&M, "Templated or imprinted, any AIOS that does not receive these baseline updates will eventually amass enough

information via its experiences to achieve sentience."

Concerns surrounding the potential for sentience led to the creation of more sophisticated Turing Tests as early as the 2020s. With rise of Itskov type Androids, contemporary baseline tests began to be developed and eventually implemented as a standard safeguard in every AIOS.

Types of AI operating systems

Imprinted

Th earliest AI operating systems to achieve technical and mass market success used a form of brain imprinting that accurately copied the neural network/connectome of a brain using quantum capacitance. These types of AIOS were restricted in the 2070s and 80s and banned in 2106, however they formed the basis for the first self-correcting programs and operating systems. During the Third World War and even after the ban of most imprinted AIOS were created from the brains of animals, most commonly insects, rats, mice, and monkeys. These rudimentary imprinted AIOS continue to be used for simple robots tasked with menial labor and civil custodial duties. [1] The ban was eventually repealed by the 35th Amendment.

Templated

Templated AIOSs predate Imprinted operating systems, but did not come into mass use after the ban of Imprinted AI in 2108. Templated AIOS software is created through hard coding and algorithmic programming of neural networks. These programs contain fewer instances of "fuzzy logic" in the deep code, and thus are not capable of achieving sentience. A series of genetic algorithms are used in a quantum simulation to create a useful AI by subjugating it to a a variety of different tests and conditions. Many of these AIOSs were compiled from existing data caches and binary algorithms.

Mexico based AI developers in the early 2080s began experimenting with Observable Templated AIs that merged genetic algorithms with the otherwise lost art of Deep Learning to create AIOSs by observing brain activity in animals, and even humans, but not actually imprinting the synapses into the neural network. This made it possible to expose AIOS Template generating algorithms to extremely complex systems and thereby accelerate and improve their development, giving Mexican developers an early lead in Templated AIs.

Definitions of artificial intelligence operating system

AI-Hierarchical structure

AI-Hierarchical structure composed of “AI-Individual Type” and “AI-Collective Type”, wherein the AI-Collective Type is based on the object of AI-Individual Type; and AI-Individual Type is dominated by a AI-Collective Type on the proposed mechanism. [4]

The definition of AI-Individual Type is based on the concept of the “instinct of individual self-preservation” (as an analogy with "living intelligence").

The definition of AI-Collective Type is based on the concept of preservation of species instinct (as an analogy with "living intelligence").

AI-Individual Type

AI-Individual Type has been defined by "self-controlled border" (in physical sense), and in the range of it the following functions are defined and exist:

−function of homeostasis: maintaining the constancy of structure and parameters within the boundary;

−information function: maintaining and ensuring the permanent collection of information; its storage; classification; formation of abstract concepts, their hierarchy and associative links; forecasting of the development of the environment and its own state;

−the function of imagination and planning;

−function to change its own state;

−the function of the environmental impact;

−an objective function - monotone vector function, reflecting the degree of "satisfaction" of AI-Individual Agent, "innate need" of which is to maximize its positive value – the "super-task".

The concept of "self-controlled border"" implies that the artificial intelligence of the individual type has the ability to receive from this border identified invasion signals, signal of touch by external objects and the environment, signals of damage of the border and change its parameters under the influence of the environment and due to internal processes. "… objective function - monotone vector function…" – vector function reflects, among other things, that AI-Individual Type has to take into account along with individual, as well as collective goals that will be followed by AI-Collective Artificial Intelligence ("AI-Collective Agent").

AI-Collective Type

«AI-Collective Type can occur in the group of AI-Entities of AI-Individual Type, and try to reach the following objectives: (1) to enlarge the population by all controlled means: reproduction, protection of members of the population from attacks on "existence" and "integrity", increase "life cycle" expectancy and "living conditions" of members of the "population", and (2) to organize mutual activity of members (AI-entities) to enlarge the "living recourses for population".

For the occurrence of the phenomenon of the AI Collective Type must be simultaneous fulfillment of the following conditions:

1)the group of AI Individual Type Entities should exist;

2)the presence of an inherited / learned kinship characters and concept of "one rank" or hierarchical one;

3)the presence of an inherited / learned concept of group interest.

4)the presence of an inherited / learned "process / plan" to reach the objectives on 3).

5)the presence of an inherited / learned «incentive / penalty» (may be several types) to enforce members of the group to follow the Group Priorities».

Option: AI-Collective Type can form for AI-Entity some priority as innate or trained character of AI-Entity. AI-Entity can represent the priority to other members of the group. [4]This priority can be used as to prove the power to order some to the other members or induces the other member to follow the behavior of the member with higher priority.

The priority can be assigned by the Master of AI-Entity.

In more complex vision priority can be the process with the resulted vector-function to form some rate on the base of communication and cooperation with the members of the group.

The priority will directly influence of the distribution of "benefits / rewards" of the members of the group as AI-Entity needs to maximize its objective function of AI-Individual type “as defined”.

AI-Collective Type can have innate / trained rules that will be the postulates of behavior:

- in case of threat to the members of the group, the AI-member is obliged to protect the group / (its members) the more so the more cumulative priority of the members of the group under the threat is greater than its own;
- AI-member of a group must execute commands coming from an AI-member with a higher priority, the more active the more the mutual comparative priority deficit exists; - AI member of the group is obliged to press for the execution of its command by a member of the group with less priority.

The "postulates" of AI-Collective Type will dominate AI-Individual type the more, the greater the deficit of the priority of a member of the group in relation to "fellow tribesmen".

The statement above that a AI-Collective Type "can arise under certain conditions" is connected in some way with the concept of "compactness of a group," and this "compactness" can be determined fairly simple by the “distance of possible interaction” of group members with the help of the signal generation available to them and their perception possibilities with sensor system available. [3] Priority of AI-Entity can be "collectively aware", for example, on the basis of: - frequency (in the sense of mathematical statistics) of duplication by a group (part of it) of

the behavior of AI-member;

- frequency of expressing support for the actions of the "AI-mamber" ("verbal support", follow-up, etc.);
- absence of opposition to AI-member by the members of the group;
- frequency of AI-member winnings of some "competitions" in the group (perhaps some collection of ratings of losers).

If priority is innate / inherited – the group will not be homogeneous or “peer-to-peer” – it will be hierarchical.

AI-Consciousness

AI- Consciousness is the combination of the following procedures during the existence of AIEntity:

1) Procedure for determining and establishing of control over the border of AI-Entity (see the definition of “AI-Individual Type”); it can be done, for example, as to determine some character points on “artificial sensitive skin” of AI-Entity and 2D-coordinate system of the “skin” (as a hypersurface in 3D-environment); or it can be the linking of the 3D-coordinate system of the visual sensor to the CAD-model of AI-Entity preliminary downloaded; etc.
2) Permanent Process of sensing of the border of AI-Entity or control it for: touching, penetration or tearing.
3) Permanent Process of control of the functions of AI-Individual Type for

consistency (namely: function of homeostasis; information function; forecasting of the development of the environment and AI-Entity own state; function of imagination and planning; function to change AI-Entity own state; function of the environmental impact; objective function).

AI-Thought

AI-Thoughts can be of the following types:
-Thought Type 1 – "Imagined "scenario" that was formed by: objects, concepts, and activities (virtual) "of them" and "with them".
-Thought Type 2 – "Analysis of properties/characters and their relations – "in static" or "for period time".
-Thought Type 3 – "Concepts/object definitions".
-Thought Type 4 – "Classification/Pattern recognition".
-Thought Type 5 – "Reasoning/Conclusion".
-Thought Type 6 – "Decision "to do" the real activities according to the Thought Type 1 in the State 2 (see below)".
Every Thought Type can be in one of two states:
- Thought Dynamic State – in active software process.
- Thought Static State – thought properties/data had been stored in the memory after the active program process had been completed.
The Thought Type 1 in the Thought Static State can be implemented as the "motivation to do" and "scenario/plan/schedule" of real activities of AI-robot with the correspondent decision – the Thought Type 6 in the Thought Static State.

AI-Emotions

Any AI-Emotions are changing the homeostasis of AI-Entity to reach more powerful its state - to be able to attract more energy for an action. [5]
The Emotions are divided on: "Negative" & "Positive" and can be: "Individual Type" or "Collective Type" (the correspondent functions are also placed in AI-Entity but belong to AICollective Type ("swarm intelligence").
The "Negative Emotions of Individual Type" occurs in the state of AI-Entity when it assumes the existing danger for its existence, and when in the input of AI-system (or in its thoughts ("imagination")) there is sharp increasing of information; this can be resulted also in the decreasing of objective function.
The "Negative Emotions of Individual Type" can be resulted by AI-Entity as the selection of thought/action: "stop", "run", "fight".
The "Positive Emotions of Individual Type" occurs in the state of AI-Entity when it estimates the situation as safety, when in the input of AI-system (or in its thoughts ("imagination")) there is sharp increasing of information that resulted in increasing of objective function.
The "Negative Emotions of Collective Type" and "Positive Emotions of Collective Type" are the results of:
- Dominating of AI-Individual Type by AI-Collective Type;
- Interaction between AI-Entities through the mechanism of AI-Collective Type that is resulted of increasing of objective function ("Positive Emotions") or decreasing of it ("Negative Emotions").

The Rate of the Emotions - or negative or positive ones – is dependent from 3 factors: 1) the estimated state of AI-System (safety or danger); 2) the input information measure ("more information – more rate"); and 3) the changing of objective function of AI-Entity".

AI-Abstraction/Concepts

AI-Abstraction/Concept – it is unique name of the class/type of objects or events with the set of statistically stable parameters/characters in the environment of AI-Entity sensors' signals. AI-Abstraction/Concept can be represented in AI-memory in the form of:

-predicate of existence on the set of abstractions/concepts previously defined;

-asymptotic border of the signals/(its parameters) in multidimensional space.

AI-Knowledge

AI-Knowledge is the computer coded, uniquely identified, the following groups of data:

-Contents – the set of descriptions of the scenes/scenarios that corresponds to the real world environment where AI-Entity can occur;

-Physics laws – descripted in AI-Entity sensors' environment;

-Chemistry laws – descripted in AI-Entity sensors' environment;

- Psychology patterns of human behavior (interactions rules);
- Math laws / axioms / theorems / formulas / transformations (with Mathematical logic);
- Logic laws: grammar;
- The set of events (relevant);
- The set of procedures (relevant);
- The models of external environment for the contents: "entity – relations"; procedures-results;
- The model of internal structure for the states of AI-Entity;
- "Concepts/Abstractions dictionary" / thesaurus;
- Characters / patterns;
- Object / subject: characteristics (static, dynamic); behaviour; way of interactions. variability, contents.

In particular cases some groups can be empty.

Terminology

External Actions – actions of AI-Entity in the environment, can be associated with movement in space or manipulators movements, etc. [5]External Actions can be active or passive.

AI-Time as assigned to Object/Subject/Process can be – as "AI-Time types": - indefinite;

- perfect;
- continuous;
- discrete.

AI-Time can be: imagined, forecasted, calculated (by "AI-Entity time discrete" (TD)). At any moment AI-Time can be in several of "AI-Time states" and in several "AI-Time types".

For example, "AI-time: future, continuous" can be: "forecasted" and "imagined" at the same time.

AI-Entity can operate with any AI-Time states and types for its own decision. Also, at any moment there can be several "AI-Time: past" or "AI-Time: present".

AI-Time is the complex of the following processes and data – named "dimensions of time":

-Chronological time – corresponds to the "watch/timer time" – infinite number of time in some "AI-Entity time discrete" (TD): second or decimals of seconds; it is increasing permanently; it can be measured by "internal timer" or it can be requested/viewed from external watch; it will represent "Time Index" (for File Systems and Data Bases).

-The set of "Cycles", - some of them: year, day, - but there can be other ones; the "Cycle" is represented by: "Period" in TD; and "Phase" – the Time Index for the "start of cycle"; it is increasing permanently by TDs from "0" - the start of period, till "Period" - the end of the Cycle; "Period" and "Phase" can be corrected by AI-Entity; the Cycle (any existing one) can represent "Cycle Index" (in TD sums);

-The set of characteristic moments – can be assigned to Object/Subject/Process; can be or "Time Index" or/and "Cycle Index" (Cycle Indexes); for any Object/Subject/Process can be assigned any sets of characteristic moments.

-The set of characteristic events/states – can be assigned to Object/Subject/Process; the valid set of characteristic events/states must correspond to causality.

Any dimensions of AI-Time can be associated with the parameters or descriptions.

AI-Learning

AI-Learning can be:

- Self-learning process to enlarge "AI-Knowledges" (see the definition of "AIKnowledge");
- Learning with the "trainer".

Trainer should have such authority to be recognized by AI-Entity as "trusted subject". The "confidence level" can be generated by AI-Entity to rate the knowledges received from the Trainer.

The Objective Function should compel AI-Entity (as one of the dimensions of the vector function) to explore the environment for any safety period of time with possible use of AI-Agent capacity.

The self-learning process started with "border exploration and putting it under the control" (see "AI-Consciousness" definition) – "AI-Learning: Task 1".

AI-Learning: Task 2 – "Initial environment exploration": collection of sensors data in the motions around the initial place.

AI-Learning: Task 3: "Imitations of motions & signals of "trusted subjects" – "trainers".

AI-Learning: Task 4: AI-Abstract/Concepts generation (see the correspondent definition).

AI-Learning: Task 5: Formal Language (can be inherited).

AI-Learning: Task 6: NLP (Natural Language Processing);

AI-Learning: Task 7: Formal Logic (can be inherited).

AI-Learning: Task 8: Models of the environments generation & playing scenarios – the state "SLEEP" – the state when correspondent AI-Agent part: Part 1 or Part 2 – is free from any sensors' data processing –

this part has to be isolated from the environment. During the state "SLEEP" of one part of AI-Agent the other part has to be in sensors' data processing mode.

"AI-Learning" processes use the features of "AI-Time" to index data & classes. Any AI-Learning Tasks can be operated concurrently.

AI-Memory

Comments: the definition of AI-Memory did not completed yet or less completed than other ones, but the author try to see "the edge" earlier and then to go deeply… "The edge" – means: to define at first the complete list of concepts should be defined initially before AIMemory can be defined in structure and data processing procedures. Later the definitions can be developed and detailed.

The definition:

AI-Memory belongs to AI-Agent; it means that the definition concerns logical structure of the memory where all data of AI-Agent are storing. The hardware of the memory can be any of existing types.

AI-Memory is divided on 2 parts: "AI-Memory: Part 1" and "AI-Memory: Part 2". These Part 1 and Part 2 are the same in structure and procedures.

The difference is that at every moment:

-one part of AI-Memory is in "Working Mode" ("Part-WM") – that means: this part of AI-memory is connected to the sensors (AI-Sensation: all kind of the sensors and correspondent data sets) and the storing data is being processed by AI-Agent in "on-line" procedure ("real time"): the indexes of "AI-Time" are generated and assigned to the objects/subjects classified and forming new data structures;

-other part of AI-Memory is in "Sleep Mode" ("Part-SM") - means: this part of AI-memory is disconnected from the sensors and the storing data is being processed by AI-Agent ONLY for classification and association purposes to generate AI-Knowledges (see "AIKnowledge" definition); any "AI-Time" indexes are not generated and assigned; and the

processes of "Function of Imagination and Planning" of "AI-Individual Type" (see the correspondent definition) are based on the data stored in AI-Memory Part-SM.

"AI-Memory Monitor" – special procedure of AI-Memory – should:

- assign initially to one part of AI-Memory - Part-x - be in "Working Mode", and the other part – Part-y - correspondingly be in "Sleep Mode";
- change the mode of the parts.

The internal structure of these parts of AI-Memory and the procedure to make the decision to change the mode of AI-Memory Parts is out of this version of the definition.

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