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AI based OS

Future of Operating System

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***Abstract*—**This research paper analyses how AI can be useful 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. Strong Artificial intelligence-based methods can be used for AI based OS. Expert system, neural networks, pattern recognition, fuzzy logic prediction, and other AI features are useful to develop the AI operating system. AI based OS will have abstraction association AI thinking, perceptive intelligence, imaginations context specific search, context priming, and other AI techniques. This paper also includes some of the OS projects that already exists or being developed. We will also discuss pros and cons of AI based OS.

Keywords*—AIOS, expert system, fuzzy logic prediction, intelligence management system*

I. Introduction

An artificial intelligence operating system (AIOS) is a form of system software that manages computer hardware and software resources and provides common services for computer programs via general artificial intelligence. The AI operating system is a component of the system software in a computer system.

This paper talks about Artificial Intelligence based Operations system which has perceptive intelligence, imaginations context specific search, context priming, abstraction association thinking and other AI techniques. These methods help in cutting down the operation time by using parallelization of processes, good management of memory, and improved security. New operating systems have digital assistants, translation services, voice recognition, user interaction, profile management, security scanning, and user reporting. AIOS will have features related to hardware management, software management and common system services. The main difference from traditional OS will be the intelligence in the management of the OS. AIOS will use intelligence of a computer or a machine in order to solve complex problems with ease. Operating system architecture evolved from old IBM Mainframe to Linux and macOS. Soon AI will play an important role in Operating System architecture. Windows metro showed some of the features of Artificial intelligence in the operating system.

Type of AI needed:

AI can be classified into two types Weak AI and Strong AI. Weak AI, also known as narrow AI, focuses on performing a specific task, such as answering questions based on user input or playing chess. It can perform one type of task, but not both, whereas Strong AI can perform a variety of functions, eventually teaching itself to solve for new problems.

Strong Artificial intelligence-based methods are used for AI operating system. Fuzzy logic, expert system, neural networks, pattern recognition, prediction, and other AI features are used to develop the AI operating system.

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II. Features

The following are some major features of AIOS:

- Monitor and optimize their own performance
- Smart Process Management
- Smart Memory Management
- Predicting results
- Using the right resources
- Making sure that resources are available by predicting before a process asks for it
- Suggesting alternative options to a problem.
- Search internally and externally for information to help themselves.
- Deriving a solution to problem by themselves
- Healing themselves and getting immune to viruses after attack.
- Communicate to other OS

III. Working

The operating system consists of kernel, shell and system services. User interacts with the terminal for shell services. The services are components related to authentication, authorization, scheduling, managing files, and reporting. The kernel has capability to scale elastically, execute run-time independent of the technology stack, and abstract the container from specific implementation. The containers can be easily deployable across different clouds. This operating system will be useful for AI based data modeling, machine learning, and deep learning. The data need to be processed and analyzed for training, testing and executing the AI models. The operating system can select the specific container which has the technology stack to analyze the machine learning models. It can be based on Tensor Flow, Keras, Caffe, scikit-learn or R based technology stack. Managing and integrating with different data sources will be easy in the operating system as it is AI based. Using the elasticity pattern, operating system can scale easily using multiple nodes and storage management features. It can have features such as self-correcting, self-optimizing and auto scaling. The operating system can have discoverability services related to finding the different services, functions, models, data sources, and technological components. Similar to App Stores, this operating system will

have an app store which will have applications which can be deploy-able easily. Vendors and developers can publish the applications.

IV. System Life Cycle

Like a classical operating system, the important features remain same from booting to shut down. The code runs from the boot disk and locates the partition boot record. This record locates the booting specific code files. These files are loaded for execution. After the loading of the files, user is presented with a user-friendly interface. At this point, the services related to artificial intelligence methods are initialized. Boot sequence ensures starting these services to help the user to perform his tasks. AI services take over from the boot module and help the user to process his requests by command line, text, gestures, user interface menus, and voice. These services keep track of user data, patterns, navigation, behavior, and use the data for learning. The communication services use signal-based channels to send and receive messages. AI Basic module is processing information and helping different services to manage the system. User actions are stored and updated in a data store. The application specific behavior, file naming, organization of content, and information processing are persisted in the data store. To handle language processing related to voice, text, and command line methods, NLP & NLU modules are used to process the content. Neural network-based module helps in learning the user input patterns in voice, text and gestures. Personal usernames, passwords, preferences, profile data to fill the forms, and user data are stored in a secured data store. The operating system provides a better login experience where there are minimal inputs from the user.

V. Technologies that can be used

A) Expert System: An expert system is a computer system emulating the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, represented mainly as if–then rules rather than through conventional procedural code. The first expert systems were created in the 1970s and then proliferated in the 1980s.Expert systems were among the first truly successful forms of artificial intelligence (AI) software. An expert system is divided into two subsystems: the inference engine and the knowledge base. The knowledge base represents facts and rules. The inference engine applies the rules to the known facts to deduce new facts. Inference engines can also include explanation and debugging abilities.

B) Neural Network: Evolving nature of the neural network will help the operating system to learn about the user and will help in creating a better experience for the user. A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature.

C) Pattern Recognition: Pattern recognition is the automated recognition of patterns and regularities in data. It has applications in statistical data analysis, signal processing, image analysis, information retrieval, bioinformatics, data compression, computer graphics and machine learning.

D) Fuzzy Logic System: Fuzzy logic systems receive incomplete, ambiguous, distorted, or inaccurate (fuzzy) input but in turn it provides acceptable definite output. The approach of FL imitates the way of decision making in humans. Elements of an operating system such as process management, file management, storage management, distributed system management, etc., can be used to tackle the problems by fuzzy information after it is fuzzified. A fuzzy logic system allows operation of computer systems for the users in convenient and natural manner in both certain and uncertain environments. Fuzzy logic systems make the computer systems work efficiently and economically under fuzzy and precise conditions.

VI. Current Progress

Some projects on AI based OS by various organizations are:

- Black Swan: An Israeli software services developer debuting this week positions its platform service as an enterprise AI operating system that combines deep and machine learning, natural language processing, neural networks as well as data operations.
- Algorithmia's AI OS: Algorithmia's CEO, recently gave at the 2017 GeekWire Tech Cloud Summit, titled "Building an Operating System for AI".
- NeurOS: Artificial neural network-based OS named NeurOS is developed. Its functions including perception, pattern learning and recognition, working memory, imagination, prediction, context priming, attention, abstraction, classification, associational thinking and behavior. NeurOS applications are inherently portable, scalable, networkable, extensible and embeddable.
- Cognition: AIOS based Operating system namely Cognition has been developed which helps as an intelligent assistant, electronic advisor, offer engines and Chatbots.

VII. Advantages

- AIOS can be considered as future of Operating Systems. The benefit of an AI based OS is it will provide help in defense systems, bio-medical researches, scientists, education and many more.
- The biggest advantage or feature of this OS is that using AI it will be continuously learning and will grow itself with time. As a human learns thongs from his/her previous mistakes similarly this OS will become better and better as it grows.
- The AI will also help users to perform complex and expert task in short amount of time.It opens doors for ease in modification i.e., you don't have to wait for company to release an update, or restart your machine. The OS will automatically update itself in run time. Modifying the AI does not affect the structure of an AI, hence AIOS would reduce the crashes that often occur in Operating Systems.
- The AIOS would be a great merger from traditional Operating Systems to the OS which could reduce time of operation, parallel process management, improvised memory management, provide better security and understand the user to some context

VIII. Disadvantages

- It's easy for AI to understand natural language, so it is possible that the OS is able to understand your emails, messages, and even calls which can be threat for a user.

- Setting up AI-based machines, computers, etc. entails huge costs given the complexity of engineering that goes into building one. Further, the astronomical expense doesn't stop there as repair and maintenance also run into thousands of dollars.

- AI is making humans lazy with its applications automating the majority of the work. Humans tend to get addicted to these inventions which can cause a problem to future generations. As AI requires lot of calculations, predictions, speech recognition and decision making its possible that it could slow down the OS and also it would require more external storages. Lack of common sense while reasoning will also disappoint the user of AIOS.

CONCLUSION

The evolution of Artificial Intelligence is at great heights, and yes, we are using a machine to create it, and evolve it. It's going to be amazing when the AI created by the machine itself helps to evolve the OS running on it. It's unimaginable how much fast and good an OS can become using AI as a tool and as AI grows so does the OS will grow. As a conclusion there is a need of AI based OS but, before releasing, it should be trained very well, also if it gets in wrong hands, they can make it harmful for humans and cause terrorism. The goal of artificial intelligence is to create systems whose intelligence equals or surpasses humans.

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