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Plato's Philosophy and Cloud Computing System with a Cognitive Approach

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Abstract: In this study, a cognitive approach has been adopted to examine the relationship between Plato's philosophy and modern cloud computing systems. Plato's theory of forms has been conceptualized within the framework of digital technologies, establishing a parallel between the metaphysical world of ideas and cloud-based data processing. The epistemological and computational intersections between these domains have been analyzed, focusing on how knowledge is structured, stored, and processed in contemporary cognitive systems. The interaction of cognitive humanoid robots with cloud environments has been investigated, and their role in the dynamic acquisition and utilization of knowledge has been highlighted. A model integrating statistical and algorithmic interpretations of Plato's cognitive cycle has been proposed, demonstrating its relevance to AI-assisted learning mechanisms. Through comparative evaluations, cloud computing has been identified as a structured system that facilitates data abstraction and transfer, reflecting the epistemological process outlined in Plato's philosophy. The findings have shown that the cognitive functions of cloud-based AI systems align with Plato's philosophical constructs, particularly in the area of knowledge representation and processing. Furthermore, statistical modeling of knowledge acquisition in cloud systems has been examined to establish a formal relationship between idealized knowledge structures and real-world applications. A systematic analysis of cloud computing and Internet of Things (IoT) technologies has been conducted, and the significance of maintaining the connection between Plato's forms and sensory experiences has been identified. The results indicate that cloud-based AI solutions correspond to Plato's conceptual structures, particularly in the processing and abstraction of knowledge.

Keywords: philosophy of Plato, forms, things, cloud computing, IoT, cognitive system, cognitive humanoid robot

1. Significance Statement

The most important feature that distinguishes humans from other living things is its developed cognitive structure. Developing concepts, language, and mathematics, the human mind has reached today's technology, by developing the modern science methodology too, which is the basis of the technology it produces, while developing its mindset based on logic and philosophy. In doing so, humankind conceptually established the foundations of this development with Plato about 2400 years ago. The communication of the human mind with the world of ideas, which is based on the concepts, and their embodiment in the world, has formed the reductionist side of the human mind from abstract one to through the objective one. In fact, the information appeared like a flow from the field of pure knowledge to the human mind; hence, it transformed into dynamic knowledge and enabled the concepts to be objectified. A similar technological situation today is the humanoid behavior that emerges with the interaction between the data in cloud computing systems and the memory of a cognitive robot communicating with it. The meaning of information flowing from a central domain of knowledge in the cognitive humanoid robot is the projection of Plato's philosophical approach 2400 years ago in our technological world today. This study emphasizes the philosophical and cognitive side of technology based on this defined similarity.

2. Introduction

In ancient philosophy, Plato and Aristotle played vital roles in shaping human history and modern science. Plato's ideas influenced human thought and the realm of faith, while Aristotle's approach focused on understanding the physical world through experimentation [1–3]. Aristotle, therefore, laid the foundation for modern science and technology. Modern science, rooted in Aristotle's principles and methodologies, has contributed to the development of today's technological knowledge [4]. However, contemporary technology remains closely connected to Plato's ideas [5], and it is likely that this connection will be further enhanced with future advancements in technology [6]. Nonetheless, the challenge lies in defining cognition within the cloud system or integrating it into a higher system using algorithmic approaches, which is still at a nascent stage despite some existing definitions in this regard [7, 8].

Plato believed that humans and the human soul possess purer and elevated emotions in the realm of faith. Consequently, Plato's philosophy had a significant impact on the aesthetic, artistic, mystical, and metaphysical aspects of human comprehension,

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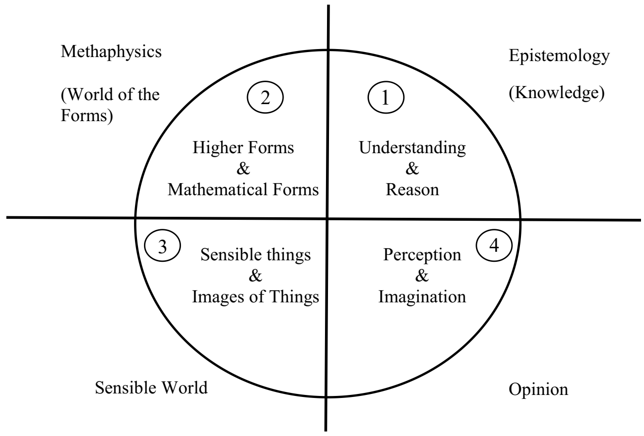
shaping human cognition as a poetic element [9]. On the other hand, Aristotle's concepts emphasized realism and pragmatism [10]. According to Aristotle, society aims for a more comfortable life, which forms the basis of contemporary entrepreneurship and e-commerce concepts. While Plato's philosophy focuses on the individual soul, making it more local than global, it can be generalized as "Think globally, act locally." Thus, his philosophy serves as a synthesis applicable to the present day.

Consequently, Aristotle's philosophy and approaches are responsible for the modernity of science and technology we witness today. However, contemporary technology also exhibits similarities with Plato's understanding, suggesting an integration of both Aristotle's and Plato's thoughts. Based on these considerations, this study aims to map Plato's philosophy, rooted in the concept of the World of Ideas, as the communication link between the cloud computing system and a cognitive humanoid robot named Platonics, within the digital-virtual world.

Figure 1
Plato's epistemological system



3. A Short View to Plato's Philosophy

Plato's most significant philosophical works are his dialogues, where he engages in discussions on specific themes with two or more participants. Some notable examples include "Apology," "Crito," "Gorgias," "Phaedo," "Meno," and "Symposium" [11].

In his metaphysics, Plato distinguishes between "Things" and "Forms." Things refer to objective entities that can be sensed by humans, representing aspects of reality that are subject to change and decay with time. Forms, on the other hand, are defined by ideas and are eternal and unchanging. They exist as perfect conceptual realms comprehended through reason rather than sensory perception.

According to Plato, the world of forms is the "real world," while the world of things is regarded as an imitation of reality. Imperfect things in the sensible realm exist as imperfect models of absolute and perfect forms.

Plato's philosophy presents the world of ideas as an upper world, and all occurrences in the sensible world are conceived as concepts within this realm. This upper world is defined within the context of epistemology, represented by "knowledge," with its elements being understanding and reason. Forms exist within the world of forms or the epistemological domain.

In this realm, the key term is defined in the form of a verb of knowing, allowing for the knowledge of invisible things or forms through intellectual means. The main source of things is related to reason, playing the role of an adjective, such as the term "good."

The illustration of Plato's epistemological framework, divided into four distinct components, is presented in Figure 1.

4. Cognitive Cycle in Plato's Philosophy

Based on Figure 1, the first part (numbered as 1) depicts the epistemological world at the level of knowledge. The fundamental functions of a super-cognitive system, which includes consciousness, are understanding and reasoning. Moving on to the second part, forms manifest in the abstract space of the metaphysical world. As an observer, the human brain perceives these forms as objects and images. The mind, referred to as his space, then translates them from ideas into objective meanings. Therefore, the human mind and consciousness act as a unified cognitive system, utilizing abstract forms known as ideas, akin to shadows or forms existing within itself. Consequently, it acquires self-knowledge, reflecting the essence of part 1. Plato's metaphysical approach and the world of ideas are thus represented through this cognitive system.

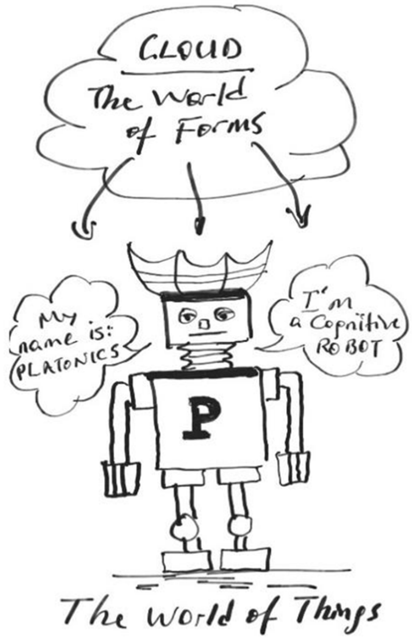
Here, the conscious must be an unconditional concept because, in the world of the forms, the mathematical forms are defined and mathematical concepts or itself of mathematics can be done [12] into the conscious. For this reason, conscious is an absolute thing as indicated by Max Planck [12–14]. The cognitive capacities contingent upon their definitions serve as propelling forces in delineating mathematical forms, analogous to the conceptual framework of comprehension and reasoning.

The memory systems of Platonics serve as repositories for storing information and data. In this context, the term "cloud" pertains to the utilization of cloud computing technology within the realm of robot memory. Cloud computing facilitates seamless provision of computational resources, storage capacity, and data management services through an internet-based network or server infrastructure. Consequently, robots can employ cloud computing services to store information, process data, and even leverage algorithms based on artificial intelligence. Sensors, cameras, and other data collection tools embedded within the Platonics's memory enable it to perceive and interpret the surrounding physical environment. The collected data are transmitted to the robot's memory where it undergoes processing. However, in certain scenarios, a robot's onboard memory may have limitations, lacking sufficient resources to accommodate and process all available data. This is where cloud computing plays a crucial role. Robots can transfer data to a centralized server or data center using cloud-based services. Subsequently, these data are stored within the cloud, subject to processing and even analysis employing artificial intelligence algorithms. Platonics robots can access cloud services via an internet connection, ensuring prompt access to pertinent information whenever required. Consequently, cloud computing technology permits the expansion of a robot's memory, granting access to enhanced storage capacity, processing capabilities, and data analytics. Additionally, collaborative efforts and data sharing can be achieved through the utilization of a shared cloud-based memory accessible to multiple robots.

5. Cloud Computing Basics and Internet of Things (IoT)

Today's modern technology can be understood through the lens of Plato's approach, as depicted in Figure 2. This figure illustrates the relationship between the world of forms, represented as a cloud

Figure 2
A cognitive humanoid robot platonics and metaphysical world-cloud system



system, and the world of things. The communication between these two realms is facilitated by smart communication, leveraging cognitive technology similar to human consciousness [7]. Thus, human consciousness can be seen as the things of Plato, utilizing abstract ideas from the world of forms (big data). With this perspective in mind, the following can be attributed to a cloud computing system and the IoT.

5.1. Cloud computing basics

A cloud computing system is a computing paradigm in a large pool system, which is connected with private and public networks. Here, the cloud computing is based upon the board band-spectrum applications and the reusability of IT capabilities [15, 16].

The cloud capabilities are listed as follows:

1) Dynamically scalable infrastructure,
2) Self-service management,
3) Pay per use.

A cloud provider gives the following services:

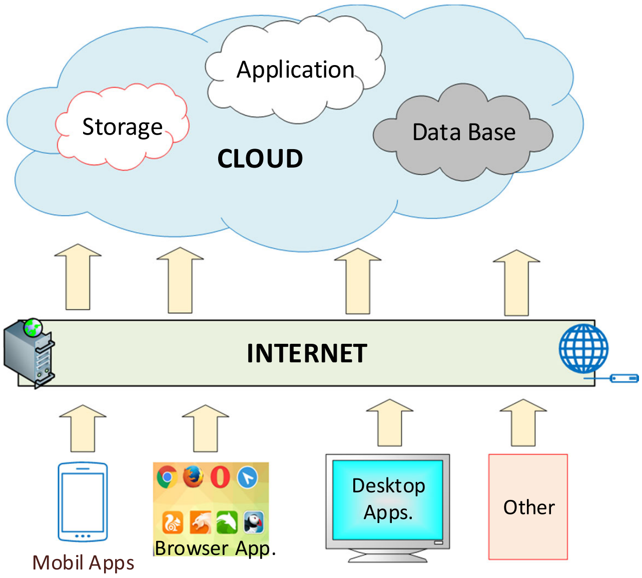
1) SaaS (Software as a Service): Internet-based application and service to the end-user.
2) PaaS (Platform as a Service): The platforms, which are used to design, build, and test applications.
3) IaaS (Infrastructure as a Service): Services like storage and database management [17].

For enterprises, applications are presented on the public, private, or hybrid clouds.

The benefits of cloud computing are given as follows:

1) Reduced cost,
2) Increased storage,
3) Flexibility.

Figure 3
Conceptual view of the cloud computing system



A conceptual view of the cloud computing system is shown in Figure 3.

Finally, cloud computing provides the action moves to the interface between service suppliers and service consumers [18–20].

5.2. Internet of Things

The IoT defines a network that connects anything to the internet using special protocols. It provides smart recognition, positioning, monitoring, and administration.

In this context, IoT is a global structure that offers solutions based on the integration of information technologies. IoT encompasses various hardware devices for connectivity, and the collaboration among these devices is managed with a high level of safety. However, the most important characteristic of IoT is its "interconnectivity," which enables connections with the global information and communication infrastructure. Another characteristic of IoT is interoperability. This means that any IoT device can connect to another device and exchange information based on desired preferences. This is achieved through the network and communication protocols. Additionally, technical interoperability procedures, such as physical and logical connections among systems [21, 22], contribute to the core value of interoperability on the internet. Connected systems are able to communicate using the same language of protocols. From this perspective, IoT can be applied to various fields in modern life, including industry, human health, smart agriculture, and more [23–26].

5.3. Comparisons on the cloud system and IoT

The comparisons of the roles between the cloud system and IoT can be summarized in terms of some characteristics, processing ability, storage capability, connectivity power, and big data. Hence, Table 1 can be shown for their comparisons.

Hence, the connected state between cloud computing and IoT can be interpreted as a joint upper system.

Table 1
Comparisons between cloud computing and IoT

Some items	Cloud computing	Internet of Things (IoT)
Characteristics	Virtual resources	Real-world objects
Connectivity	Internet usage for service delivery	Taking the main role in the internet
Storage capability	Unlimited storage capabilities	Very limited storage capability
Processing capability	Unlimited computation capability	Limited computation
Big data	Management of big data	Generation of the big data

6. Statistical and Algorithmic Interpretation to Plato's Approach

Plato's conceptualization of the interaction between the ideal world and the sensory world can be rigorously formalized through a statistical model. This model aims to quantitatively portray the probability of accessing and utilizing information from the ideal realm through the sensory world. The model takes into account crucial factors such as the quantity of information present in the ideal world, the quantity of information available in the sensory world, and the dynamics of information transfer between the ideal and sensory domains. By incorporating these salient factors, the model effectively predicts the likelihood of accessing and employing information from the ideal world through the sensory world.

Plato's philosophical framework invites further comprehensive scrutiny and comprehension using the tools of statistical modeling. This analytical approach not only fosters a profound understanding of the ideal world but also holds promise in facilitating well-informed decision-making.

For example, the development of a predictive model that assesses the probability of accessing and utilizing information from the ideal world through the sensory world could substantially augment individuals' capacity to acquire knowledge and, in turn, make more informed choices. This has the potential to yield far-reaching benefits, including improved educational outcomes, enhanced employment prospects, and an overall elevation in the quality of life for individuals.

The scientific algorithm employed to represent current cloud systems statistically or quantitatively is as follows:

Step 1: Metric Identification

Identify relevant metrics that can effectively measure the performance of the cloud system. These metrics should be selected based on their ability to capture critical aspects of the system's functioning.

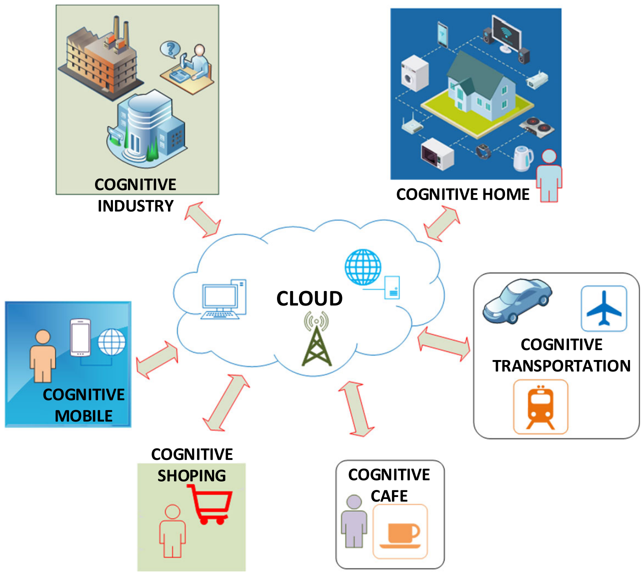
Step 2: Data Collection

Collect necessary data to evaluate and quantify the performance of the cloud system. The data collected should align with the identified metrics and should be comprehensive enough to provide a reliable assessment.

Step 3: Data Analysis and Metric Calculation

Analyze the collected data and calculate the specified metrics. This involves processing the data and utilizing appropriate statistical methods to derive the desired quantitative measurements.

Figure 4
Relationship of cognitive digital world



Step 4: Metric Interpretation and Evaluation

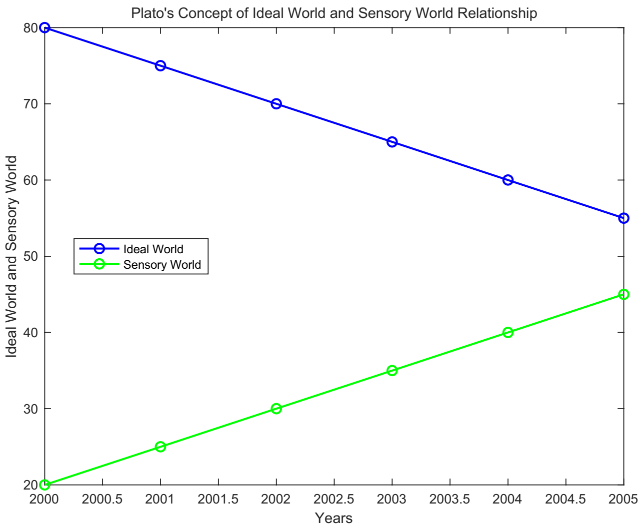
Interpret the calculated metrics and evaluate the cloud system's performance based on the results obtained. This step involves a careful examination of the quantitative outcomes in the context of the cloud system's objectives and requirements.

The outlined algorithm serves as a fundamental guide to statistically or quantitatively represent existing cloud systems. It emphasizes the importance of selecting appropriate metrics that are tailored to the specific application's needs. As cloud systems can vary significantly in their functionalities and purposes, the choice of the most suitable metric plays a vital role in obtaining accurate and meaningful performance evaluations.

The representation of this algorithm in the Python programming language is provided below:

```
def get_cloud_system_performance_metrics(cloud_system):
"""
Get metrics for the performance of a cloud system.
Args:
cloud_system: The cloud system to get metrics for.
Returns:
A dictionary of metrics.
"""
# Get the metrics that can be used to measure the performance of the cloud system.
metrics = [
"data_usage",
"compute_power",
"storage_capacity",
"network_connection_speed",
"security_level",
"availability",
]
# Get the data for the metrics.
data = cloud_system.get_performance_data()
# Calculate the metrics.
results = {}
for metric in metrics:
```

Figure 5
Plato's concept of ideal world and sensory world relationship




```
value = data[metric]
results[metric] = value
return results
def analyze_cloud_system_performance_metrics(metrics):
""""
Analyze metrics for the performance of a cloud system.
...
...
```

In Figure 4, the connections and relationship between the Cognitive Digital World and the Cloud System are delineated.

7. Concluding Remarks and Discussions

From a broad perspective, this study presents Plato's metaphysical world or the world of forms through the emulation of a cloud system, encompassing high storage capacity, databases, and application units. Within this system, the stored data possess the equivalence of knowledge found in the metaphysical world. The flow of knowledge occurs from the world of forms to the world of things. This area is further represented by the cyber world of the internet, interconnected through mobile applications, browser apps, and other units. These interconnected units assume the role of things according to Plato's definitions.

As a concluding remark, the following lemma can be defined. Hence, this is the cross point of the philosophy and technology, namely techno-philosophy or Technosophy.

"In the human thinking system, the concept of Plato's ideas World is mapped to the Cloud-Cognitive Robot System based on the Data Communication in technological manner." And then it can be defined by the following lemma:

$$P(I) \xrightarrow{T(\cdot)} Q(D)$$

Where:
$P(I)$: Plato's ideas world
$T(.)$: Technological transform
$Q(D)$: Objectiveness from the data.

The relationship between Plato's conception of the ideal world and cloud computing systems can be represented scientifically through a graph as a curve. This curve will illustrate how closely the ideal world approaches the sensory world through cloud computing systems.

According to Plato, the ideal world is distinct from the sensory world, which is ever-changing and imperfect. He views the ideal world as the realm of immutable and perfect entities, while the sensory world consists of changing and imperfect entities.

Cloud computing systems symbolize the interaction of the ideal world with the sensory world. These systems offer individuals the ability to access and utilize information from the ideal world through the sensory world. As a result, people can acquire more knowledge from the ideal world and make better decisions.

By representing the interaction between the ideal world and the sensory world, cloud computing systems enable individuals to acquire better knowledge and make improved decisions. Consequently, according to Plato's philosophy, cloud computing systems bring the ideal world closer to the sensory world.

The curve depicting the relationship between Plato's ideal world conception and cloud computing systems commences at a starting point and progresses along an orbit that indicates how close the ideal world approaches the sensory world. The shape of the curve demonstrates the degree of proximity between the ideal world and the sensory world. The slope of the curve indicates how rapidly the ideal world approaches the sensory world (Figure 5).

As a result, generating new knowledge is related to the upper system and storage in the cloud. Hence, the cycle goes on in this structure, and then the cloud computing system plays a role in the technological aspects of Plato's philosophy. This is just an analogy. But including the machine learning algorithm into the cloud systems, this huge system will be a more general-purpose machine. Moreover, in light of the advancements beyond Industry 4.0, this cyber-universe will entail comprehensive descriptions of cognitive characterizations, production models, and lifestyles. In this meaning, it will be an alternative approach to the human–machine interaction, as a physical–cyber universe interaction.

Hence, the digital world, which consists of the cloud system and IoT, can be defined as the worlds of ideas, which are described in Plato's philosophy. However, this digital world is a product of Aristo's realistic world rather than the Plato's worlds. In terms of human life and usage, this interaction is similar to the information flow between the abstract world and realistic one. Figure 2 shows this relationship by the help of the "Platonic"! The humanoid cognitive robot platonic is presented, as a bridge between the Plato's conceptional worlds, by the technological view.

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Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Author Contribution Statement

Serhat Seker: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration. **Tahir Cetin Akinci:** Methodology, Software, Investigation, Data curation, Writing – review & editing, Visualization. **Ahmet Ozturk:** Formal analysis, Investigation.

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