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An Investigation of Artificial Life to Examine Systems Related to Natural Life, Its Processes, And Its Evolution, Through the Use of Simulations with Computer Models, Robotics, and Biochemistry

Elangovan Muniyandy[1], Arun jayakar S[2]

[1] Professor and Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, India
[2] Bannari Amman Institute of Technology, India
*Corresponding Author Email: [1]muniyandy.e@gmail.com

Abstract

Science, arts, technology and social implications which are related to nature are discussed in artificial life. This study is approached to understand the structure and abilities of the living system. In the whole world different kinds of spices of the living system are present and this complexity is included in artificial life. In the early stages, artificial life is used to develop new autonomous technology such as robots. The technology has developed as per the formation of the living system. Artificial intelligence system is involved in a robot that provides operating commands and the entire system is operated by the commands. Basically, AI technology is capable of making algorithms based on information and the system provides commands to robots as algorithms. Under artificial life genetic algorithms have been observed and this observation helps to develop robots. Different kinds of mediums are used in artificial life to understand the structure and characteristics of the living system.

Initially mathematics has been used as it is capable of making numerical value of living system equations. However, technology has developed and computer simulation has been introduced in artificial life to provide better representation of living system equations. Computer simulation is capable of providing a visual representation of a living system that helps to understand the structure and characteristics of it clearly. Better understanding has been developed on the living system and its activities and for this reason researchers are able to develop new technologies on it. Biochemistry has also huge involvement in artificial life as it helps to understand characteristics of natural chemicals which play an important role in forming the living system. Involvement of biochemicals helps to develop artificial cells in the technological field and this development plays an important role to fill the gap between machine and human. The entire study has been developed on secondary qualitative data. Secondary data has been collected from different kinds of sources such as journals, articles and websites.

Keywords

Artificial life, AI technology, Biochemistry, Robotics.

INTRODUCTION

Artificial life is about the field of study in which science, artistic, technology and social implications are discussed related to nature. In the initial stages, artificial life is used to make autonomous devices for increasing usability of technology in various activities. Basically, artificial life is used to understand the entire system of living life. Different kinds of spaces are present in nature and their structure is much more complex, study of artificial life is considered to understand this complexity. In the early stage this system has been used for producing autonomous devices. Development has happened in this system and that has helped to establish modern principles of artificial life. Modern artificial life promotes robots and computer models which are used to understand the complexity of the living life system. However, these models are involved to make research on genetic algorithms that helps to define the artificial creatures that are designed as per the requirements of human life.

Genetic algorithm is used to define selection of natural analogues and it is developing gradually. Usability of natural analogues is increasing to make new designing's which have great importance for making human life comfortable. Different kinds of natural aspects are described through this study that helps to understand the real-life practice. Coordination and behavior of natural elements are observed under this study that helps to supervise for improving. Bio chemistry is involved in artificial life to understand the structure and formation of the living system of nature. Artificial intelligence systems are used to define artificial behavior of natural elements and also to focus on the problems which are occurring in generating behavior. Robots have been developed as per the behavior of natural elements and artificial life study helps technology on this development.

LITERATURE REVIEW

Importance of artificial life to examine natural life

Artificial life helps to understand different kinds of natural behaviors such as self-growth, reproduction, evaluation and learning. Most of the researchers try to find out the concept of insights of living systems that promote self-organizing. Software and hardware are basically used to understand the

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complexity of the living system that helps to develop technology based on human behavior orientation. Software is considered as the root of artificial life as characters of life are defined through software. Structural materials are also characterized by software and for this reason software is largely used in artificial life. Entire system is created in artificial life under the help of software and different kinds of data are imported in the software [1]. These elements are used in artificial life to make a model such as a living system. Most researchers try to represent the model of natural aspects.

Development of models helps to investigate characteristics of natural elements that are necessary to understand natural changes in the real world. The produced model is not real world in case this kind of model is largely used by researchers to understand the characteristics of natural elements [2]. The data is imported in software in such a way that it follows biological principles that helps to increase its resemblance with the real world. Almost accurate description of the living system is obtained from this model which is developed based on data. Possibility of occurring in the future is not provided by this model, it can provide the entire process of the living system of the real world. Computer science and robots are the part of artificial life that plays an important role in developing the real-life achievements of human beings. Robotics technology is an autonomous system that is used in various activities.

This autonomous system is capable of interacting with humans that helps to achieve particular competence. Sensors are used in this technology to achieve the particular competence. Robots have been developed as per the real-world living system behavior. The technology is able to handle the feedback that helps to tackle the achievements. Various industrial and technological applications are included in hardware artificial life such as robots [3]. These applications are necessary to operate the robots as per the requirements of human beings. In industry, robots are used in different kinds of activities such as manufacturing and smart production. Robotics technology is more capable to do these activities as compared to human workers. Entire systems of robots are operated through information and for this reason the possibility of occurring error is less than human beings and in smart production minimum error is accepted.

Considering the fact, robots are used in industry to develop industrial activities. Study of artificial life is considered to understand behavior in the living system and this understanding plays an important role in developing a new technological system that can work as a living system in the real world [4]. In the present time, requirements of people are increasing rapidly and for this reason more technological systems are necessary to achieve the requirements. Various military applications are also included in robots for using robots in military activities. The applications help the systems to provide proper feedback on military activities. Artificial life is important to understand the capabilities of the living system and their characteristics in doing something. This kind of understanding helps to develop robots which have capabilities to perform in military activities.

Various powerful countries have used this study to develop robots and applications which are beneficial in military movement. Study of artificial life encouraged the study of the environment and capabilities of environmental elements, influencing researchers to develop this kind of technology in the real world which can perform as a living system and robots is one of the examples of this influence [4]. On the other hand, the development of virtual life in computer software helps to understand the behavior of living systems clearly, which plays a significant role in developing such technologies. Other technologies such as artificial intelligence are all used in the technology to improve its capabilities for achieving competencies.

Usages of robotics, computer model and biochemistry in artificial life

Biochemistry has great involvement in artificial life. Artificial life is the study to observe the characteristics of the living system of nature. Biochemistry is used in artificial life time to understand the behavior of molecules of organs in the living system that helps to define capabilities of the living system [5]. Chemicals which are present in living cells are identified through biochemistry and it helps to define the characteristics of living organs. Most researchers approach the study of artificial life to make a model that is capable of working such as a living system and for this reason defining characteristics of living organs is necessary. However, understanding capabilities of different kinds of living organs is impactful to make technology-based living systems.

Researchers consider biochemistry to understand the ability and activities of the organs. This understanding helps to make technological components such as living organs and assembling of the technological components provide a whole system in the real world which have capabilities such as living systems. Mostly under artificial life concepts, free systems are developed and in living systems different kinds of cells are present [2]. Capability of the living system depends on the cells and in developing models such as the living system mechanism of the cells is needed to understand the researchers and biochemistry plays an important role to define the cells and their structure. Considering the facts, researchers approach biochemistry in the study of artificial life. In recent times an alternative approach has been developed and under this approach cell free technique has been introduced.

Trends of cell free structure are increasing and mostly people are preferring cell free techniques that help to develop new systems in the real world.

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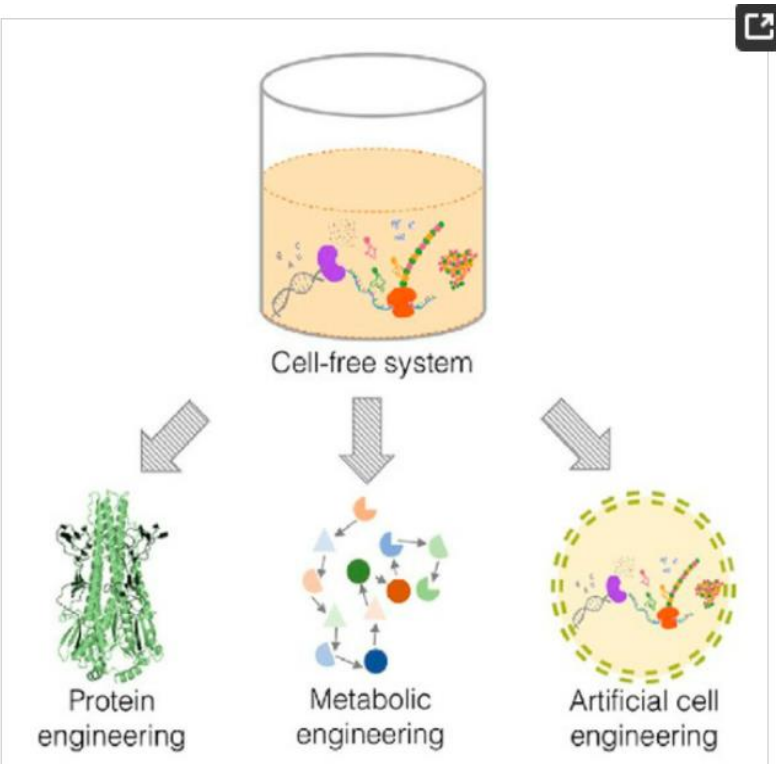

Figure 1: Involvement of biochemistry in artificial life
(Source: [6])

Various natural chemical components are involved in this formation and biochemistry is able to describe characteristics of the chemicals. Researchers approach biochemistry in artificial life to understand characteristics of natural chemicals which are needed in formation of cell free structure [6]. Artificial life is classified into two divisions such as hard artificial life and other is soft artificial life. Mathematical and computer-based models are considered as soft artificial life and on the other hand, robots are approached as hard artificial life. In the real world, robots have the ability to provide physical responses and for this reason robots are considered as hard artificial life. In the real world, hard artificial life is more practical and usable.

Robots have dynamic capabilities to interact with the environment and agents and for this reason in the real world, agents can use robots in many more activities to increase its usability. Sensors are used in robots to make responses in it as per the commands and for this reason this system is able to increase its performance for doing betterment in achieving agents' requirements [7]. Robots have the ability to tackle much more complex patterns that help to define various activities based on the patterns. Self-organizing capabilities of robots is an important quality that helps to increase its usability in different kinds of activities. However, all kinds of robots do not have self-organizing capabilities. Several studies show that physical experiments are happening with the help of robots and in this case self-organizing capabilities are necessary.

This kind of ability plays an important role in making decisions on the emergency situations that helps to avoid bad impact of physical experiment. Self-managing capabilities helps the robots to make movement as per requirements and in most of the cases, robots can change direction due to its self-organizing ability [8]. For example, flying robots use self-organizing capabilities to change direction that helps to make accurate movement during flying. Computer models are considered soft artificial life. Different kinds of models are used in managing self-organizing behavior of developed systems. Cellular automata is considered one of the impactful soft artificial models which has self-organizing capabilities. In the early time this soft artificial life was used. Collective behavior is also important for soft artificial life.

METHODOLOGY

Research methodology is considered as a systemic process of data collection and data analysis. Required data collection method is determined through research methodology and justification for choosing particular data collection method is also provided. Data analysis process is also justified through research methodology. Data collection method is chosen to gather data and the entire interpretation is done with gathered data. Primary and secondary these two types of data collection method are involved in research methodology. Primary data is collected through conducting interviews and surveys [9]. Human participants are included in the interview and survey and responses are collected from the invited participants. A lot of budget and time are required to conduct surveys and interviews and most of the time limited budget and time can not manage primary data collection. Considering this financial aspect, the primary data collection method is not used by many researchers.

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However, human participants are actively involved in interviews and surveys and for this reason the possibility of bias happens in data collection. Bias plays a key role in reducing the effectiveness of study outcomes. On the other hand, effective study outcomes do not get much more recognition. Considering these drawbacks primary data collection method has been approached for this study. Secondary data is cleaned and structured as the data is used in previous research [10]. Structured and cleaned data helps to increase authenticity of study that enhances recognition. One of the main motoes of study is to maintain its recognition. A wide range of data sources are available in google and google scholar and for this reason researchers have multiple options for choosing data sources. Online articles, journals, websites and magazines are the sources of secondary qualitative data.

Researchers have the opportunity to approach different kinds of articles, journals and websites. This kind of flexibility is provided by a secondary data collection method and for this reason researchers can choose data sources as per their requirements. This situation helps to make proper discussion on the entire study that can increase effectiveness. Huge amount of data is available in the secondary sources of secondary data [11]. This facility of secondary qualitative data provides flexibility to choose data for making authentic discussion based on collected data. However, secondary data sources are easily available in google scholar and google. Less effort is required to collect data from the data sources and for this reason less time is consumed for collecting data from secondary qualitative data sources. Getting less time helps to save additional time consumption in data collection and for this reason the entire study can be completed within limited time.

Researchers can submit the study within the deadline and extra time is not needed for approaching secondary data collection. Less time and effort consumption help to complete data collection procedures within a limited budget and that is the reason much more financial support is not required in secondary data collection. Economically considering a secondary qualitative data collection method is beneficial. However, secondary data is easily accessible and researchers can gather the required data from the sources easily [12]. Online journals, articles and websites have been approached in this study to collect required data. Needed data has been collected from this kind of secondary qualitative data collection method. Artificial life is the study by which the structure of natural elements is defined. Journal and articles related to artificial life have been considered and data has been collected from the sources.

The collected data has helped to make discussion and to define the artificial life study and its impact in the modern technological era. Journal and article are the sources of secondary qualitative data [13]. Environmental elements are involved in artificial life and these influence researchers to make more research on artificial life and its importance. Journal and article have been approached as the sources of secondary qualitative data. How environmental elements influence researchers to make research on artificial life related information has been collected in this study to make discussion on it. Artificial life is classified and articles, journals related to the classification of it have been considered for this study. Required data to describe the classification of artificial life has been gathered from the considered data sources.

In the discussion part, the impact of this classification has been described through the gathered data. Technologies have involvement in artificial life and this fact has been defined from the gathered data [2]. The technologies which have huge involvement in artificial life have been discussed from the collected data that has been gathered from the chosen secondary qualitative data sources. Discussion of this study has been developed as per the gathered data. The entire discussion helps to make a proper conclusion of this study outcome. Google and Google scholar have been used to search and approach the required data sources. Necessary information and data related to artificial life has been collected from the considered secondary data sources. The entire discussion has been developed based on secondary qualitative data.

DISCUSSION

Computers and artificial intelligence systems are considered as the root of artificial life rather than biology. Traditionally biology has little use in theory, it is largely based on practical. According to biologists, artificial intelligence and computer systems have been developed by the belief of living substances. Natural elements revolution promotes the development of the design of artificial intelligence and computer systems and this fact is covered in artificial life [14]. In the current situation, artificial intelligence technology has proved itself as dynamic technology and its behavior is also dynamic. Several mediums are present in artificial life to explore it properly. Realizing living systems with computer systems, defining behavior of living systems with computer simulation, simulation-based theory and theories which are tested by computer simulation, these mediums are used in artificial life to understand the characteristics of living systems.

One of the major issues for artificial life is to interpret the actual function of the living system that can be determined to transform into technological formation. In studies it is found that artificial intelligence technology is able to provide an advantage for realizing the actual function of the living system. AI does not work based on the traditional symbol; it works through making proper algorithms based on authentic information. However, manipulation of symbols is protected by an artificial intelligence system by its algorithm and for this reason it is more capable to realize the structure of the living system. Basically, mathematics is used to make numerical results of thoughts of physical theory [15]. In the present time computer simulation is much more beneficial as compared to other tools. Visual presentation is provided by computer simulation and for this reason one can easily

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understand the entire theory properly.

In the modern era, computer simulation provides images as output rather than numerical output. Most numerical equations are represented as images by computer simulation and for this reason the usability of computer simulation has increased. In artificial life, computer simulation is used to define the living system and their activities with visual representation. This kind of visual representation helps to understand the structure and activities of the living system properly and helps researchers to use these in the real world. Several limitations are included in computer simulation that are important for artificial life. In previous times various mistakes have occurred in the artificial intelligence system and artificial life needs to understand the actual power of computer simulation to describe physical theory with the form of visual representation [15]. Computers have much more capabilities to explain physical theories in various ways as compared to human beings.

Different kinds of realizations are operated by this one simulation and for this reason there is the possibility of being misled by computer simulation. This simulation provides visual representation of physical theories virtually and it is the proper evidence of physical theories. These limitations are also applicable for the computer simulation that is used in artificial life to make visual representation of the living system. Conditions leading to the emergence of the living system is the main area of artificial life [2]. In the process of this understanding conditions of metabolism is necessary. The conditions define the characters of metabolism in which conditions the metabolism is able to sustain itself and capable to provide reproduction. Biochemistry is used to understand the conditions of metabolism.

Artificial chemistry has three models by which natural chemicals components are defined, possible molecular set, reaction set and reacting algorithm. The molecules are observed properly through the concept of artificial life. Self-organizing facts of molecules is realized with the help of computer simulation and in the current situation the simulation is able to provide visual representation of it [16]. The representation helps to understand the functionality of self-organizing molecules and this understanding motivates researchers to build artificial cells that can manage self-organizing. Biochemistry is involved in artificial life to understand the characters of self-organizing living molecules and the chemical components are identified through biochemistry. However, biochemicals are mostly used to build artificial cells and these are inorganic components. Artificial cells are not built by natural materials and for this reason these cells are not as complicated as natural cells.

Building artificial cells are to be much more practical for using and on the other hand, these cells can fill the gap between human and machine. This kind of development can open several impressive capabilities for living systems. Self-organizing processes can happen in machines and for this reason autonomous maintenance is to be possible due to involvement of artificial cells. Autonomous chemicals processing can be possible molecules and for this reason maintenance of machines will be silent. Biochemical systems are included in artificial cells and that promote cell reproduction smoothly [17]. Structure of artificial cells is simple and for this reason understanding its characteristics becomes easy. Biochemistry has a great role in formation of artificial cells that is the main motto of artificial life. However, robots are the example of applying artificial life study in real life. AI is included in it to operate it properly and in recent time development of technology provides more capabilities to this technology. Bio Inspired robots are developing and this kind of robot is more flexible and capable of doing work.

CONCLUSION

Mathematics is used to find out numerical values of living system equations. In early stages Characteristics of the living system is defined by the numerical value that is provided by mathematics. Technology has developed a lot and for this reason trends of visual representation have started. Computer simulation is able to provide visual representation of the living system and its characteristics that helps researchers to understand the facts properly. This kind of understanding helps to motivate us to investigate the facts much more and try to develop new ideas based on the living system. Considering the facts, the importance of computer simulation is increasing in artificial life.

One of the main motivations of artificial life is to understand the characteristics of the living system that helps to develop new technological systems. Most researchers consider computer simulation to realize characteristics of the living system. Functions of the living system are understood by computer simulation and researchers get proper ideas about the activities and formation of the living system. On the other hand, the artificial intelligence system is also involved in artificial life. AI technology plays an important role in making algorithms based on information. Artificial life is classified into software, hardware and wetware. Software is basically computer simulation which is able to make visual representations. On the other hand, hardware is robotics technology that is made based on characteristics of the living system.

In robots, artificial intelligence technology is used to make algorithms and the technology is operated by the pattern of algorithms. Study of artificial life helps to understand capabilities of the living system and this technology has been developed to resemble the living system. However, robots are much more capable as compared to the living system. Biochemistry has great involvement in artificial life. This part of science provides an efficient understanding of natural chemicals which are involved in the formation of living systems. Biochemical helps to understand the characteristics of nature chemicals and its material. This kind of understanding plays an important role in the development of artificial cells. These cells are much more flexible and help to fill the gap between machines and humans.

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