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Avatars-Based Decision Support System Using Blockchain and Knowledge Sharing for Processes Simulation:

A Natural Intelligence Implementation of the Multi-Chain Open Source Platform

Vardan Mkrttchian, HHH University, Australia

ABSTRACT

This article is an enhancement of the chapter "About Digital Avatars for Control in Virtual Industries" in the book Big Data and Knowledge Sharing in Virtual Organizations. The article discusses the capabilities of the R language for modeling Levy processes that currently most closely correspond to the nature of the organizational learning movements in sliding mode. The efficient algorithm of the CGMY process simulation as a difference of the tempered stable independent Levy is processed and programmed at R language. The efficient algorithm of variance gamma process simulation using variance gamma random variables is processed and programmed at R language. Overview of CGMY process simulation in practice is use for human capital management in the context of the implementation of digital intelligent decision support systems and knowledge management and for digital intelligent design of avatar-based control with application to human capital management.

KEYWORDS

Avatars-Based Decision Support System, Big Data, Knowledge and Human Resource Management, Knowledge Sharing, Modelling the Organizational Learning, Multi-Chain Open Source Platform, Natural Intelligence

INTRODUCTION

The model of teaching students in an environment enabled by the evolutions in modern virtual industry software tools is in need of a new paradigm for solving problems of human-computer interaction. This is especially so if Blockchain technology is to be adopted in order to implement human-computer interaction in the education sector in an economically viable way. The purpose of this article is not to consider existing literature on avatar-based models for the purpose of providing policy advice. Rather, the purpose is to attempt to evaluate the merits and problems of avatar-based Electronic/Ubiquitous/pervasive learning (E/U-learning 4.0) models as a solid basis for economic policy recommendations that are mainly based on performance. The scope of performance covered in this article is the reflexive adaptability of the E/U learning software system and additional six goals sow in background.

Technology has played a significant role in changing the educational environment in so many schools that have implemented it (Lawrence, 2013). According to Goktas, Yildirim & Yildirim (2009), increasing the quality of teaching and learning has been a seemingly important concern for education.

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Since the beginning of this century, education has faced a variety of social, cultural, economic, and technical challenges. As the study and practice of facilitating learning and improving performance, the field of educational technology attempts to overcome challenges by developing novel approaches and frameworks (Januszewski & Molenda, 2008). In this context, ICT represents a novel approach for enhancing the dissemination of information and helping to meet these challenges (Goktas et al., 2009). ICT covers all technologies used for the handling and communicating of information and their use, specifically in education. For example, desktops, mobile telephony, projection technology, digital recording equipment, software applications, multimedia resources, information systems, Intranet, Internet, tablet, PCs, e-readers, laptops and host of other devices that convert information (text, images, sounds, and motion) into general digital formats (Ashrafi & Murtaza, 2008).

The rapid growth of ICT has dramatically reshaped teaching and learning in education (Pulkkinen, 2007; Tomei, 2005), by increasing the quality of teaching and learning is essential for successful education in the 21st century (Bransford, Brown & Cocking, 2000). The use of ICT can transform the learning and teaching process so that students can deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001). ICT is considered as an important means to promote new methods of instruction and to develop students' skills for cooperation, communication, problem solving and lifelong learning (Voogt, 2003). The integration of ICT in education continues to gain momentum in educational literature (Bransford et al., 2000). The growth of ICT has opened up a vast arena providing opportunities for the improvement of education, particularly in teaching and learning environments, where teaching and learning can take place anytime and anywhere (Cradler and Bridgforth, 2002). There is tremendous potential for teachers and students to harness the power of ICT to improve the quality of teaching and learning in the classroom (Lawrence and Tar, 2018). ICT can be used to complement existing teaching methods to support the teaching and learning enterprise and it is helpful for teachers' lesson preparation and delivery and can improve student learning and motivation (Lawrence and Tar, 2013; Wodi, 2008).

The article is written based on the reflections on the experiences in a recently completed project at the HHH University, Sydney, Australia. In this project christened the Triple H Avatar, an Avatar-based Software Platform was developed for HHH University, Sydney, Australia. The agenda of this project was to create a closed model based on avatars supported with strong empirical grounding and micro levels. The avatars will provide a single platform for solving problems in the educational sector and it also has the potential to address various areas of the digital economy. It will also create new tools for improving upon Block chain technology using Intelligent Visualization technologies for Big Data Analysis and Knowledge sharing in virtual industries as well. (Mkrttchian, and Aleshina, 2017). In this section, an overview of the Triple H Avatar and its implications on E/U learning software systems will be discussed.

Triple H Avatar and E/U Learning

This approach adopted by the HHH University, Sydney, Australia to the learning model using Block chain technology led to the creation of Electronic / Ubiquitous Learning - pervasive e-learning (E/U-Learning 4.0)-) or new tools for improving upon Block chain technology being used for Intelligent Visualisation technologies for Big Data Analysis and Knowledge sharing in virtual industries. E/U-Learning 4.0 and the newer tools are based on the interface of very advanced information technologies, such as distributed computer systems, service-oriented Internet technologies, cloud technologies, mobile personal devices and telecommunications, artificial intelligence systems and means of virtual reality using all the technical and software achievements of the virtual industry. The introduction of E / U-Learning technologies has elevated the modern educational system to a new stage of education delivery, contributing to the processes of internationalisation and the intellectualisation of education.

Emerging Challenges to E/U Learning Software Implementation

However, despite the introduction of the E/U-Learning, a fundamentally new scientific problem has arisen. This is the need to create a unified interstate intellectual environment for managing the transfer of knowledge and the provision of electronic educational services, which will include heterogeneous forms of knowledge representation, interstate standards and forms of education, international teaching and student/- staff relationship (Mkrttchian et al., 2015).

Potential Solutions to E/U Learning Software Implementation

The solution to this fundamental problem requires the formulation of solutions on a number of more specific technical problems. Such solutions will require: Ensuring the autonomy of the life cycle of the software components of the electronic educational environment due to multi-level self-organisation without the unnecessary processes of recompiling the source code. In particular, the problems of the software components that are not adaptable to changes in the scope and quality of knowledge in subject areas; changes in the requirements of society to the knowledge and skills of specialists; changes in the forms and methods of training and education delivery; changes in the technical means of training and communications can be solved with this proposed solution. Cross-platform compatibility is ensured by supporting a wide range of desktop computers and personal mobile devices, as well as through compatibility of wireless protocols. In this scenario, the user should be granted permanent presence in the educational cloud without being tied to specific geographical territories, life circumstances or software and hardware platforms. Ensuring flexible personalization due to adaptive adjustment of electronic educational services to the requirements of each individual (psychophysical, intellectual, technical), as well as the efficient usage of distributed educational resources.

Properties of E/U Learning Systems

This solution to the aforementioned problems reveals three important properties of modern E / U Learning systems. These properties are: autonomy, pervasive accessibility and adaptability. Adaptability as a property should be considered from three main points of view: the adaptability of the educational system to the constantly changing level of knowledge of the learner; the adaptability of the educational system to the changing course materials within the framework of each individual training course; the adaptability of the educational system to changing requirements from employers and labor markets. Pervasive accessibility as a property implies the continuous transfer of knowledge and the provision of reference and educational services in initially uncertain conditions for previously uncertain groups of users. At the same time, in a forced way, the concept of the life cycle of the electronic educational system is changing. This is because: It is no longer advisable to provide adaptability as a property through the release of chains of updated software versions. The developer simply does not have the right amount of time to recompile, debug and verify each new version of the system or training course, therefore distance education services software must be provided continuously and with an equally good level of quality. The E / U Learning system requires a self-tuning that is transparent to the user, without recompiling the source code as mentioned earlier. Therefore, the architecture of such a system should initially be based on variability models (VMs) controlled by feedback loops with the trainee, the teacher and the employer (that is, taking into account all three of the above points of view on adaptability) (Mkrttchian et al., 2015). In order to implement this property of adaptation (or rather, self-adaptation), it is advisable to use the methods currently used in the field of Engineering Product Lines (SPLE). In particular, the paradigm for reusing software products through the dynamic reconfiguration of their software code as developed within the framework of DSPL technologies (Dynamic Software Product Lines). In addition, the structure of the E / U Learning system should have a distributed modular appearance with clearly defined autonomous services and flexible algorithms for their interaction. To date, one of the best approaches to solving these problems is service-oriented technology. Here the architecture of the system is built on the basis of an autonomous, jointly functioning web-service. This architecture is called Service-Oriented Architecture (SOA) (Mkrttchian et al., 2015).

Practical Implications of the Triple H Avatar and Goals of the Article

The aggregate of various E / U Learning web services makes sense because it is functionally classified and grouped, thus creating intelligent software agents capable of adapting to, the current knowledge level of the learner; the environmental requirements (for example, labor markets); to specific teaching methods and forms training; and to various the national educational systems and standards (Mkrttchian et al., 2015).

Concluding the description of the general point of view of this article, we can identify specific goals:

- To evaluate the merits and problems of models based on avatars as a solid basis for recommendations on economic policy;
- Creation of a closed model based on avatars with strong empirical grounding and micro levels, which provide a single platform for solving problems in various areas of the digital economy;
- Create new tools to improve Blockchain technology using Intelligent Visualisation for Big Data Analysis for Knowledge sharing in virtual industries;
- Develop a method of structural and parametric synthesis of adaptive software components of the environment for Knowledge sharing in virtual industries;
- The discusses the capabilities of the R language for modeling Levy processes - processes that currently most closely correspond to the nature of the organisational learning movements in Sliding Mode;
- The efficient algorithm of the CGMY (Carr, Geman, Madan, and Yor, 2002) process simulation as a difference of the tempered stable independent Levy is processed and programmed at R language for Avatar-Based Knowledge Management.

BACKGROUND

The existing tools used in the modern learning environment, to improve upon Block chain technology, with the aid of Intelligent Visualisation for Big Data Analysis for knowledge sharing in virtual industries is a complex system. The complex system includes didactic and methodical components, as well as information and software components. As program components may include various interactive simulators and testing programs with adaptive properties, an important thing to consider is the development of methods of synthesis of these components (Czarnecki, et al., 2012). Apart from the complexity of the system, in recent years, technology tools that utilize intelligent visualisation to analyze big data to facilitate knowledge sharing in virtual industries to improve Block chain technology are being developed rapidly. As a result, issues related to improving the quality of software of virtual systems are becoming more relevant. There is an increasing focus on the continuous operation of programs. There is also a demand on the increase in their reliability and flexibility. These characteristics are directly dependent on the ability of the software system to adapt to changes in the subject area, environmental conditions and user characteristics. Currently, among specialists there is no single definition of the concept of software adaptability. The situation is such that for different types of software systems adaptability can be determined in various ways. For information systems, adaptability primarily means that the system has reactions to changes in the subject area; for virtual simulators, adaptability is most often the program's ability to change its structure and behavior depending on the user's actions and personality characteristics. Views on the implementation of the adaptation process may also vary within the consideration of one class of systems and that strongly depends on the chosen design methodology. Nevertheless, despite seemingly significant differences in definitions and approaches, one can identify one common property of all systems that can be referred to as adaptive. These properties include: the ability of the system to self-modify (at the level of the structure of the system as a whole or at the level of individual components). The requirements imposed by the external environment, the characteristics of users and the subject area, are usually such that it is impossible to adequately adapt to them without making changes to the architecture. However, for each type of software system, the restructuring process will continue to be carried out in its own way and depend on various factors.

The Analysis of Adaptive Software Made it Possible to Distinguish 4 Main Adaptation Mechanisms in Software Systems

Runtime Adaptation

Runtime adaptation is carried out by a software system in the course of its operation and it is characterised by the relative speed in the process of program restructuring. Most often, adaptation by runtime type is characterised by simulator systems which collect data about the learner in the process of execution; form an individual trajectory without significant delays in the functioning of the program for Knowledge sharing in virtual industries.

Self-Healing Systems

Another area of possible use of runtime models is the construction of so-called self-healing systems. Such systems must control their own reliability and security, as well as be able to automate tasks that often lead to system failures and require the attention of specialists. Self-healing software systems should provide maximum resistance to deviations in operating conditions. The implementation of large virtual environments (virtual, universities, laboratories, technology parks) requires increased fault tolerance, and, therefore, the inclusion of self-healing mechanisms in them.

MAPE-K

IBM's approach to organising a runtime adaptation is widely known. The approach was called MAPE-K (from the English Monitor, Analyze, Plane and Execute with a Knowledge), and it is based on the specific architecture of the software system that implements the adaptation cycle, which consists of 4 main stages. The stages are: the observation and collection of the necessary information; the analysis of the obtained information; the planning of program behaviour and the performance of planned operations. A number of other approaches to the implementation of runtime adaptation, in particular, approaches, are built on the integration of the principles of software engineering and control theory.

Domain Adaptation

Adaptation of the domain is used primarily in information systems and decision support systems. It differs from runtime adaptation, firstly, by the obligatory participation of the user (designer or expert) when making changes to the domain models, and secondly, by the need to temporarily decommission the modified system. The adaptation of the domain was first implemented in ERP-systems. ERP-system is a software product that implements the principles of the ERP concept (from the English. Enterprise Resource was planning, enterprise resource planning). The concept of ERP determines the organisational strategy for the integration of production. The basis of ERP-systems is the principle of creating a single data warehouse containing all corporate business information, to which simultaneous access of a certain number of company employees with different levels of authority should be ensured. Since the subject areas of ERP-systems are rapidly changing, the need to endow such systems with adaptive properties arose rather quickly. Two approaches towards adaptation were developed namely, the original and model design. The original design is based on the use of CASE-technology (for example, SilverRun) and involves the generation (re-creation) of the information system whenever the need for change arises. The basis of a typical design is the component design systems (R / 3, BAAN, Prodis, etc.), and instead of regeneration, the configuration (adaptation to the features of an economic object) of software systems is carried out. At the heart of both approaches lies the principle of a constantly evolving domain model, for the storage of which a special knowledge base is used - the repository. It is on the basis of the data stored in the repository that the program is generated or configured. Adaptation in such systems is reduced to the timely adjustment of the domain model, for the construction and subsequent modification of which special software tools are used.

OVERVIEW OF CGMY PROCESS SIMULATION THEORY

The efficient algorithm of the CGMY (Carr, Geman, Madan, and Yor, 2002) process simulation as a difference of the tempered stable independent Levy is processed and programmed in the R language. The efficient algorithm of variance gamma process simulation using variance gamma random variables is processed and programmed in R language, as the modeling in the Digital Globalisation Era and Avatar-Based Knowledge Management.

Levy processes are used as processes that describe the evolution of logarithmic return on assets at Levy model:

$$S_t = S_0 \exp(rt)\exp(X_t) \tag{1}$$

where:

$S = \left(S_t\right)_{t\geq 0}$ – price organizational learning process

$S_0 > 0, X = \left(X_t\right)_{t\geq 0}$ – Levy process

$r > 0$ – percent rate

Definition 1. A stochastic process $X = (X_t)_{t\geq 0}$ defined on a probability space $(\Omega, \mathscr{F}, P)$ having amounts in $\mathbb{R}$ such as $X_0 \overset{n.H.}{=} 0$, is called a Levy process if:

1. X has independent increments: for any $n \geq 1$ and any point set $t_j \in [0,\infty)$, $j = \overline{0,n}$, such as $0 \leq t_0 < t_1 < \ldots < t_n$, values $X_{t0}, X_{t1} - X_{t0}, \ldots, X_{tn} - X_{t_{n-1}}$ are independent;
2. For any $s \geq 0, t \geq 0 \cdot X$ has stationary increments:

$$X_{t+s} - X_s \overset{d}{=} X_t - X_0$$

3. X is stochastically continuous: for any $t \geq 0$ and $\varepsilon > 0$:

$$\lim_{s\to t} P\left(\left|X_s - X_t\right| > \varepsilon\right) = 0$$

The CGMY process is one of the Levy processes that can be used to describe the evolution of logarithmic return on assets at Levy model (1). Let's define the CGMY distribution and the CGMY Levy process.

Definition 2. Distribution F is called CGMY distribution with parameters $C > 0$, G, $M > 0$, $Y < 2$, if it's characteristic function is:

$$\phi(u) = \exp(C\Gamma(-Y)((M - iu)^Y - M^Y + (G + iu)^Y - G^Y)),\ u \in (\Omega, , \mathscr{F}, P) \tag{2}$$

and:

$$\Gamma(x) = \int_0^\infty z^{x-1} e^{-z} dz \text{ – gamma function, } x > 0$$

Let's write down a random variable ξ with CGMY distribution as $\xi \sim CGMY(C,G,M,Y)$. The Levy measure for the CGMY process is given by:

$$v_{CGMY}(x) = \begin{matrix} C\exp(Gx)(-x)^{-1-Y} dx, x < 0, \\ C\exp(-Mx)x^{-1-Y} dx, x > 0 \end{matrix} \tag{3}$$

Definition 3. A stochastic process $X = \left(X_t\right)_{t\geq 0}$ with parameters $C > 0$, $G > 0$, $M > 0$, $Y < 2$, defined on a probability space $(\Omega, \mathscr{F}, P)$ having amounts in $\mathbb{R}$, such as $X_0 \overset{n.H.}{=} 0$, is called CGMY Levy process, if:

1. X has independent increments;
2. X has stationary increments that corresponds CGMY distribution: for any $s \geq 0, t \geq 0$:

$$X_{s+t} - X_s \sim CGMY(Ct, G, M, Y)$$

3. X is stochastically continuous: for any $t \geq 0$ and $\varepsilon > 0$:

$$\lim_{s\to t} P\left(\left|X_s - X_t\right| > \varepsilon\right) = 0$$

An efficient CGMY process simulation algorithm is based on the tempered stable processes. Let's define the tempered stable distribution and the tempered stable process.

Definition 4. A random variable X defined on a probability space $(\Omega, \mathscr{F}, P)$ follows the tempered stable distribution with parameters $a > 0$, $b > 0$, $0 < k < 1$, if it's characteristic function is given by:

$$\varphi_X^{TS}(u;a,b,k) = \exp(ab - a(b^{1/k} - 2iu)^k) \tag{4}$$

Let's write down the random variable X follows the tempered stable distribution as $X \sim TS(a,b,k)$.

Definition 5. A stochastic process $X = \left(X_t\right)_{t\geq 0}$ with parameters a, b, k defined on a probability space $(\Omega, \mathscr{F}, P)$ having amounts in ℝ, such as $X_0 \overset{n.H.}{=} 0$, is called a tempered stable process if:

1. X has independent increments;
2. X has stationary increments that corresponds the tempered stable distribution:

$$X_{t+s} - X_s \overset{d}{=} X_t - X_0 \sim TS(at,b,k)$$

3. X is stochastically continuous: for any $t \geq 0$ and $\varepsilon > 0$:

$$\lim_{s\to t} P\left(\left|X_s - X_t\right| > \varepsilon\right) = 0$$

Theorem 1. Let $X = \left(X_t\right)_{t\geq 0}$ is the CGMY process with the parameters $C > 0$, $G > 0$, $M > 0$, $0 < Y < 1$ defined on a probability space $(\Omega, \mathscr{F}, P)$ with the Levy measure (3), and $X^1 = \left(X_t^1\right)_{t\geq 0}$, $X^2 = \left(X_t^2\right)_{t\geq 0}$ are the tempered stable independent Levy processes with the corresponding parameters $C > 0$, $M > 0$, $0 < Y < 1$ and $C > 0$, $G > 0$, $0 < Y < 1$ and such as their Levy measures are given by:

$$v_1(x) = \frac{Ce^{-Mx}}{x^{1+Y}} 1_{x>0} \text{ and } v_2(x) = \frac{Ce^{-G|x|}}{|x|^{1+Y}} 1_{x<0} \tag{5}$$

Then the CGMY process CGMY can be given as:

$$X_t = X_t^1 - X_t^2 \tag{6}$$

Proof. Representation of the CGMY process as the difference of two tempered stable processes follows from the form of the CGMY process characteristic function.

Consider the CGMY process characteristic function:

$$\varphi(u) = \exp(tC\Gamma(-Y)((M-iu)^Y - M^Y + (G+iu)^Y - G^Y)) =$$
$$\exp(tC\Gamma(-Y)((M-iu)^Y - M^Y))\exp(tC\Gamma(-Y)((G+iu)^Y - G^Y))$$

From (5) and (4) we have the following relations for the parameters of the process $C = a2^k \frac{k}{\Gamma(1-k)}$, $M = \frac{1}{2} b_1^{1/k}$, $Y = k$. We obtain similar relations for the process $X^2 = \left(X_t^2\right)_{t\geq 0}$: $C = a2^k \frac{k}{\Gamma(1-k)}$, $M = \frac{1}{2} b_1^{1/k}$, $Y = k$. Then the characteristic function $\varphi(u)$ of the CGMY process can be rewritten as:

$$\varphi(u) = \exp\left(at2^k \frac{k}{\Gamma(1-k)} \Gamma(-Y)\left(\left(\frac{1}{2} b_1^{1/k} - iu\right)^k - \left(\frac{1}{2} b_1^{1/k}\right)^k\right)\right)$$

$$\exp\left(at2^k \frac{k}{\Gamma(1-k)} \Gamma(-Y)\left(\left(\frac{1}{2} b_2^{1/k} + iu\right)^k - \left(\frac{1}{2} b_2^{1/k}\right)^k\right)\right) =$$

$$= \exp\left(atb_1 - a\left(b_1^{1/k} - 2iu\right)^k\right)\exp\left(atb_2 - a\left(b_2^{1/k} + 2iu\right)^k\right)$$

Thus, the characteristic function $\varphi(u)$ of the CGMY process is representable as the product of the characteristic functions of the tempered stable processes $X^1 = \left(X_t^1\right)_{t\geq 0}$ and $X^2 = \left(X_t^2\right)_{t\geq 0}$:

$$\varphi(u)\varphi_{X^1}(u)\varphi_{X^2}(u)$$

From where it follows (6) the theorem is proved.

The variance gamma process is one of the Levy processes that can be used to describe the evolution of logarithmic return on assets at Levy model (1). Let's define the variance gamma distribution and the variance gamma Levy process.

Definition 6. A random variable X defined on a probability space $(\Omega, \mathscr{F}, P)$ variance gamma distribution with parameters $\sigma > 0, v > 0, \theta \in \mathbb{R}$, if it's characteristic function is given by:

$$\varphi_X^{VG}(u;\sigma,v,\theta) = \left(\frac{1}{1 - iv\theta u + \left(\sigma^2 v / 2\right)u^2}\right)^{\frac{1}{v}} \tag{7}$$

where:

$\Gamma(x)$, $x \in \mathbb{R}_+$ – gamma function

Let's write down the random variable ϑ follows the variance gamma distribution with parameters $\sigma > 0, v > 0, \theta \in \mathbb{R}$ as $\vartheta \sim V(\sigma, v, \theta)$.

Definition 7. A stochastic process $V = (V_t)_{t\geq 0}$ with the parameters $\sigma > 0, v > 0, \theta \in \mathbb{R}$, defined at probability space $(\Omega, \mathscr{F}, P)$ having amounts in ℝ, such as $V_0 \overset{n.H.}{=} 0$, is called variance gamma process if:

1. V has independent increments;
2. V has stationary increments that corresponds variance gamma distribution: for any $s \geq 0, t \geq 0$:

$$V_{t+s} - V_s \overset{d}{=} V_t - V_0 \sim V\left(\sigma\sqrt{t}, v / t, t\theta\right)$$

3. V is stochastically continuous.

An efficient variance gamma process simulation algorithm is based on the gamma process. Let's define the gamma distribution and the gamma process.

Definition 8. A random variable X follows Gamma distribution with a shape parameter $a > 0$, and a scale parameter $b > 0$, if it's characteristic function is given by:

$$\varphi_X^{\Gamma}(u; a, b) = (1 - iu / b)^{-a} \quad x \in \mathbb{R} \tag{8}$$

$\Gamma(x) = \int\limits_0^{\infty} z^{x-1} e^{-z} dz$, $x \in \mathbb{R}_+$ – gamma function

Let's write down the random variable γ follows the gamma distribution $\gamma \sim \Gamma(a, b)$.

Definition 9. A stochastic process $G = (G_t)_{t\geq 0}$ with parameters $a > 0$, $b > 0$, defined at probability space $(\Omega, \mathscr{F}, P)$ having amounts in ℝ, such as $G_0 \overset{n.H.}{=} 0$, is called the Gamma process if:

1. G has independent increments;
2. G has stationary increments that corresponds variance gamma distribution:

$$G_{s+t} - G_s \overset{d}{=} G_t - G_0 \sim \Gamma(at, b)$$

3. G is stochastically continuous.

The variance gamma process can be defined as the difference of two independent Gamma processes.

MAIN FOCUS OF THE ARTICLE

Issues, Controversies, Problems

The approaches developed initially for Enterprise Resource Planning (ERP) systems are now part of information systems used in many areas of human activity. Some of these approaches can be used to address the major goal of this article as mentioned in the introduction. This goal was the development and implementation of new technologies that can deliver new tools for improving Block chain technology. These new technologies will utilise Intelligent Visualisation technologies for the purpose of analyzing Big Data and enable Knowledge sharing in virtual industries. As inspired by the Triple H Avatar project, we realized the need to find the cause of reflex adaptation; create non-removable hardware and software; and create suitable products for its implementation. Reflexive adaptation is characterized by the presence and combination of features of the adaptation mechanisms of the previous types considered in the previous section. Like the runtime adaptation, it does not require the substantial participation of an expert for either in the self-modification of the system or in the decommissioning of the modified system. However, as in the case with the adaptation of the subject area, it needs some time to analyze the current state of the program and prepare recommendations for its subsequent restructuring. Unlike runtime adaptations, reflexive adaptations do not lead to automatic self-modification during execution. Its main purpose is the "offline" analysis of the system's behaviour by using information about its internal structure and making decisions about possible restructuring on that basis. Information of this kind may include protocols on system behaviour over a sufficiently long period of time or protocols on procedures for dynamic analysis of the source code. Reflexive adaptation can be implemented in training systems, in particular, virtual simulators. Logging the behaviour of different users for a certain period of time and the subsequent analysis of the obtained data will allow the elimination of the problematic points from the behavior of the simulator. The problematic points are understood to be those inaccuracies made during the design of the simulator, which, according to the results of the analysis, reduces the effectiveness of its operation when working with a large number of students. These may include, excessive complexity or ease of implementation of individual stages of the simulator operation; excessive concentration at some stages to the detriment of others; and poor organisation of the interface, resulting in an unjustified increase in the time to master the program, etc. The purpose of reflexive adaptation is the search by the system in its own program code for fragments that can lead to malfunctions or inefficient functioning (the task of dynamic analysis of program code). In addition to the ability to find problem areas in the community structure, an ideal adaptive system must also have the ability to eliminate them. This property is especially relevant for systems organized according to a service-oriented principle: adding an incorrectly written module to the general structure of a workable system as a whole can lead to unforeseen disruptions in its functioning. This innovation is known as TRIPLE H-Avatar, taking into account multifunctional cloud stage, administration situated virtual examination furthermore, learning environment in the sliding mode, connecting into a solitary virtual space instructive and research assets, programming and specialised backing. In this environment, the understudy and educator avatars, own, programmed sliding mode chose utilising versatile devices, picked to best meet the scholarly necessities and individual capacities, give full proficient separation adapting as preparation of Distance Education Expert (DEE). In this part we portray a cloud stage, which is taking into ac- count the components of virtual reality, fake brain power, information administration frameworks, and Web assets. At the point when outlining an incorporated research and showing environment is gathered to utilize the information of educators and specialists of instructive foundations, science and business, notwithstanding their geographic area, Mkrttchian et al, (2016). Elements of reflexive adaptation were successfully implemented in the WebCT e-learning system developed and first introduced at the University of British Columbia. WebCT implements a Web Mining mechanism - optimising the interface in accordance with user requests. However, adaptation based on observation of the information environment is still a poorly developed mechanism for implementing adaptive behavior in software systems. And most of the works in this area are mainly devoted to the prospects of using Big Data technology in constructing adaptive systems of this kind. The basic idea underlying this adaptation mechanism is the use of various methods of collecting and analyzing a large amount of data related to the subject area of the software system, and subsequently restructuring the system based on the findings of the analysis. Furthermore, the global information network can serve as an information medium from which the necessary information can be gathered. This type of adaptation is in many ways similar to the adaptation of the subject area, but differs from the latter by a significant decrease in human participation in the process of forming and making a decision on restructuring the program.

CGMY LEVY PROCESS SIMULATION USING R

R is a language and a free software environment for statistical computing and graphics. The R language contains a group of functions for modeling the common probability distribution laws. Beta distribution, Gamma distribution, normal distribution, Poisson distribution, uniform distribution and others can be simulated by R language functions. However R language doesn't contain any function or any package for CGMY distribution and CGMY Levy process simulation. Hence the problem of simulation CGMY distribution and CGMY Levy process is actual.

First an algorithm of CGMY Levy process simulation, formulated by Poirot J. and P. Tankov, are programmed at R. This algorithm suggests simulation of the CGMY Levy process with parameters, $C > 0$, $G > 0$, $M > 0$, $Y < 2$ using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable process that is called stable subordinator:

$$X_t = AS_t + W_{S_t}$$

where $W = \left(W_t\right)_{t \ge 0}$ is the standard Wiener process at random times S_t, $S = \left(S_t\right)_{t \ge 0}$ is $Y / 2$-stable Levy process independent from the Wiener process, $A = \dfrac{G - M}{2}$.

The proposed algorithm for the CGMY process simulation as a difference of the tempered stable independent Levy processes is based at the theorem 1 and consists of the following steps.

Algorithm 1. The CGMY process simulation as a difference of the tempered stable independent Levy processes:

1. Simulate the tempered stable independent process $X^1 = \left(X_t^1\right)_{t \ge 0}$ with parameters $C > 0$, $M > 0$, $0 < Y < 1$.
2. Simulate the tempered stable independent process $X^2 = \left(X_t^2\right)_{t \ge 0}$ with parameters $C > 0$, $G > 0$, $0 < Y < 1$.
3. The CGMY process $X = \left(X_t\right)_{0 \le t < T}$ with parameters C, G, $M > 0$, $0 < Y < 1$ simulate as:

$$X_t = X_t^1 - X_t^2$$

An algorithm for the tempered stable independent Levy process simulation can be found at Poirot J. and P. Tankov work.

When CGMY process with parameters $C = 10$, $G = 7$, $M = 5$, $Y = 0.2$, $\varepsilon = 0.0001$ and time step $\Delta t = 0.01$ is simulated using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable process, standard deviation is 0.0241. When CGMY process with parameters $C = 10$, $G = 7$, $M = 5$, $Y = 0.2$, $\varepsilon = 0.0001$ and time step $\Delta t = 0.01$ is simulated as a difference of the tempered stable independent Levy processes and $K = 10000$, $\Delta t = 0.01$ standard deviation is 0.0238. The advantage of the CGMY process simulation method as a difference of the tempered stable independent Levy processes relative to the simulation method of this process using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable process is the time spent on the CGMY process simulation. The CGMY process simulation as a difference of the tempered stable independent Levy processes takes less time than this process simulation using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable process. For example, the CGMY process ($C = 10$, $G = 7$, $M = 5$, $Y = 0.2$, time step $\Delta t = 0.01$, $T = 1000$) simulation as a difference of the tempered stable independent Levy processes takes 11 seconds, but the CGMY process($C = 10$, $G = 7$, $M = 5$, $Y = 0.2$, time step $\Delta t = 0.01$, $T = 1000$) simulation using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable process takes 302 seconds. Similar time costs for modeling the CGMY process using the Wiener process and randomly replacing time with a non-negative non-decreasing $Y / 2$-stable processes are noted by Poirot J. and P. Tankov. R language doesn't contain any function or any package for variance gamma distribution and variance gamma Levy process simulation. The algorithm of variance gamma process simulation as the difference of two independent Gamma processes can be found at «Levy processes in finance» by W. Schoutens. This article proposes the simulation of the variance gamma process using variance gamma random variables.

Algorithm 2. The variance gamma process simulation $V = (V_t)_{t \geq 0}$ with parameters σ, v, θ, μ c using variance gamma random variables.

1. Simulate the independent Gamma distributed random variables $\left\{\xi_k, k \geq 1\right\}$ with parameters $a = \Delta t / v, b = 1 / v$ using the R language function dgamma:

$$\xi_k \sim \Gamma\left(\Delta t / v, 1 / v\right),\ k \geq 1$$

2. Simulate the independent Gamma distributed random variables $\left\{\eta_k, k \geq 1\right\}$ as the random variables with Normal distribution and $E\eta_k = \theta \Delta t \xi_k$, $D\eta_k = \sigma^2 \Delta t \xi_k$ using the R language functions dgamma and rnorm:

$$\eta_k \sim N(\theta \Delta t \xi_k \mu \Delta t, \sigma^2 \Delta t \xi_k),\ k \geq 1$$

3. Simulate the variance gamma process $V = (V_t)_{t \geq 0}$ with parameters σ, v, θ, μ as:

$$V_0 = 0,\ V_{k\Delta t} = V_{(k-1)\Delta t} + \eta_k,\ k \geq 1$$

The advantage of the variance gamma process simulation using algorithm 2 is that there is no need to simulate another stochastic process like the previously developed algorithms does.

OVERVIEW OF CGMY PROCESS SIMULATION PRACTISE

Impacts From Using Knowledge in This Study

Jennex (2005, 2020) utilized an expert panel, the editorial review board of the International Journal of Knowledge Management (IJKM), to generate a definition of KM as the practice of selectively applying knowledge from previous experiences of decision-making to current and future decision making activities with the express purpose of improving the organization's effectiveness. Another key definition of KM in- clues Hollsopple and Joshi (2004) who consider KM as an entity's systematic and deliberate efforts to expand, cultivate, and apply available knowledge in ways that add value to the entity, in the sense of positive results in accomplishing its objectives or fulfilling its purpose. Finally, Alavi and Leidner (2001) concluded that KM involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application. Taken in context, these definitions of KM focus on the key elements of KM: a focus on using knowledge for decision making and selective knowledge capture. This is important as the selective focus on knowledge capture separates KM from library science, which at- tempts to organize all knowledge and information, and the decision making focus emphasizes that KM is an action discipline focused on moving knowledge to where it can be applied. Ultimately, KM may best be described by the phrase "getting the right knowledge to the right people at the right time" and can be viewed as a knowledge cycle of acquisition, storing, evaluating, dissemination, and application. KM is better understood when the concepts of Organisational Memory (OM) and Organisational Learning (OL) are incorporated. Jennex and Olfman (2002) found that the three areas are related and have an impact on organisational effectiveness. Organisational effectiveness is how well the organisation does those activities critical to making the organisation competitive. OL is the process the organisation uses to learn how to do these activities better. OL results when users utilize knowledge. That OL may not always have a positive effect is examined by the monitoring of organisational effectiveness. Effectiveness can improve, get worse, or remain the same. How effectiveness changes influences the feedback provided to the organisation using the knowledge. KM and OM are the processes used to identify and capture critical knowledge. Knowledge workers and their organisations "do" KM; they identify key knowledge artifacts for retention and establish processes for capturing it. OM is what IT support organizations "do"; they provide the infrastructure and support for storing, searching, and retrieving knowledge artifacts. Figure 1 illustrates these relationships and the following sections expand on these concepts in sliding mode control.

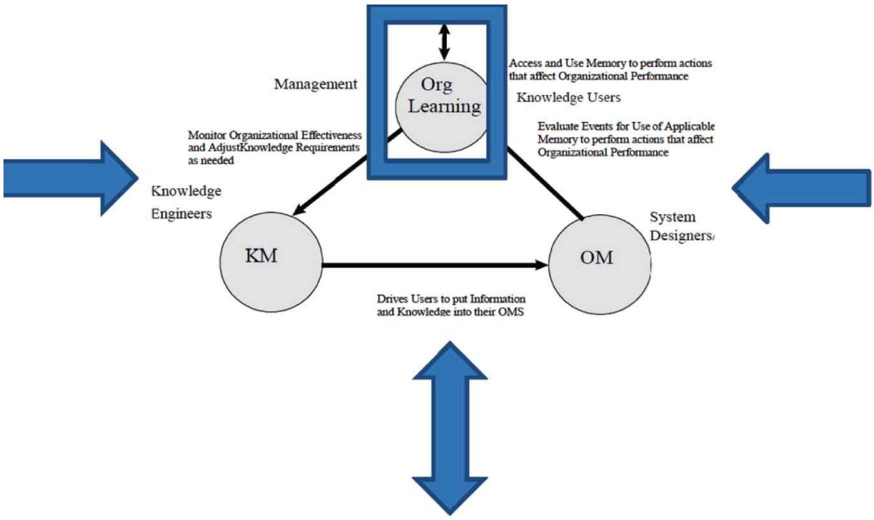
Sliding Mode vector's To/From/Close/Monitoring/ Controlling/Knowledge Management/Org Learning is shown in Figure 1.

IMPACTS FROM BLOCKCHAIN-BASED REPUTATION MANAGEMENT IN THIS STUDY

Impacts from blockchain-based reputation management in this study are organized as follows:

- The latest materials in the field of task unloading, based on methods such as blockchain, are covered;
- The system model presented covers the design of the architecture of the proposed system and its implementation;
- The Experimental results and tuning the modeling structure.

Figure 1. The KM/OM/OL Model in Sliding Mode and Processes Simulation a Natural Intelligence (Jennex & Olfman, 2002), modern modified (Mkrttchian & Aleshina, 2017)



The overall blockchain-based reputation management framework shows in Figure 2.

IMPACTS FROM EFFECTIVENESS KNOWLEDGE SHARING BARRIERS IN THIS STUDY

In today's knowledge-based business, knowledge is the only source of competitive advantage for engineering industries. Knowledge sharing plays an important role in the success of knowledge management (KM). Knowledge sharing barriers (KSBs) become obstacles for KM to achieve the goals of the industries. In this paper, three categories of KSBs have been identified such as individual, organisational and technological (Sharma & Singh, 2014). The goal of our research is to measure the effectiveness of individual, organisational and technological KSBs by the application of an analytical network process (ANP) framework which helps to the managers for making decisions to enhance the successful knowledge sharing in the engineering industries is Sliding Mode Environment, result is see in Figure 4.

Figure 2. The overall blockchain-based reputation management framework

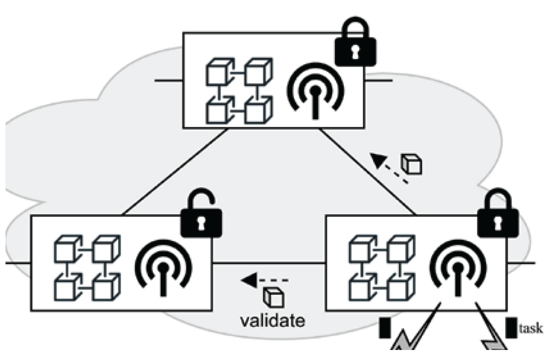


Figure 3. The overall blockchain-based reputation management in Sliding Mode Environment

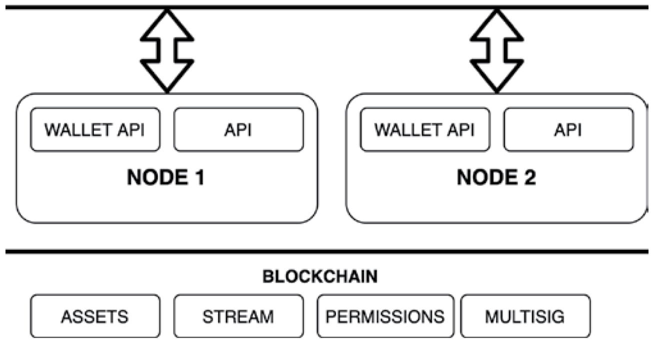
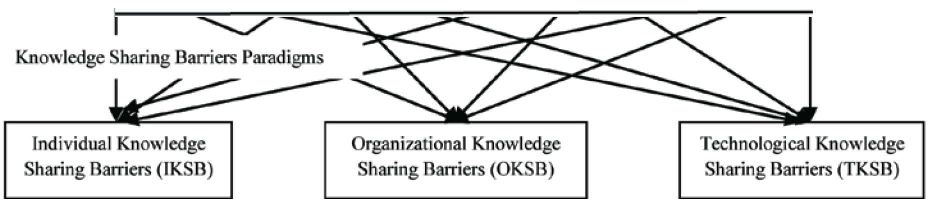


Figure 4. Impacts from Effectiveness Knowledge Sharing Barriers (Sharma & Singh, 2014) modern modified (Mkrttchian & Aleshina, 2017)

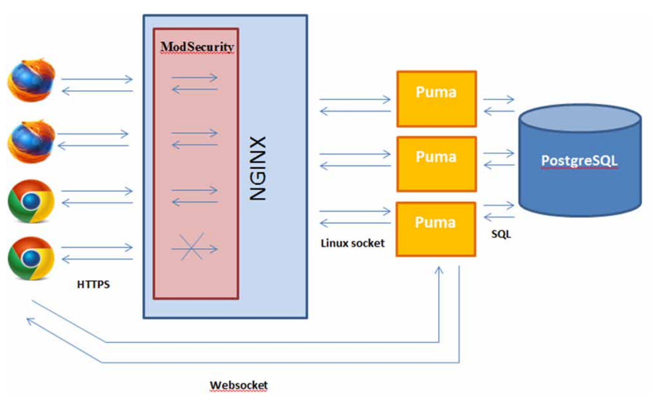


IMPACTS IMPLEMENTATION OF THE MULTI CHAIN OPEN SOURCE PLATFORM

The software architecture of the created e-learning system is shown in Figure 5. Interaction between the user browser and server part is carried out either through HTTPS protocol (all basic actions) or through Websocket (actions related to updates screen elements resulting from deleted events).

HTTPS requests are processed by NGINX web server, including ModSecurity WAF screen, which blocks all potentially dangerous requests. Web server immediately processes requests for static pages. Dynamic requests are transmitted via Linux sockets to Puma application servers running in parallel. Puma also processes Web socket requests. Puma's Ruby On Rails application server communicates with PostgreSQL through SQL queries generated by Active Record object-relational converter.

Figure 5. Diagram of the Multi Chain Open Source Platform



SLIDING MODE CONTROL ENVIRONMENT

The architecture also includes a mobile application based on Ruby language and Ruboto technology. Unity of programming language of web application and mobile application can significantly reduce cost of maintaining a programmer's team.

Conceptual scheme of created application includes the following aspects:

1. Three levels of interface complexity for creating and managing an electronic course;
2. Three performance accounting schemes and ability to connect own algorithms in Ruby module form;
3. Ability to connect training elements in form of IFrame, Ruby module, C-module integrated into Ruby, web module;
4. Support full integration through JSON-API with NRNU MIFI systems for contingent accounting, scheduling, curriculum preparation, performance monitoring, etc.

Three work options are offered to the teacher:

1. Interface for creating "community of discipline" according to given template within internal social network;
2. Interface for creating "community of discipline" with its own architecture within internal social network;
3. Interface for creating electronic courses in e-learning systems.

In the first mode, the teacher only selects one of his disciplines to create an electronic course. Further, the course frame is formed automatically. After forming a course framework, teachers can only correct template texts and download pre-prepared materials. Preparation of materials is carried out outside of the e-learning system using standard office products.

In the second mode, the teacher himself creates a tree of course pages and can prepare materials directly in an e-learning system using Markdown technology. At the same time, technologies for interacting with students are limited by the framework of the intra-university social environment.

The third mode allows teachers to plug in various communication technologies, integrate additional software modules and use all means of modern LMS.

CONCLUSION

- In order to create a closed model based on avatars with strong empirical grounding and micro levels, which can provide a single platform for solving problems in various areas of the digital economy and creating new tools for improving Block chain technology using Intelligent Visualisation technologies for Big Data Analysis and Knowledge sharing in virtual industries, a system has been developed and implemented on avatars for reflexive adaptation. This system is an effective mechanism for self-optimisation of a software system. The ability of the system to self-observe and the subsequent formation of decisions on restructuring is a feature whose presence allows you to maximize the participation of developers in the maintenance of the program and increase the time of its continuous operation.
- The developed method of structural-parametric synthesis of adaptive software components of the virtual environment allows you to formalise a complex mathematical procedure for defining variability in a visual, simple and intuitive way using visual design tools. The use of the method in practice will increase the life of systems and reduce the resource costs of their creation. It will also support the mobility of electronic education; improve the adaptive properties of software for Knowledge sharing in virtual industries.

- This analysis allowed building up a gateway for improvement for author ideas about use of Online Multi- Cloud Platform Lab with Intellectual Agents - Avatars for Study and the capabilities of R language for modeling Levy processes are observed. R language is added by efficient algorithms of Levy processes simulation and modeling.
- Overview of CGMY process simulation in practice use is for Human Capital Management in the Context of the Implementation of Digital Intelligent Decision Support Systems and Knowledge Management (Mkrttchian,2020) and for Digital Intelligent Design of Avatar-Based Control with Application to Human Capital Management (Mkrttchian & Chernyshenko, 2020).
- Thus, we can safely talk about the effectiveness of using free solutions in the field of e-learning for Russian universities. At the same time, to ensure the university's high competitive ability in the international market, it is necessary to go beyond the framework of basic tools such as Moodle and Sakai and carry out our own development, often completely redesigning e-learning systems from scratch. When developing your own e-learning system, special attention should be paid to differences in the preparation of faculty and to ensure the possibility of trouble-free work even for employees who are poorly qualified in the IT field. Over time, this approach should provide enhancements to the overall digital culture of the staff and allow the transition to the construction of more complex and high-quality courses, both at the design and at the substantive level. The use of various technologies for assessing students' knowledge in the e-learning system allows them to flexibly respond to changes in the socio-cultural characteristics of students, ensuring high interest, regardless of their initial training and nationality.
- The question about the successful implementation of the adaptation mechanism in the systems of the virtual industry is currently debatable. The influence of models on the level of reflexive adaptation; the level of observation of the information environment on domain models and the execution time in such systems are, at first glance, an obvious fact. But this fact is currently not studied sufficiently and it is a serious issue that warrants further research. Another issue of interest to researchers is the integration of the considered adaptation mechanisms within a single software system.

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Vardan Mkrttchian graduated from State Engineering University of Armenia, the Faculty of Cybernetics as an Electronics Engineer & received his Doctorate of Sciences (Engineering) in Control Systems from Lomonosov Moscow State University (former USSR). Dr. Vardan Mkrttchian taught for undergraduate and graduate student's courses of control system, information sciences and technology, at the Astrakhan State University (Russian Federation), where he was is the Professor of the Information Systems (www.aspu.ru) six years. Now he is full professor CAD&Economy departments of Penza State University (www.pnzgu.ru). He is currently chief executive of HHH University, Australia and team leader of the international academics (www.hhhuniversity.com). He also serves as executive director of the HHH Technology Incorporation. Professor Vardan Mkrttchian has authored over 400 refereed publications. He is the author of over twenty books published of IGI Global, included ten books indexed of SCOPUS in IT, Control System, Digital Economy, and Education Technology, and 41 works in SCOPUS and 15 in WoS. He also is Editor-in-Chief of International Journal of Applied Research in Bioinformatics (IJARB).