



# Digital Simulations And Virtual Reality

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**Abstract-**This paper surveys the area of simulations and virtual reality, the research is already being done about the subject since 1997 in this we recall all the further modifications and have recollected all the types of simulations being used with all the various real life applications including latest technologies being introduced. This paper further introduce the field of virtual reality, in which human can interact with 3D- environment generated by computer using electronic equipments like VR glasses, helmetsetc specially designed for the purpose.

**Key words-** 3D, simulation, virtual reality, data.

## 1. INTRODUCTION

Since its birth, simulation application and working is implemented in many sectors and working fields. Such as

- Manufacturing services
- Healthcare
- Public services

Objective of this paper is to fill these gaps, and review academic literature with

- (1) A wider coverage of the digital simulations;
- (2) A wider scope of simulation techniques;
- (3) Highlighting real-life applications.

### 1.1 Literature-Review Methodology

This includes all the simulation techniques encountered in the literature and follows a vast, procedural search within the academic peer-reviewed literature. This review paper also contains both factual and non-factual studies. It rechecks past and previous research into process and management rather than into engineering, technical and physical design, where simulation has also made a dramatic impact. Given such breadth and width, it was necessary to establish an valuable method to process this amount of literature while, at same moment, capturing the necessary elements of the scenario. These presents the building blocks of the search methodology used.

### 1.2 Classification Schemes

In order to study and analyze the results in a more planned way, the papers were distributed in respect to two attributes: the factual nature collected from studied papers and the applications related to simulations used.

To analyze the factual nature of the papers, we divided the literature into three parts, defined as follows:

**Real Problem-Solving papers:** the simulation is used implementing for real problem with practical data or real data.

**Hypothetical Problem-Solving papers:** the simulation is been used for implementing the purpose of solving a real-world problem, but using unreal data instead of real data. It has the objective at providing generic solutions. **Methodological papers:** research is conducted to improve the methodology of simulation itself regardless of any specific application area without experimental study.

'Process Engineering in Manufacturing' which includes both process design and improvement, accounts for being second popular application of simulation, while other applications including 'supply chain management (SCM)[1]', 'Strategy', 'Transportation', and 'Project Management' are included in the list.. Although, this is mainly related to the use, application and utilization of system dynamics. In addition to this, we found a noticeable number of papers on project management (PM)[4], management training, knowledge management (KM)[6] and organizational design (OD)[5]. SCM maintains a visibly a certain fashion, mainly because simulation is basic technique for supporting decision-making on supply chain design, inheriting the modeling flexibility. This discovery is very stabilized with the no. of review on SCM, noted. A gradual increase in the organizational design (OD) area shows the ante of the simulation Community in the abilities of simulation to address organizational topics. 'Production Planning and Inventory Control', which shows the mix of application around planning and control, also shows a growth that could be explained by the recent practices in hybrid simulation (where two or more simulation techniques are linked together and used simultaneously to solve the problem). In contrast, to the 'Process Engineering in Manufacturing' seems evident.

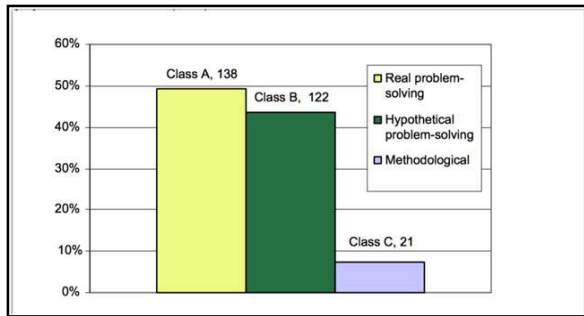


Fig: 1

In terms of techniques, results show that discrete event simulation (DES)[2] is the main and more widely technique or we can say method for business and production. It has been implemented in a variety of industries for a wide scope of operational management applications including scheduling, control, process engineering, and inventory management, SCM and project management purposes. This proves that DES has been appropriate for tactical and operational decision-making levels. Also, DES tends to be user-friendly for precise process study, resource utilization, queuing, and

relatively short-term study. As per our review paper system dynamic is widely used technique in manufacturing and business, with a popularity rate of over 15%.

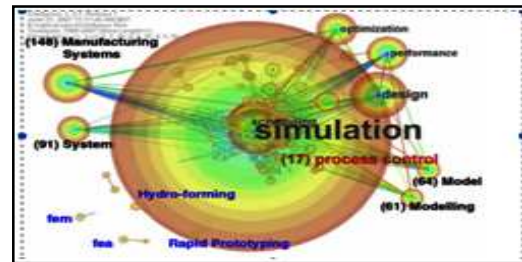


Fig 2

Its use has been focused on such domains as policy and strategy development, project management, SCM, as well as knowledge management. Figure implies that SD's application sectors are planned decision-making level and study, high level perspectives, according to qualitative analysis (e.g. knowledge management).

The main idea of distributed simulation is to disperse

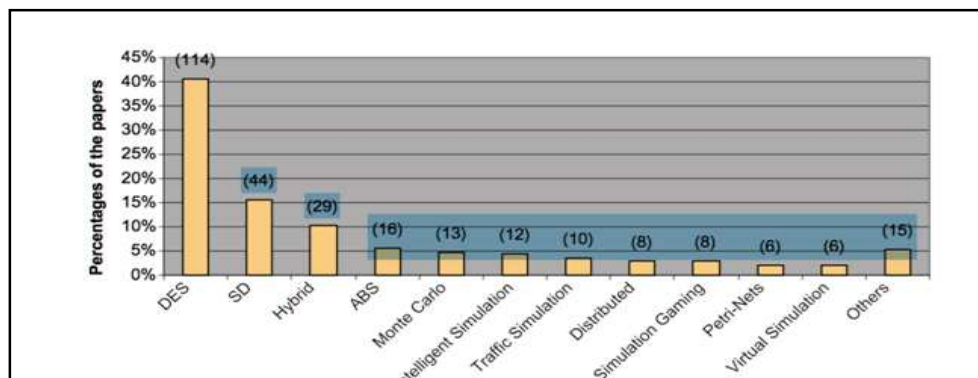


Fig 3

simulation functions across a network, which is in harmony with the growing trend towards decentralization schemes within organizations. This approach is related with distributed architectures, for example high level architecture (HLA), and implemented for organizations and problems with a network architect, as transportation (as a part of a hybrid technique), production of electricity generation, is also SCM where network structure of the chain plays a major role. Its very much use for military applications is also been listed in literature. Simulation gaming (SG)[4] is another technique that is receiving special attention from the education and training sectors and which is been applied in such areas as incident management training. Simulation gaming has also shown its practical use where there are some pre-developed simulation games for specific

industries such as insurance, financial services, or supply chains. Petrinets were introduced as a graphical and mathematical tool to model computer systems. Generally they can be considered for describing and analyzing systems that are characterized as being overlapping, asynchronous, distributed, parallel, and stochastic. Petrinets support all the features required to model processes. However, our review did not find any particular design of use for this technique, as it has been encountered in a wide variety of applications and industries (Petri-net based modeling and simulation techniques in the context of manufacturing, work-flow and transportation systems).

Develop virtual environments (e.g. virtual factories) that supervisors and engineers use to have a more clear, and more truth-worthy image of any change's impacts on the system. The data in such an environment will be shared for analyses in various



activities including product development, production planning, assembly analysis, work study, work- place

In addition to the analysis application standalone simulation - techniques, the present review identified 14 papers using hybrid simulation. These analysis bring all simulation to solve a problem. The best known instance of such an approach is the combination of DES[] and SD,[] which was found in 11 papers reviewed. The research on this particular combination has focused on the concept of 'Enterprise Modelling and Simulation' where the impact of production decisions, evaluated using DES models, is investigated on enterprise level performance measures. The SD simulation captures long-term

design, operation simulation.

effects of these decisions, in a holistic sense that are appropriate for higher management levels, while DES provides detailed analyses of the shorter-term decisions and actions. Other instance of such integration is a ranked production architecture consisting of SD components for the enterprise level planning, and DES components for the shop-level planning . We think that this integration approach will hold trust during the next decade.

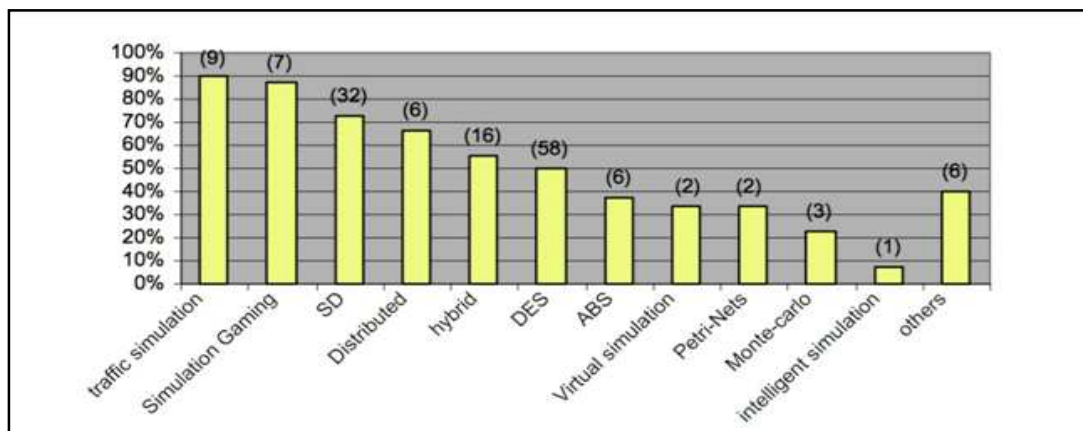


Fig. 4

## 2. FUTURE RESEARCH

This review shows that DES inspite its popularity – does not consist of the same level of stake-holder engagement as, for instance, traffic simulation and simulation gaming This is probably virtue to the difficulty and time needed for data collection, which usually opposes stakeholders in the fast pace of today's business. Secondly, we find that SD results higher in terms of stakeholder engagement, because it uses standardized conceptual modeling techniques that enrich brainstorming. This is in addition to its lesser reliance on hard data when compared with DES. Simulation gaming is also found to have a higher level of user engagement, because it is mostly utilized for education and training. Application wise, scheduling scores the highest as an application area for modeling. This is mainly confined to the fact that this section is well defined with known elements. The difficulty usually is in finding a reliable analytical method. This is not usual, the case for structured problems where the need for modeling is useless and the outputs are not tangible enough to be recognized. We also find that there is growth in strategic modeling, which is enhanced by the increased usage

of SD. Our review add newest application sectors to those of Shafer and Smunt [10] project management (PM), management training, knowledge management (KM) and organizational design (OD). This is an important finding because it shows the increasing standards of organizations of lighter aspects of their performance up grader. Another important search is the rising profile of hybrid modeling (where two or more techniques are used simultaneously). In fact it is the third most broadly reported approach. We believe this is broadly fuelled by the current fashion to add enterprise-broad solutions and the common assumption that various parts of an organization – however different in structure – will have common impacts.

The use of this approach is likely to grow in the next-few years, given the pace of technological advancement. Generally speaking, this review asserts that during the recent decade the simulation literature has witnessed a major diversification phenomenon both in terms of OR techniques and applications. This will open doors to new opportunities and challenges. Another major trend observed is an evidenced move towards empirical studies compared to methodological ones. This demonstrates a clear sign



of maturity in the discipline. More investigations and analyses of real problem-solving papers (class A), challenges, lessons learned, and new findings with a focus on the stakeholders engagement issue will establish a promising line of further research. Another interesting avenue for future research is a comparative historical and evolutionary analysis of various simulation techniques with a larger sample of papers, which would extend the current review to include grey literature. Furthermore, studies of simulation success and failure stories would help simulation researchers and practitioners to conduct more efficient and successful works both in developing new techniques and applying the present techniques in new domains.

### 3. REAL LIFE APPLICATIONS

#### 3.1 Interactive simulations

Simulations that are self-contained steps, You write the code and press execute and hope for the best that we not only interact but also experience to the point of complete immersion. Video games that are the most perfect example of Interactive Simulations (htc vive) is the most advanced technology available in it. These are stimulating the audio visuals. What about everything else like touch? There are full body suits like tesla-suits and vests like core-fx. Gloves give the illusion of holding, getting hit and even the sensation of temperature. Then they are entire systems build to give the entire virtual experience like driving simulators, railway simulators, flying etc. If you want to navigate inside a virtual environment. Best option is virtual x Omni .All of these technologies are fantastic but are not ideal they are only the beginning of virtual reality revolution. But using these you are always feel that you are wearing a mounted headset what eventually goes to mediating technology to create a truly immersive experience.

#### 3.2 BCI (brain computer interface)

BCI started in 1970 and till now it has come a long way. BCI help disabled to work as normal beings. From entertainment perspective you can truly see its potential when combined with virtual reality. And it was in 2014 when brain to brain communication was possible between two people on internet.

#### 3.3 C. CBI (Computer brain interface)

The device[8] receives information from the brain and tries to interpret what the information means. But this isn't possible yet because if something goes wrong will transmitting the signal, then it may damage the brain as well. Once we have unlocked the mysteries of the brain, the possibilities will be virtually endless.

#### 3.4 D. Prio VR

It is a 12 sensor suit for the gamer who wants full body tracking including the legs which allows imitating the real life tasks. And help in navigating in the virtual environment.

#### 3.5 Tesla Suit (feel what you play)

Tesla suit [9] is full body haptic suit that lets you touch and feel sensation in Virtual Reality[08]. A haptic suit used modern electrical impulses to transmit signals to skinny muscles. The technology is used widely in physical therapy to help train muscle groups as well as pain relief adaptive back technology to help transmit signals through virtual reality simulations. (Virtual reality stimulating massive potential) Potential of tesla suit is enormous. It is also open for developers who may use haptic sdk to enhance and take it to the next level. 2 versions of tesla suit: PIONEER which has 16 points and POLICY which has 52 impact points which means more realistic experience. This unit connects wirelessly to any device such as game consoles, VR headsets, Mobile phones, tablets, pc taking potential of tesla suit well beyond gaming and you can already experience many uses such as sports, gaming and medical therapies. It is also good for music industries and military training. It has potential to use in any world music to health, education to entertainment. Development kit of tesla suit is ready to give the freedom to create your own sensation. Software includes the haptic educational studio and easy to use sdk. There is also the concept of virtual meeting app which enables friends and family to add tactile sensations, video calling, messaging to send and receive real hugs over internet generation.

#### 3.6 Cyberith

It helps providing the interactive simulations i.e simulations in simulations. It helps to enable to walk inside of the game. This actually provides the solution to walk inside the virtual space. It uses virtual simulations. Virtualiser is a watering locomotion device. For virtual reality to move freely in Virtual environment. It is done by combining revolutionary low friction principle and high precision sensors. This is a special mechanical construction. It allows natural movement which is low latency and isolates the user from outside inferences.

### 4. CONCLUSION

Over 70 years simulation are used in manufacturing and business, has led to a wide spectrum of successful applications in different fields such as design, planning and control, strategy making, resource allocation, Training, etc. This review has not come over the whole census of significant publications; we



believe it is different from previous attempts from three perspectives: broader coverage of the literature sources, broader scope of the simulation techniques, and a focus on real-life applications. Even after getting the simulations which are close to real we will always feel that some burden on our head and pain while wearing some tight suits or heavy wired headsets. If this technology continues to advance and is able entirely escape the realm of science fiction the world technically advance, the world as we know, future we often imagine will dramatically change. So we are trying to imagine that this future we often think of humanity is grand explorers of the universe. It is often assumed that we will continue to expand outwards far beyond the earth and the solar system. Of course this is just the optimistic assumption that we steadily continue to progress and innovate. This powerful virtual reality would allow us to do anything and everything. No fear of harm or death, no irreversible consequences, no physical limitations, the ability to customize and manipulate the world and also fit our personal needs and preferences.

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