Simulation Environments

Arpan Hanjra
CSED, DAVIET
Jalandhar, India
arpanhanjra26@gmail.com

Sherry
CSED, DAVIET
Jalandhar, India
Sherry.0989@gmail.com

Abstract: This research paper provides information about simulation and its enviornments. They are mainly used for the creation of dynamic models which supports different types of modeling like discrete, physics based modeling. The development of these tools enable users to visualize real world system that depicts the behavior and the associated methodology. The majority of simulation environments encompass its own programming language and rest of them relies on graphical approach. Different simulation environments are discussed on the basis of their usability, reliability provided by simulation model.
Keywords:-Simulation; environment;modeling;

I.   INTRODUCTION

This research paper deals with the simulation and the simulation environment. The document discusses about the characterstics of various environments. The main aim of the document is to pen down the uses of simulation environments.   Simulation aims at drawing conclusions which are meaningful , correct and statistically sound. It allows the study of complex systems and evaluation more convenient and accurate. It is very difficult to keep pace with ever increasing demands of companies by using old paradigms. In the real world time and cost involved in the direct experiments is very high and the results are not satisfactory. Companies are facing lot of problems in designing, evaluating and testing of product or system.   But simulation environment reduces these overheads .Innovative, fast and agile scheme is needed to increase the productivity . Simulation provides cost effective modeling of system . It forecasts the behavior of the system[1]. User can look into different

properties of the system. Design, Diagnose of existing system problem, Testing of designed system based on different parameters can be easily performed with the help of these environments. Fig 1 represents that development of simulation model. It undergoes through various stages of preprocessing and evaluation.
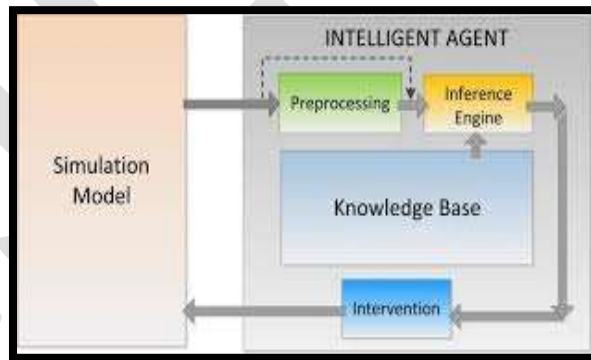

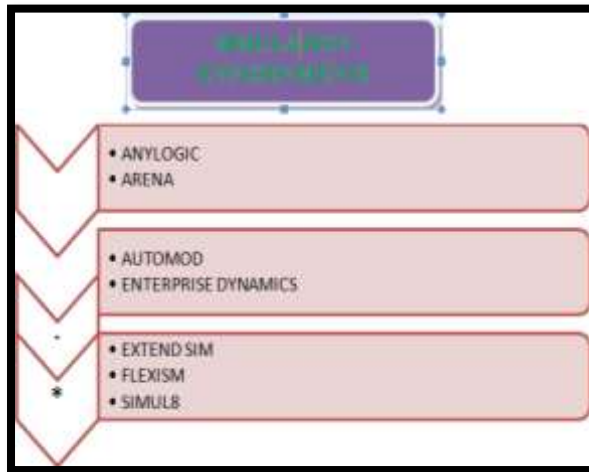
Figure 1: overview of simulation

Figure 2: Simulation Enviornments

II.   SIMULATION ENVIORNMENTS

The period from 1987 till today is notable with emergence of various enviornment tools which supports features like graphical user interface and advanced visualization tools.These enviornments includes input and output analyzers.The majority of simulation environments encompasses its own programming language and rest of them relies on graphical approach. Fig 2 shows some of the simulation environments discussed in this paper[2].
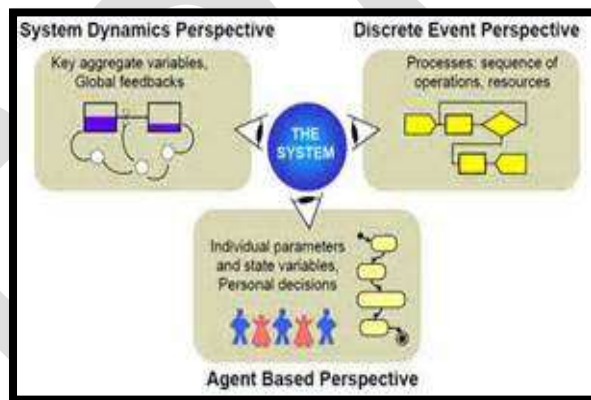

Figure 3: Perspectives supported by AnyLogic

A) Anylogic

Anylogic is a simulation software that supports multi-method simulation in fields like discrete event modeling, agent based modeling & system dynamics. It consists of objects for modelling of a process.It supports all the known modeling approaches. Fig 3 displays these perspectives and the associated variables supported by AnyLogic.This software is based on Java and is platformindependent[3].Source,Queue,Delay,Resource Pool,etc. are the objects in software. It is easy to build model in AnyLogic.It provides good visualization to the developer. Flexibility is another important feature. Drag &Drop capabilities are present. The model can expand limitlessly. Debugger is present in it. The user can save the state and restore the state at later stage. Supply chain logistics, Health care ,Transportation & Warehousing ,Airports, Stations are the applications of Any Logic. AnyLogic has two versions Advanced& Professional are two versions .Business Tools are present in Advanced AnyLogic.New version was released in 2014.It has major updates. Libraries are renewed with less reduced need of coding. Open street maps and Google maps are part of AnyLogic 7.1.AnyLogic is a simulation software that works on different platforms like Windows, Linux and Mac OS.
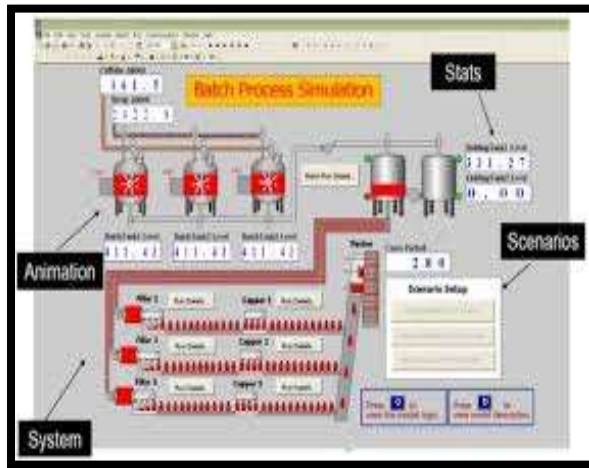
Figure 4: Batch processing Simulation in Arena

B) ARENA

Rockwell Automation offered Arena Basic & Professional Editions. Discrete and Continous systems are simulated using ARENA. It uses entity based ,flowcharting methodology. Graphical Objects are used to build simulation model called modules. Modules can be used to build experimental model. Templates are the collection of organized modules.IconPlus is used to represent the modules.Siman Language is the heart of ARENA. The Professional Edition Of Arena is flexible and has additional functionalities. It measures and tracks performance metrics. The Standard version of Arena is versatile and solve many problems related to simulation. It contains advanced templates.It has student version which is mainly used for academic purpose. It has runtime features.Visioflowcharting is part of it. It provides ODBC data compatibility and real time modeling. Validation, Verification& Debugging is easier in this software. Arena made the communication possible between complex processes. Input Analyzer automates the selection of proper distribution. There is an integration of Opt Quest optimization. It can import files flowcharts of Microsoft Visio and can read from and output to Excel sheets and Access databases. It hosts ActiveX controls. Fig 4 demonstrates the batch processing simulation in ARENA [4].

Figure 5: Representation of real world   system modeling in AutoMod

C) AUTOMOD

Applied Materials offers AutoMod. AutoMod comprises of simulation package, AutoStat for Experimentation & Analysis. The largest manufacturing system is modeled in AutoMod. It deploys material handling templates.Full Simulation language is present in AutoMod. It comprises of one or more System.Flow & Control Logic is based on material handling. Fig 5 represents the real world material handling simulation .3D virtual reality,animation graphics,detailed,Stastics&Optimization,interactive modeling are prominent attributes of AutoMod. Reductiom of risk of operation ,highest degree precision are features of Automod. It increases work fecundity. Automod presents Optimization on the basis of Evolution Strategies,characterizationofscenarios,detemination of warm-is done in the environment of Autostat. It supports operational analysis ,evaluate strategies, revamp existing facilities and helps in decision making.Automod is known for its performance, scalability and accuracy[5]**.** Fig.6 throws light on the areas which uses Automod as simulation tool.

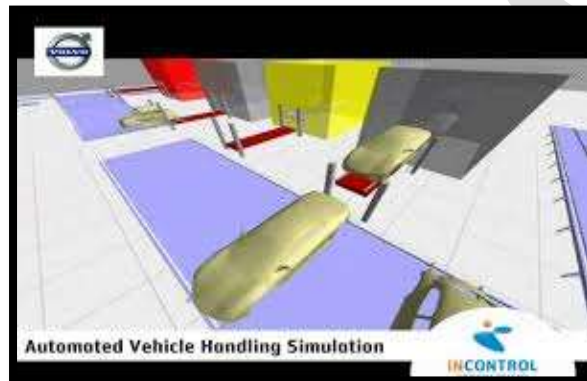**Figure 6: Areas of Automod application**

Figure7:Automated Vehicle handling Simulation in Enterprise Dynamics

D) Enterprise Dynamics

Enterprise Dynamics is a simulation software & is a product of Incontrol Simulation Software. It has its own simulation language, 4DScript.4D Script is a functional programming language that supports object oriented scheduling based on events. Enterprise dynamics contains collection of predefined & user defined rules. It supports 2D & 3D animation. It allows the developer to model the problem virtually and then provide the solution for the same. Objects called Atoms are selected from library which captures real world behavior and creates a model. At early design stage, it detects the problem. Rough Cut Capacity planning, transportation planning, equipment planning are performed to optimize and safeguard the investment. There is an availability of 1500 functions. It has drag & drop facility. It allows provision for additional libraries and extension of object libraries.The libraries are designed to comploy with the customers demands. These libraries are: ED Airport,ED Educational, PD Pedestrian Dynamics and Showflow. Fig7 shows the automated vehicle handling   simulation. It is intelligent management system to improve efficiency and is cost effective [6].
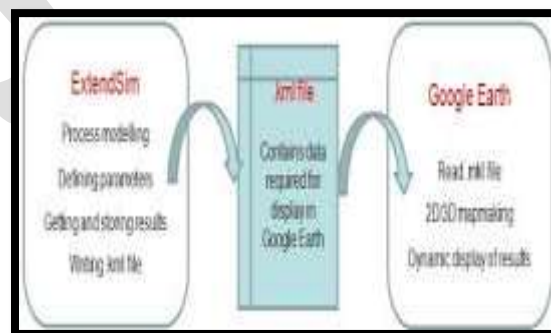

Figure 8: Processing In Extend Sim

E) Extend Sim

Extend Sim is the product of Imagine That Inc. Extend Sim is simulation environment for discrete event & mixed discrete continous systems. This can model continous ,dynamic , linear, non- linear ,agent based systems. It provides drag & drop facilities to the user. This environment has graphical objects which can show logical as well as physical elements. New models can be developed by the connection of various blocks. Each block has its dialog box in which parameters are entered. This block consists of icon, user interface& animation, precompiled code.Create, Queue, Activity, Resource & Pool are present in elemental blocks.It creates logical representation of any process in a simple format.It has customized graphical interface that identifies the relationships in the developed system.Models can be decomposed hierarchically which makes modeling easy and flexible. It has Open Database Connectivity(ODBC) & File Transfer Protocol support. Relational Database ,an Optimizer are also present in the software. Supply chain dynamics ,communication systems , Pulp & Paper process are its applications. Fig 8 shows the steps involved in producing dynamic display of results .The first step shows the process modeling, defining parameters. These results are then written in .kml file which stores data required in Google Earth. After that there is 20/30 mapmaking and finally results are displayed [7].

Figure 9: Airport Security Simulation in Flexism

F) Flexism

Flexism software was the creation of Flexism Software Products ,Inc Of Orem , Utah. This software uses the Open GL technology to simulate discrete, object oriented . 3D virtual reality is used for animation. FlexScript is a precompiled language which is present in Flexism .Complex Algorithms Are modeled by Using Flexscript and C++.It uses object oriented approach .Four classes namely node class, fixed resource class, task executer class and visual object class are used to define objects.It has drag and drop capabilities which drag ahe abstracted 3D objects from different classes and link I n the model. Modification of objects can be done and then saved and shared with other users. There can be an interconnection of many computers .Collaboration of multi users is possible in the software. It allows the modelers to work together from different areas to develop model and run different experiments and analyze the results. Fig 9 represents the application of Flexism in airport security checking.It covers all facets of business and optimize the system by making necessary changes [8].

G) Promodel

ProModel is the product of ProModel Corporation in 1988. It provides opportunity to developers to evaluate new trends for designing system.It is mainly used to model the non-manufacturing systems. It offers various products like MedModel for healthservices, Service Model for service system simulation,Emergency Department for estimating resources..It has Certified Partner Microsoft Gold.It models continous processes. It creates animated layout automatically and uses graphics from user defined or inbuilt libraries. It enables you to represent interdependencies in real world processes [9].
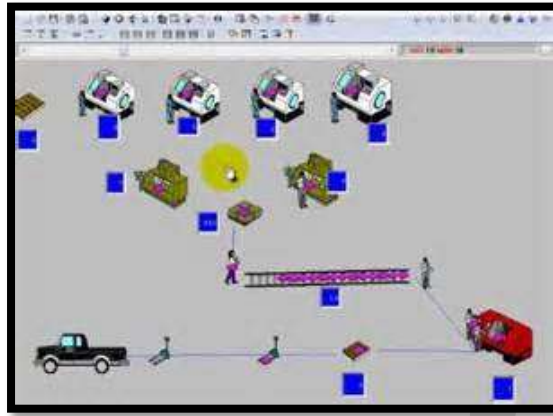
Figure 10: ProModel simulation

The ProModel methodology follows three steps:1. Visualize the real world system and note down all the processes in action.2. Analyze the model to identify the shortcomings and make necessary changes to improve it.3. Optimize it . It gave estimation cost on the basis of information entered by user pertaining labour, equipmrent. Individual's models are built and kept which are collaborated to run as a whole when desired. It easily transfers data to Microsoft Excel and MiniTab to create charts and interactive diagrams. OptQuest Engine is a part of ProModel. It generates standard output reportsIt compares different experimented scenarios for same system. It works on evolution based strategy algorithm. It is used in warehousing, US department fo planning resource capacity logistics. ProModel helps the business analysts in decision making and to incorporate new ideas to improve the model.

III Conclusion:

Simulation is used in now a days in every field. So, it has become a need for every research area. To create virtual environments simulation software's has been developed. The development of simulation software's is quite difficult with programming languages like java and many more. Simulation environments provide the essential features of virtual environment development which are not provided by programming languages. Arena, Automod, Extendsim *etc* has provides the ease of development with various features which reduces the overhead of user.

REFERENCES:

[1]. Luke, Sean, et al. "Mason: A multiagent simulation environment." *Simulation*81.7 (2005): 517-527.

[2].Gaba, David M., and Abe DeAnda. "A comprehensive anesthesia simulation environment: re-creating the operating room for research and training."*Anesthesiology* 69.3 (1988): 387-394.

[3]. Borshchev, Andrei, Yuri Karpov, and Vladimir Kharitonov. "Distributed simulation of hybrid systems with AnyLogic and HLA." *Future Generation Computer Systems* 18.6 (2002): 829-839.

[4]. Barton, John J., and Vikram Vijayaraghavan. "Ubiwise, a ubiquitous wireless infrastructure simulation environment." *HP Labs* (2002).

[5]. Banks, Jerry. "Getting started with AutoMod." *Bountiful,UT:Brooks-PRI Automation*(2000).

[6]. Zeigler, Bernard P., Herbert Praehofer, and Tag Gon Kim. *Theory of modeling and simulation: integrating discrete event and continuous complex dynamic systems*. Academic press, 2000.

[7]. Krahl, David. "ExtendSim 7." *Proceedings of the 40th Conference on Winter Simulation*. Winter Simulation Conference, 2008.

[8]. Nordgren, William B. "Flexsim simulation environment." *Simulation Conference, 2003. Proceedings of the 2003 Winter*. Vol. 1. IEEE, 2003.

[9]. Harrell, Charles R., and Ken Tumay. "ProModel tutorial." *Proceedings of the 24th conference on Winter simulation*. ACM, 1992