VIRTUAL ENGINEERING

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ABSTRACT

This paper focus on the use of virtual engineering in the product designing by using various software's. It helps in the analysis, simulation, and optimization within a computer-generated environment. A virtual engineering environment provides a user-centered, unique perspective that allowsusers to interact with an engineered system naturally and provides users varieties of accessible tools. This requires a model that includes the geometry, analysis and any quantitative-qualitative data from the real system. The user should be able to use the operating system and observe how it works and how it reacts to changes in design, operation, or any other engineering modification. Use of the virtual environment should provide an easy understandable interface, appropriate to the user's technical knowledge and permitsthe user to explore and discover unexpected but critical details about the system's behavior.

Keywords: Analysis, Modeling, Virtual engineering, Virtual environment.

I. INTRODUCTION

The origin of the word 'virtual' is the Latin word 'virtualis', which means something has the potential to exist as possible, although not real or actual. This is important to note that the adjective 'virtual' is frequently used in the literature as a similar of 'visual' or 'imaginary'.An important aim of virtual engineering is to engage the human capacity for complex or complicated tasks.Virtual engineering allows engineers to work with objects in a virtual space without having to think about the objects' underlying technical information. When an engineer takes hold of a virtual component and moves or alters it, he or she should only have to think about the consequences of such a move in the component's real world counterpart. Engineers must also be able to create a picture of the system, the various parts of the system, and how the parts will interact with each other. When engineers can focus on the making decisions for particular engineering issues rather than the underlying technical information, design cycles and costs are reduced.

II. DEFINITION

Virtual engineering is defined as integrating geometric models and related engineering tools such as analysis, simulation, optimization and decision making tools, etc., within a computer-generated environment that facilitates multidisciplinary collaborative product development [1]. Virtual engineering shares many characteristics with software engineering, such as the ability to obtain many different results through different implementations.

Important aspects in the definition:-

2.1.Geometric modeling :-

Geometric modeling is a branch of mathematics and computational geometry that studies methods and algorithms and processes for the mathematical dimension of shapes. The shapes studied in geometric modeling are mostly 2 - 3 dimensional, although many of its tools and principles can be applied to group of any finite dimension. 2-dimensional models are important in technical drawing. Geometric models are usually distinguished from procedural and object based models, which define the shape implicitly by an opaque algorithm that generates its appearance.

2.2. Simulation :-

Simulation is the copying of the operation of a real-world process or system over time. The act of simulating something first requires that a model be developed, this model represents the important characteristics or behaviors or functions of the selected physical or abstract process. The model represents the system itself, whereas the simulation represents the operation of the system over time.

2.3. Optimization :-

In mathematics, computer science and operations research, mathematical optimization is the identification of a best element. In the simplest case, an optimization problem consists of maximizing or minimizing area function by systematically choosing input values from within an allowed set and computing the value of the function. That means finding the best solution for the problem or designing it such as it can be smoothly and efficiently as possible.

2.4.Decision Making Tools:-

Optimization, cost analysis, scheduling, and knowledge-based tools.

III. PROBLEM DEFINITION

Virtual engineering includes the following six steps in designing and its implementation.

1. Definition
2. Creation
3. Analysis
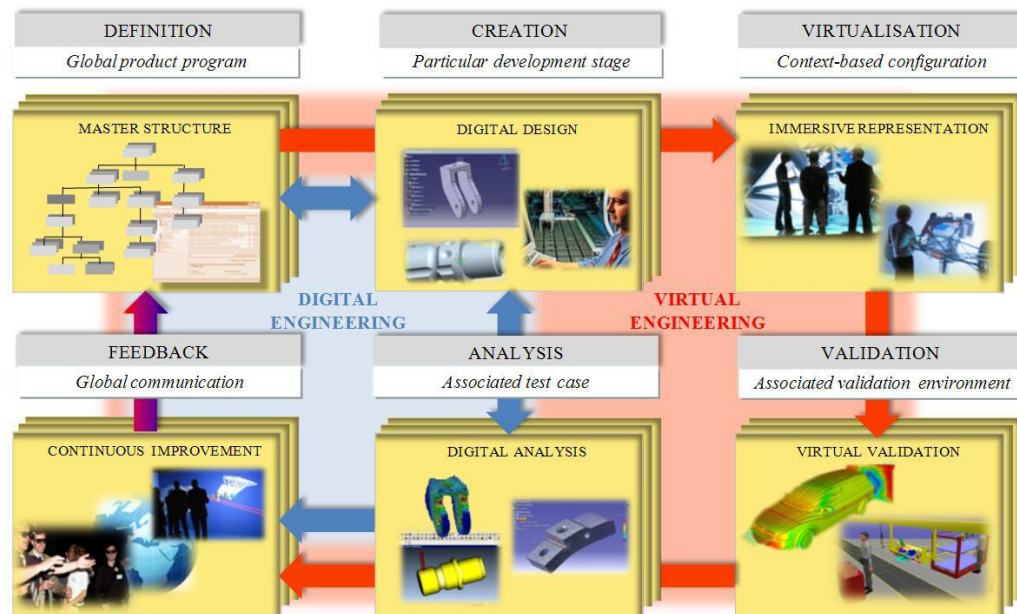4. Visualization
5. Validation
6. Tracking

Fig.1. Overview of the iterative process definition

IV. SOFTWARE'S USED IN VIRTUAL ENGINEERING

1.Computer-aided design (CAD) :-

It is the use of computer systems to help in the creation, modification, analysis, or optimization of a design.[5] CAD software is used to increase the productivity of the designer, improve the quality of design, increase the communications through documentation, and to create a database for manufacturing. It describes the capability to model a dimensions using geometric operations that can be close to real life industrial machining process. The CAD module is made to easy generation of a geometrical shape. It comes usually with other modules, such as an engineering drawing making tools.

2.Computer-aided manufacturing (CAM) :-

It is the use of software to control machinetoolsand relate in the manufacturing of workpieces CAM may also refer to the use of a computer to helpand develop in all operations of a manufacturing, including planning, management, transportation and storage. Even if the CAD provide an accurate virtual shape of the objects or parts, the manufacturing of these can be largely different, just because the previous tool just deal with perfect mathematical operation. To take into account in a more realistic manner of the successive manufacturing operations and to be able to certify that the end product will be close to the virtual model, engineers make use of production module which represent a tool that machine the parts.[5]

3.Computer-aided engineering (CAE):-

It is the broad usage of computersoftware to help in engineering analysis tasks. It includes Finite Element Analysis, Computational Fluid Dynamics, Multibody dynamics, and optimization. Another aspect is integrated in a Virtual engineering tool, which is the engineering analysis such tool can be integrated to the main software or separated. It is usual that the CAE modules software dedicated to that task, having less features in the CAD aspect. Often the tools can perform import/export to make the most of the each tool.[5]

> Software :- UC-win/Road and VR Studio by FORUM8

Basically the software's for the modeling depends upon the basic problem definition or the models required.

V. METHODS IN THE DESIGNING THE MODELS IN THE VIRTUAL ENGINEERING

Integrated design and engineering methods based on physical and virtual testing have become standard practices in the product design process. Extending these methods to support the development of mechatronic products requires addressing the challenges posed by (1) their inherent multi-disciplinarily and (2) the integration of control system concepts.

The basic geometric design choices act as a major constraint for these tasks and going back to iterating the geometry is very difficult and leads to large delays. The basic geometric design choices act as a major constraint for these tasks and going back to iterating the geometry is very difficult and leads to large delays. The second challenge relates to integrating systems and control engineering

Advanced engineering environments (AEEs) are integrated computational systems and tools that facilitate design and production activities within and across organizations. An AEE may include the following elements:

*.Design tools such as computer-aided design (CAD), computer-aided engineering (CAE), and simulation

*.Production tools such as computer-aided manufacturing (CAM), manufacturing execution system, and workflow simulation

*.Program management tools such as configuration management, risk management, and cost and schedule control

*.Data repositories storing integrated data sets

*.Communications networks giving participants inside and outside the organization secure access to data
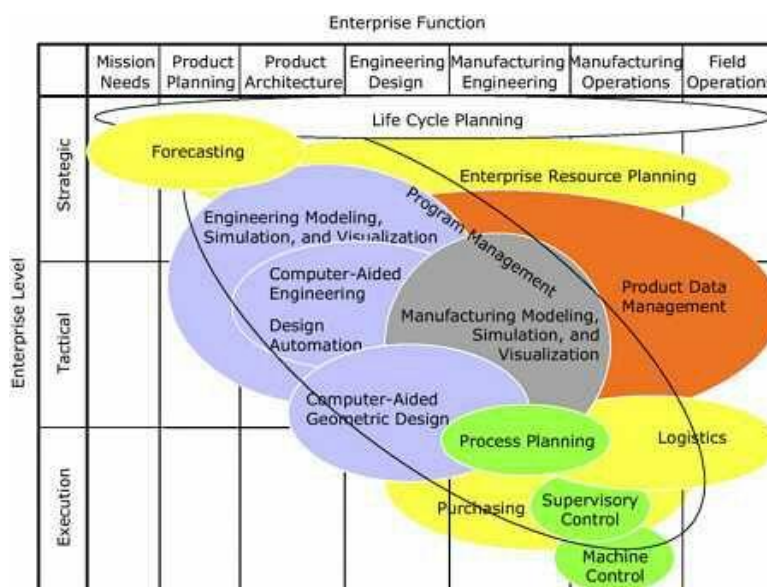
Fig.2. Overlays the tool that bridge design and manufacturing

VI. CONCLUSION

Thus this paper gives information about the basics in the virtual engineering, the knowledge about the definition,   what it   actually   includes   and   steps   in   the   analysis   of   the   models.This   paper

providesdataconcerningthe fundamentalswithin the virtual engineering. In the virtual engineering the model design and development is basically made on the software. It proposes that virtual engineering is eventually about the people's work and smart technologies create many new opportunities for creation of new design.

The analysis of the model is done in the virtual environment which is created while designing the model in the software.The advantages of Virtual Engineering are as it saves the cost and investments, increase efficiency and communication, improve quality, and provide enhanced user experiences.

Acknowledgement:-

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