Introduction to Aircraft Engineering Learning Based on Virtual Reality and Multimedia

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ABSTRACT

In the modern era a learning system will change from a conventional method to a computerized system, in the computer lab learning system the existence of a simulation workshop is a necessity where with these facilities students can practice what they get from lectures, so that students have experience and can practice all practical materials accordingly. With real conditions in the field the problem currently faced is that not all campuses have the same lab facilities because the infestations are too expensive and the costs are too large for example the simulation system for controlling car engines and airplane engines, which are relatively expensive and require relatively large space and noise pollution, to overcome this problem a virtual lab-based simulation system has been developed by making the conditions of a bench with its real condition, this virtual-based simulation system will have the advantage that students able to make a virtual operation. the existing equipment is without fear of being lost or damaged and most importantly students avoid exposure to dangerous chemicals and avoid work accidents, this virtual lab system is more attractive to students because it is based on simulations and games that make learning media more interactive.

Introduction

An aircraft engine is a turbine engine that consists of several complex and very complicated sensors, with a large size making the aircraft engine assembly system requires a very large room, besides that aircraft engines, especially jet engines have a high noise level so it requires a special lab and a place that is far from residential areas, in large jet engines the supervision process must be carried out by a professional instructor and must carry out a strict supervisory process because work accidents that can be fatal cause damage to equipment where this flight engine is very expensive, this would be different if we could present a virtual lab for the introduction of flight machines with the help of multimedia technology where in the lab students will be presented with a display of how the machine works in accordance with reality in the field without fear of damage or failure. This ritual does not replace the function of a real lab but to provide a basic knowledge and safety guidelines before going into the field, students will independently be presented and visited virtually in a lab with the help of animations that will explain the type of equipment and the names of components or sensors that are used. There is an aircraft engine that seems as if

the student is accompanied by a lecturer or aircraft engineering practitioner, several studies have developed virtual technology not only as a learning medium but re-developed in the world of games but vehicle simulations and in the health sector.

Literature Review

In a traditional manufacturing industry, there will be several process stages in the manufacture of a product, namely concept making, design, and finally a product testing, when the aircraft industry continues to improve the effectiveness and efficiency of each production and this has become a production cycle where the use of technology will add and improve the quality of sales, so that every airline industry will focus on an effectiveness and additional high technology production [1].

In order for an aircraft engine design to be more effective and efficient, a computer-based technology or VR virtual reality is created this technology makes it easy to design an assembly process tool and perform system testing, in this case an airplane engine the design step of an

airplane component, a programmer will analyze an aircraft component, the analysis process is carried out physically among others by means of measuring the size component material that is made and designing it in 3D [2].

The advantage of a VR technology is that when it is implemented in the real world the way the components work is not much different from the original components so that the tools used have the same principles and methods of working, another advantage is that it reduces the purchase of new components and is easy to do for testing, the testing process for aircraft engines requires expensive and repetitive costs, while the virtual method able to adjusted according to the needs and manipulation of the test environment [3].

At this time, computers have high capabilities and capabilities that are easy to develop into software, this software is useful for the education sector, for example it is used as a manufacture of airplane simulation machines, especially in turbine engines, why is it needed in the form of learning simulations because it will save material during the teaching process and in simulation mode we can easily perform the configuration process and add the latest technology, a teacher will have a high contribution in the development of this component because the information and how the components work can be simulated, in other words the education system has limitations in providing a tools or materials so that the education system is in accordance with learning outcomes, a computer aid is needed that will teach and provide teaching information to make it more efficient and effective, in other words how a turbine engine works can be displayed in a simulation with how the components work and form closer to the original [4].

In a previous study a software developed by part of a simulation medium for how a turbine engine worked, the software explained the basic structure of the components, explained a basic theory of how to make these components so that they were according to how they worked, another thing that was no less important was how to measure the basic ability of aircraft engines to carry out the observation process, so that audio-visual media

support is needed which will provide interactive information [5].

Modeling using computers allows us to carry out an engineering and certain conditions when testing tools or components that cannot be done in real situations, for example an operator can easily configure room temperature control devices and control the engine rotation process, the computer itself is capable of. provide information that is difficult to obtain in a direct experiment in the field [6].

A computer system is capable of performing maintenance and repair processes on one component that has been unraveled or has been assembled on the system. VR objects are divided into two parts, namely as a model called a model or human and secondly what is called the environment or workplace, humans can be referred to as a support system by enhancing and transforming it into a digital system and visualizing objects and being able to control, at the level of This interaction is divided into several parts, namely the small, medium and high scale levels [7].
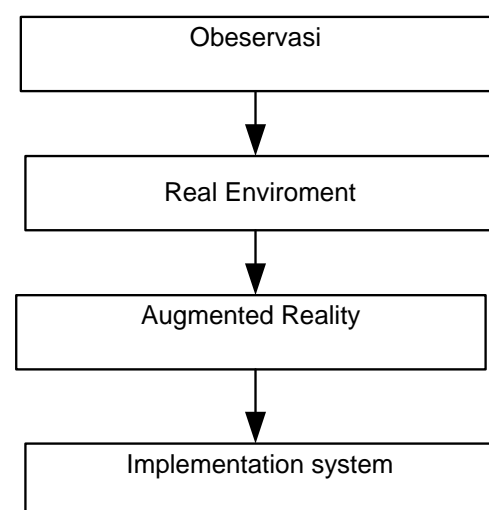
Methodology

Figure 1. Stages of making multimedia

In the picture above is a process of designing an aircraft workshop virtual lab application, in a virtual application it will represent the surrounding conditions with the same and real conditions, in this method a programmer will be required to make a component object or an aircraft

engine sensor in accordance with the original form and the resulting sound components, in this section multimedia animation gives an important role where the addition of an animation will make a virtual LAB more attractive, the stages of these observations are as follows:

• Observation

Observation is a stage in the initial process of virtual development, where a programmer and animation maker will directly consult aviation experts about how to manufacture aircraft components so that when simulated in the virtual lab, they work and form the same way.

• Real environment

In this method, the programmer is required to create a workshop atmosphere in accordance with its original conditions, how to place the engine, sensor aircraft components and most importantly information about occupational health and safety.

• Augmented Reality

In this section, each component data that has been created is then animated with the help of multimedia, which will display the types of engine sound components and even test aircraft engines with temperature conditions that can be configured according to testing needs.

• Implementation system

After the animation creation process is carried out with the help of multimedia, the virtual system is then made into several parts, the interface design of a virtual lab is made more attractive and easy to use, the simulation and animation process is made in such a way as the conditions in the field.

Results and Discussion

In this test, a virtual lab will be created which is used as a simulation tool for how aircraft engines and sensors work, in this simulation method we are given the freedom to design a tool with a real shape in the field that is carried out at the time of observation, the function of this observation is so that tool or component form that we make or design according to the form and way of working with the original component.
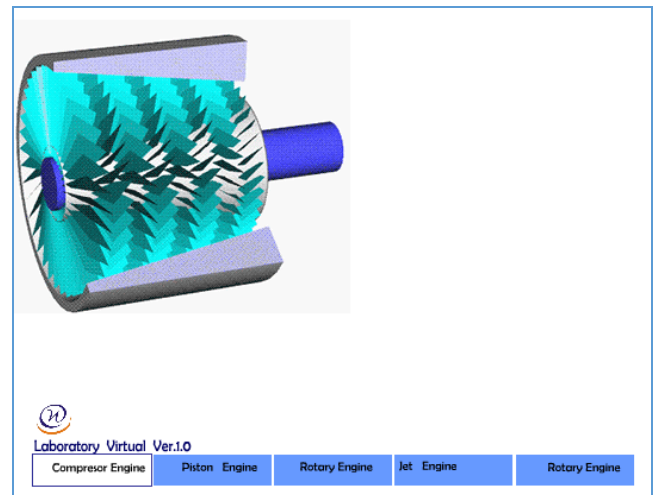

Figure 2. Basic components of a jet engine

In Figure 2 is a type of jet engine component or what can be better known as a turbine engine, in this virtual lab there are several options where students will be given an explanation of several engine components, be it a compressor engine, type of piston engine, propeller engine, jet engine and engine Rotate, in this section a virtual display of a jet engine inlet which will later provide a combustion chamber pressure, in this section there is a sensor that regulates the engine rotational speed so as to provide a pressure and thrust on the aircraft and this machine is used in subsonic and supersonic aircraft types.
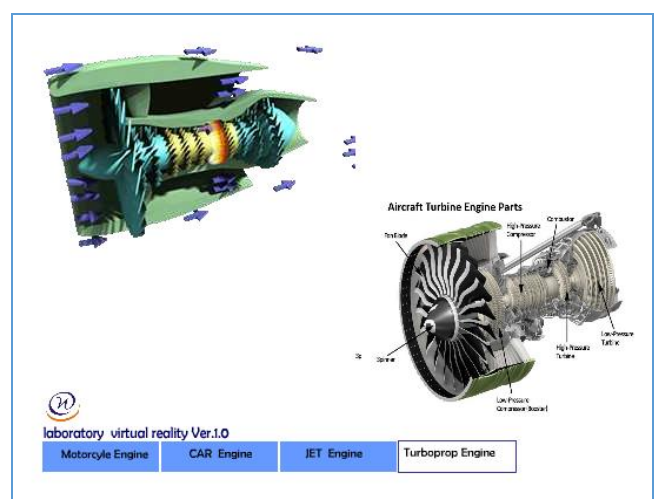

Figure 3. Basic components of a jet engine

In this section students explain how the main engine works, in that section the animation in detail explains the process of air entering the combustion chamber, then in this section the compressor raises a pressure so as to produce a strong thrust on the aircraft engine, when air

enters the engine part it will mixed with aircraft fuel so that the cold low pressure air will change with the high pressure air and create thrust.
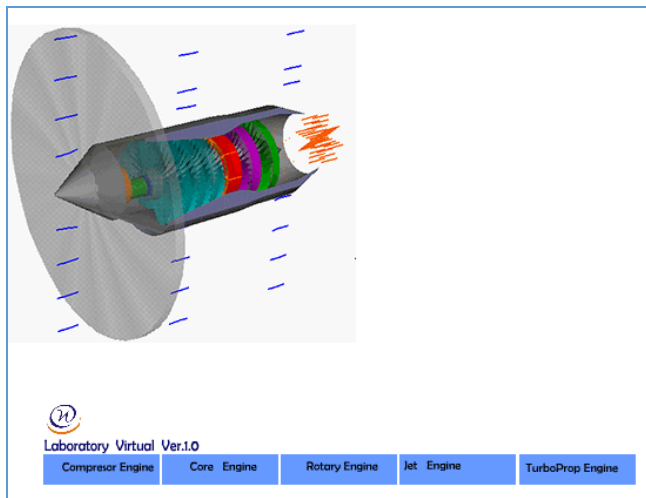

Figure 4. Basic components of a turboprop engine

In Figure 4 is a virtual lab simulation that explains how a turboprop engine works, this type of machine is also called a turbine engine whose engine has the same components as a jet engine, the advantages of this machine are very compact, light and have a large lifting capacity, virtual students will be explained every basic component in the type of aircraft engine in the form of animation that will make it more interesting and interactive

Conclusion

From the results of the application experiment made it able to concluded that virtual doesn't replace the role of lecturers or experts in the field of aviation but as a learning process aid, this virtual lab is not only on aircraft engines but can be developed for other simulations, the advantages of this virtual lab students learn unlimited time, virtual development is usually added to virtual VR, with this method a campus or agency can save space and equipment usage**.**

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