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3D Modeling Analysis on (FEI) Finite Element Image of Lumber Vertebrae

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ABSTRACT

In order to provide a more realistic representation, it is necessary to develop a vertebrae model in three dimensions. Over the last decade the use of FEM as analysis tools in biomechanics and orthopedics has grown rapidly [1]. The purpose of this study was to analyze the state of finite element modeling of human foot using ANSYS software and to validate the stress and deformation. Finite element analysis (FEA) is composed of a computer model of a material/object used in designing a new product, and getting the product smuttiness. There are basically two types of modeling: 2D and 3D modeling. Although, simplicity is given on 2-D modeling it tends to yield less accurate results. In 3-D modeling, more accurate results can be achieved, which requires high speed computers. The process of developing a mathematical representation of any 3D surface of object through method is called a 3D model.by using this project we can studies on the biomechanics of vertebrae and analyzed under static loading conditions and focused on injuries of stress which are the most common vertebrae injuries in athletes and military recruits [2].

Keywords : Finite Element Method, Finite Element Analysis, Double Dimension, Triple Dimension

I. INTRODUCTION

FEA models can be a very powerful method to understand the foot mechanical behavior [5]. Finite Element Analysis is a method in which a computational software is used to divide a solid model of a physical entity (the human foot in this case), into a large number of finite elements which are then solved to find out resultant parameters (stress, strain, deformation, etc.) when an input (load acting at a point) is given to the model. In case of structural failure, FEA may be used to help determine the design modifications to meet the new conditions [6]. There are particularly two types of analysis that are used in industry: 2D modeling and 3D modeling. Designing models in engineering practice presented numerous complex problems and challenges which can be easily addressed by FEA methods, which otherwise would have taken longer time. FEA provides a cost-effective and faster approach. It can determine the suitability, sustainability and efficiency of prototypes prior to physical manufacturing and testing. FEA is proving especially useful in biomechanical simulations where CT scan data of a physical part can be used to generate a 3D solid model, which in turn can be divided/meshed using ANSYS and FE analysis can be performed[7]. For analyzing any physical system through computational method was shown in Fig.1.2.

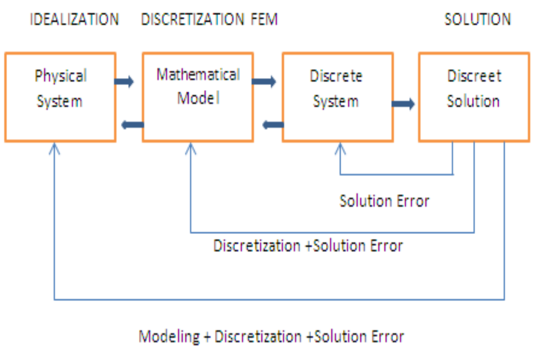


Figure 1. Computational methods to analyse the physical system

FEA has become valuable and the basis of a multibillion industry in recent days. Numerical/mathematical solutions to even very complicated stress problems can now be obtained regularly by using finite element analysis. The most important function of mathematical modeling is that users of finite element codes should plan their strategy toward this end, supplementing the computer simulation with as much closed-form and experimental analysis as possible. Less complexity will be found in Finite element codes than many of the word processing and spread sheet packages found on modern microcomputers. FEA generally consists of three steps [9]

II. LITERATURE SURVEY

Three-dimensional (3-D) imaging of the heart is a rapidly developing area of research in medical imaging. Advances in hardware and methods for fast spatio-temporal cardiac imaging are extending the frontiers of clinical diagnosis and research on cardiovascular diseases. In the last few years, many approaches have been proposed to analyze images and extract parameters of cardiac shape and function from a variety of cardiac imaging modalities. In particular, techniques based on spatio-temporal geometric models have received considerable attention. In this project a 3D projection of vertebrae is created from DICOM.

3D MODELLING

3 Types of 3D Computer Models

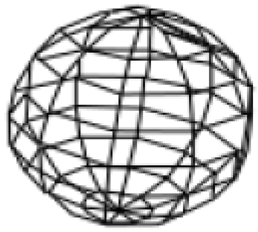
Wireframe

Surface Model

Solid Model

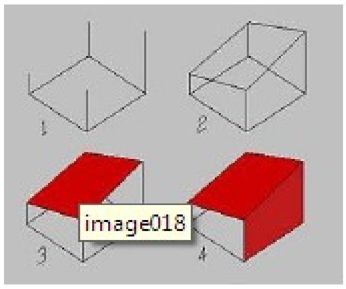
Wireframe

The wireframe model is built up using a series of connected lines to produce a 3D object.



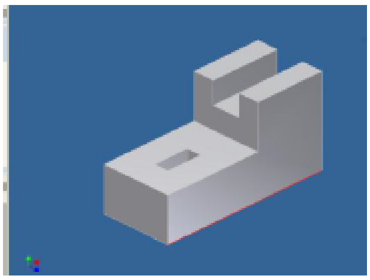
Surface Model

The surface model is built up by drawing the surfaces of an object. Like adding the canvas onto the frame of a tent.



Solid Model

The solid model is built up by using simple geometric forms or extrusions - such as cuboids, cylinders & prisms.



These can be added or subtracted to produce complex 3D models was shown in

III. METHODOLOGY

Swing was developed to provide a more sophisticated set of GUI components than the earlier Abstract Window Toolkit (AWT). Swing provides a look and feel that emulates the look and feel of several platforms, and also supports a pluggable look and feel that allows applications to have a look and feel unrelated to the underlying platform. It has more powerful and flexible components than AWT. In addition to familiar components such as buttons, check boxes and labels, Swing provides several advanced components such as tabbed panel, scroll panes, trees, tables, and lists.

Unlike AWT components, Swing components are not implemented by platform-specific code. Instead, they are written entirely in Java and therefore are platform-independent. The term "lightweight" is used to describe such an element.[1]

FileInputStream Class in Java

FileInputStream is useful to read data from a file in the form of sequence of bytes. FileInputStream is meant for reading streams of raw bytes such as image data. For reading streams of characters, consider using FileReader.

Constructor and Description

FileInputStream(File file) :Creates an input file stream to read from the specified File object.
FileInputStream(FileDescriptorfdobj)
Creates an input file stream to read from the specified file descriptor.
FileInputStream(String name) :Creates an input file stream to read from a file with the specified name.

FileOutputStream in java

A file output stream is an output stream for writing data to a File or to a FileDescriptor. Whether or not a file is available or may be created depends upon the underlying platform. Some platforms, in particular, allow a file to be opened for writing by only one FileOutputStream (or other file-writing object) at a time. In such situations the constructors in this class will fail if the file involved is already open.

FileOutputStream is meant for writing streams of raw bytes such as image data. For writing streams of characters, consider using FileWriter.

Constructor and Description

FileOutputStream(File)

Creates a file output stream to write to the specified File object.

FileOutputStream(FileDescriptor)

Creates an output file stream to write to the specified file descriptor.

FileOutputStream(String)

Creates an output file stream to write to the file with the specified name.

FileOutputStream(String, boolean)

Creates an output file with the specified system dependent file name.

BufferedReader Class

The **Java.io.BufferedReader** class reads text from a character-input stream, buffering characters so as to provide for the efficient reading of characters, arrays, and lines. Following are the important points about

The buffer size may be specified, or the default size may be used.

Each read request made of a Reader causes a corresponding read request to be made of the underlying character or byte stream.

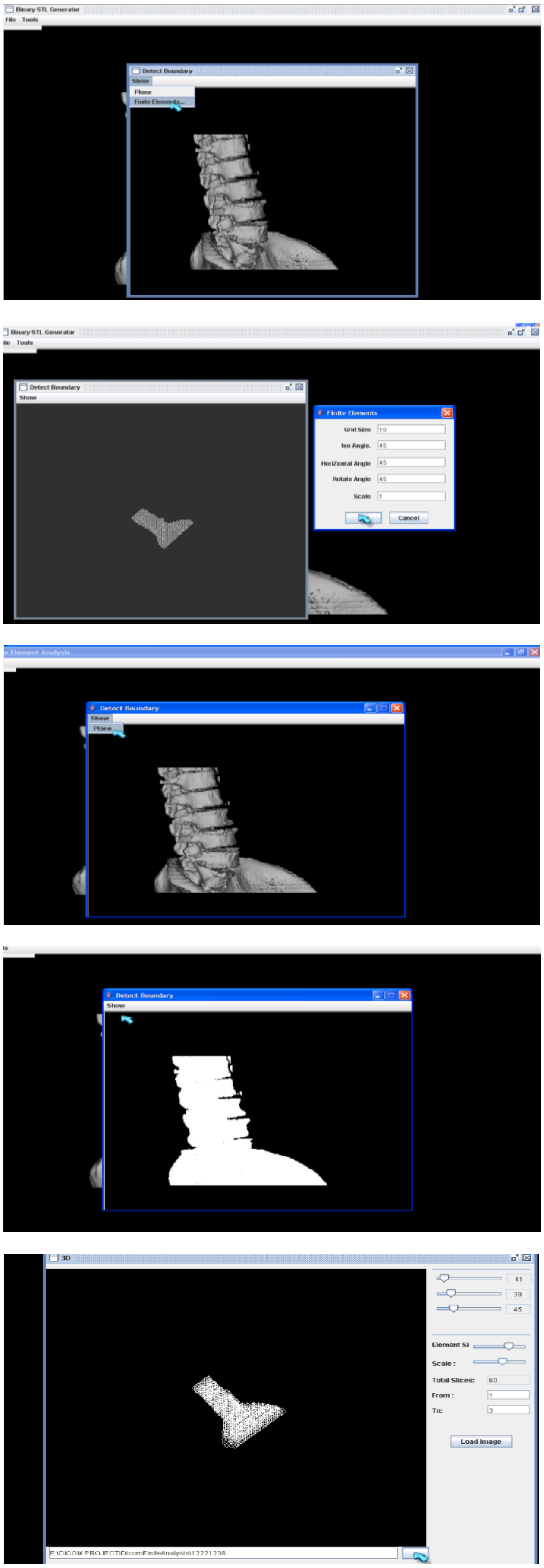
BufferedWriter Class

The **Java.io.BufferedWriter** class writes text to a character-output stream, buffering characters so as to provide for the efficient writing of single characters, arrays, and strings. Following are the important points about BufferedWriter –

The buffer size may be specified, or the default size may be used.

A Writer sends its output immediately to the underlying character or byte stream.

Snapshot



IV. CONCLUSION

The following results were obtained during this project. The 3D model of human vertebrae bone was developed using various software tools. First the combined image was obtained from CT scan images. Then a 3D model was constructed from. Then it was cleaned. After cleaning it was imported into project for analysis. Fig. 4.1 shows the step by step results of the current project.

V. REFERENCES

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