HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

COMPUTER AIDED DESIGN OF A MECHANICAL ASSEMBLY

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by

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SUMMARY

This project has to do with computer aided design of a mechanical assembly. It shows the various equations necessary for designing a machine component, the various software that is available for visualization and the steps needed to design that component using Inventor.

It also shows the advantages and disadvantages of using CAD software for visualization purposes.

Finally it shows how simple a mechanical assembly can be shown with the aid of CAD software. The program used for visualizations is Inventor 8, of Autodesk. The assembly drawings that were made are those of a Machine Vice, a Gate Valve, a Water Pump and a Hand Drill.

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I dedicate this project to my father.

Gavriel Costas

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Chapter 1 Introduction

The objectives of this project are the following:

1. To identify the necessary equations for the design of the specified machine elements of the assembly.
2. To present a survey of various commercial computer software suitable for solving design problems and for visualizing machine elements.
3. To implement available software for the design and visualization of a given machine member.

And a fourth added later on, to conclude the other objectives:

4. The advantages of using software for visualization.

A few decades ago, before computer aided design was advanced, when machine elements where needed to be produced, they would be designed on paper and then a small model would be produced. This model was made of wood, clay, plastic or even cardboard. This however was very time-consuming.

When a large assembly was needed to be constructed, it was very difficult to make small models of the various parts, contained in the assembly, and it was even more difficult to put them together. This was not only time-consuming but it was also very expensive.

For example, when a large car manufacturing company needed to design a new model, they would have drawn all the various parts of it and try to make models of them and put them together. This was very difficult but not impossible. The impossible part was to make a model of the interior of the car. To do this they would have to build a whole scale car model and by doing so they spend hours and hours of designing, building and rebuilding until they got the interior they needed.

This problem has been overcome by the use of Computer Aided Design (CAD) software. CAD software has evolved very rapidly throughout the years and is now a very powerful designing tool.

The first CAD program was developed in the 1950s and was a simple 2-dimensional tool which helped in faster drawing without mistakes and for radars. This however in the next decade became a powerful 3-dimensional tool which made modeling much simpler for the automobile, aerospace and defense industries. These CAD programs however needed a computer of there own to run. This was solved in the mid 80s when CAD programs could not only do 3-dimensional designs, but they could also assemble variable parts together and do stress analysis calculations on any personal computer.

This has made life much easier for everyone in the designing business, either he is a mechanical, electrical, civil or a computer engineer, with CAD software his work is cut down to half.