

Information Tools for Heat Treatment Midterm Report

1.0. Revised Objectives

The purpose of IPRO 304-A is to create a software package to assist A. Finkl & Sons optimize the loading of part in heat treatment furnaces.

Objective for Fall 2007: To reconstruct and improve the furnace loading software developed by IPRO 330 (Spring 2006) resulting in a program with the following attributes:

- Increased ease of use via:
 - Compatibility with popular CAD packages (i.e. ProE, UGS)
 - Solid Modeling
 - Printable maps of optimum loading
- Partial Database of Finkl parts (over 150 unique designs)
 - Model, using ProE, the most popular Finkl part shapes for use in finished program using.
- Robust development for future modifications including: (previous program had very limited ability for upgrades)
 - A complete and easily updated database of all Finkl part shapes
 - Part tracking/history for quality control
 - Migration to a hand-held device for manager/foreman/operator
 - Thermodynamic analysis for optimum heat treatment planning

The goals for this IPRO remain the same as when they were conceived at the start of the project term.

2.0. Results to Date

Completed tasks are designated with .

In Progress tasks are designated with .

Comments appear in red.

Build Dependencies - Sep 27 – **FULLY COMPLETED**

Project Tracking Software

-- Utilizing TRAC Software Creation Manager and Subversion (Central Source Repository)

Meet w/ Dr Hu

-- Dr. Zhiyong Hu (MMAE) played a large role in development of the previous version of the software. He assisted with initial setup and continues to provide guidance.

Get all developers set up

-- All developers successfully installed the build environment for use of the development packages supplied by Spatial Software Corp. – 3D ACIS Modeler and HOOPS

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3D Application Framework.

- Requirements Specification - Oct 11 – **IN PROGRESS**
 - Meet w/ Finkl
 - All team members met with representative of A. Finkl and Sons on September 7, 2007. A return visit is scheduled for November 2, 2007.
 - Research Loading Algorithms

- Basic Functionality - Oct 25 – **IN PROGRESS**
 - Multiple Document Interface
 - Open/Save Files
 - Access to the parts database was developed as a widget (visible control/functions) and is seen below in *Figure 1*.

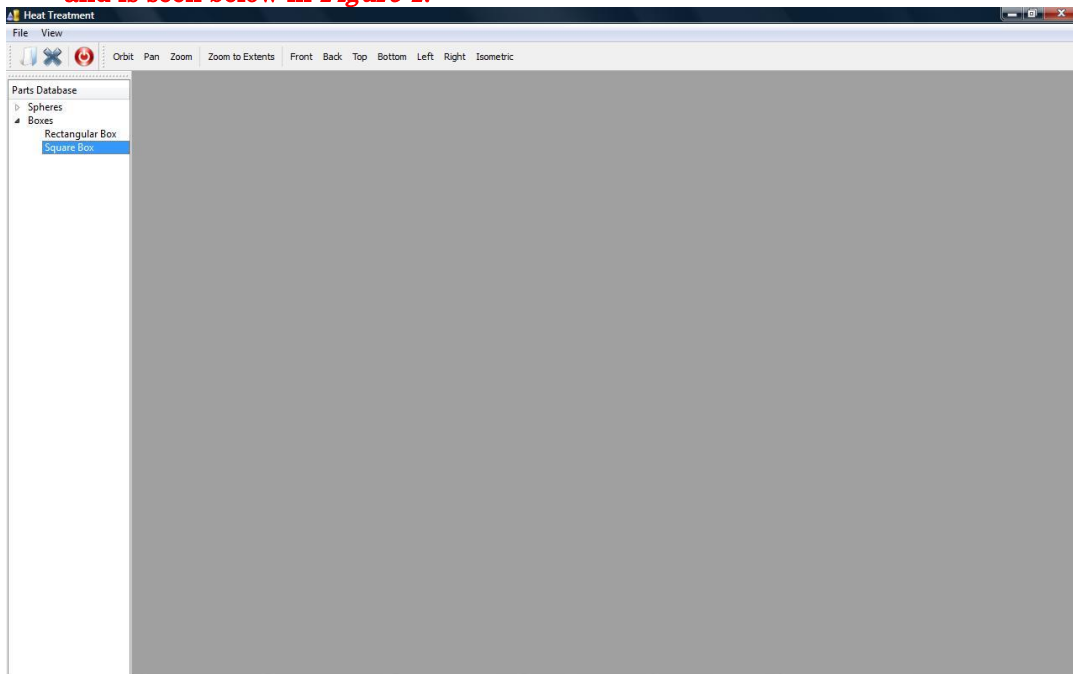


Figure 1 - Screenshot of the Parts Database Access Window widget during development

- View Functionality (Translate, Rotate, etc)
 - Created utilizing 3D ACIS Modeler and HOOPS Application Framework. The developed visualization interface is shown below in *Figure 2* and *Figure 3*

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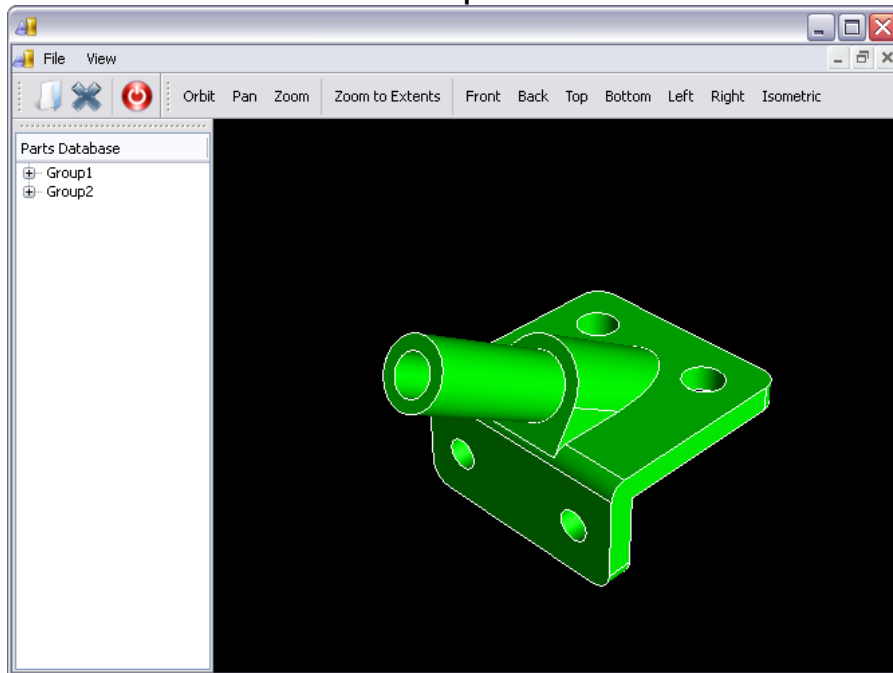


Figure 2 - Visualization Interface Example 1

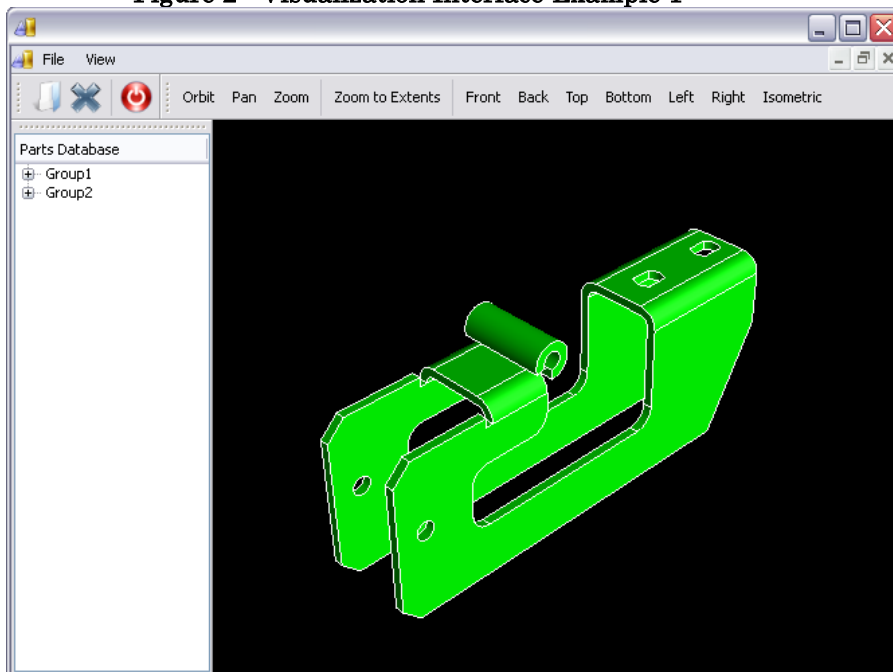


Figure 3 - Visualization Interface Example 2

- Place Parts in Furnace
- Team Building- Nov 15 – **IN PROGRESS**
 - Develop Team Logo
 - Develop Team Slogan

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- Design T-Shirts
- Feature Complete - Nov 15
 - Implement Loading Algorithms
 - Auto Part Placement
- Usability Testing - Nov 22
 - Design Test Cases
 - Testing / Bug Reporting
- Bug Fix Complete - Nov 27
 - Fix Bugs
 - Begin 2nd iteration
- Parts Modeling - Nov 22 – **IN PROGRESS**
 - Obtain Parts Spec
 - A comprehensive parts specifications list for all standard (non-custom) parts was obtained from A. Finkl & Sons.**
 - Model Parts
 - Modeling has commenced and work is in progress.**

All current results/progress directly address the main objective. All software developments represent significant steps toward the completion of a working program. Additionally, all developments to date make up the infrastructure of the finished product.

3.0. Revised Task / Event Schedule

The task schedule is listed below, shown chronologically with respect to the original task completion dates.

Completed tasks are designated with .

In Progress tasks are designated with .

Comments appear in red.

- Build Dependencies - Sep 27
 - Meet w/ Dr Hu
 - Get all developers set up
 - Project Tracking Software
 - Due to the integral nature of the tracking software to the software build, the completion date of this task was moved up in priority.**
- Requirements Specification - ~~Oct 11~~ **Nov 15**
 - Meet w/ Finkl
 - Research Loading Algorithms

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-- Time spent on software functionality limited progress on research of loading algorithms. Consequently, the completion date has been delayed

- Basic Functionality - ~~Oct 25~~ Nov 8 – The software learning curve resulted in a two week delay in the completion of this task
 - Multiple Document Interface
 - Open/Save Files
 - View Functionality (Translate, Rotate, etc)
 - Place Parts in Furnace

- Team Building - Nov 15 – **ON-TIME**
 - Develop Team Logo
 - Develop Team Slogan
 - Design T-Shirts

- Feature Complete - Nov 15 – **ON-TIME**
 - Implement Loading Algorithms
 - Auto Part Placement

- Usability Testing - Nov 22 – **ON-TIME**
 - Design Test Cases
 - Testing / Bug Reporting

- Bug Fix Complete - Nov 27 – **ON-TIME**
 - Fix Bugs
 - Begin 2nd iteration

- Parts Modeling - Nov 22 – **AHEAD OF SCHEDULE**
 - Obtain Parts Spec
 - Model Parts

4.0. Changes in Task Assignments and Designation of Roles and Team Organization

Initial Team Organization:

Developers

John Groszko

Finkl Relations

John Groszko
Kyle Koning

Modeling

Ryan Jay
Vlad Antal

Usability

Hussain Biya-
werwala
Steven Benaska
Sangwook Lee

This organizational structure did not leave designate specific individuals to address items not required by our sponsor, but required by the IPRO Program. As a result, an additional sub-group was developed to ensure success-

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ful completion by all team members of the goals and objectives set for the group by the IPRO Program. The resulting Team Organization is seen below.

Developers

John Groszko

Finkl Relations

John Groszko

Kyle Koning

Modeling

Ryan Jay

Vlad Antal

UsabilityHussain Biya-
werwalaSteven Benaska
Sangwook Lee**IPRO Goals**

Kyle Koning

Ryan Jay

The new organization has proved to be much more effective in addressing the concerns of both the sponsor and the IPRO Office.

5.0. Barriers and Obstacles

The IPRO team consists of seven students, of which only one (John Groszko) has previous experience in software development. Additionally, that same student is the only team member with knowledge of computer programming beyond a very basic level. This resulted in an extended learning period during which team members were forced to learn new skills important to the tasks at hand. To accelerate this process, Dr. Zhiyong Hu (MMAE) was contacted for assistance. Dr. Hu assisted in the initial setup of the software build environment and freely gave advice on methods for programming.

It is anticipated that additional computer science related barriers will occur before the project is completed. When such obstacles do arise, team members will first contact John Groszko for assistance, followed by Dr. Hu. If the problem cannot be resolved by them, additional help from the Computer Science faculty will be sought.

6.0. Code of Ethics

The IPRO 304-A Code of Ethics accompanies this document. The electronic file (.doc) name is: IPRO 304 A Code of Ethics.

7.0. Midterm Presentation Slides

The Midterm Presentation was given by Kyle Koning and Ryan Jay on October 8, 2007 within the Faculty Club of Herman Hall. A printout of the IPRO 304-A Midterm Presentation follows. The electronic file (.ppt) name is: IPRO 304-A Midterm Presentation.

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<p>Information Tools for Heat Treatment I PRO 304-A; Fall 2007</p> <p>Midterm Presentation October 8, 2007 Advisors: Prof. William Maurer – INTM / MPC Prof. Sheldon Mostovoy – MMAE Presented by: Ryan Jay & Kyle Koning</p> <p><i>Transforming Lives. Inventing the Future. www.iit.edu</i></p>	
	ILLINOIS INSTITUTE OF TECHNOLOGY 
<p>Overview</p> <ul style="list-style-type: none">• A. Finkl & Son Co. Steel<ul style="list-style-type: none">– What is heat treatment?<ul style="list-style-type: none">• Quenching and Tempering<ul style="list-style-type: none">– Batch process / production bottleneck– Potential for uneven heat treatment <p><i>Transforming Lives. Inventing the Future. www.iit.edu</i></p>	

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Overview

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Overview

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- A. Finkl & Son Co. Steel
 - What is heat treatment?
 - Quenching and Tempering
 - Batch process / production bottleneck
 - Potential for uneven heat treatment
 - What does Finkl want?
 - Optimal furnace loading = faster heat treatment
 - Part tracking and database of heat treat history
 - Optimal heat treatment

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The Past

- I PRO 330 – Spring 2006
 - Program successfully created
 - Represents actual stacking in 3-D
 - Replaces hand-written files
 - Groundwork laid for working solution



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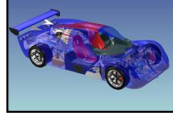


The Past

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<h3>The Past</h3>	
<ul style="list-style-type: none">• I PRO 330 – Spring 2006<ul style="list-style-type: none">– Program successfully created<ul style="list-style-type: none">• Represents actual stacking in 3-D• Replaces hand-written files• Groundwork laid for working solution– Program limitations<ul style="list-style-type: none">• Difficult user interface• Simple shapes only• Non-solid modeling (planar shape models)	
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<h3>The Present</h3>	
<ul style="list-style-type: none">• Step 1 – Main Focus<ul style="list-style-type: none">– Reconstruct program<ul style="list-style-type: none">• Increase ease of use<ul style="list-style-type: none">– Compatible with CAD programs (ProE, UGS, etc)• Solid modeling<ul style="list-style-type: none">– Complete shape representation– Database of most common Finkl shapes<ul style="list-style-type: none">• Rectangular and basic rounds	
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	<p>ILLINOIS INSTITUTE OF TECHNOLOGY</p> <h3>Overcome the Obstacles</h3>
<ul style="list-style-type: none">• New software development<ul style="list-style-type: none">– Create a build environment<ul style="list-style-type: none">• Dr. Zhiyong Hu - MMAE– Utilize development tool kits– 3D ACIS Modeler<ul style="list-style-type: none">• Open, object-oriented C++ architecture• Robust 3D modeling capabilities– HOOPS 3D Application Framework<ul style="list-style-type: none">– Versatile, mature, continuous development– Core graphics infrastructure of many top CAD programs– Microsoft Visual Studio, TRAC Software Creation Manager, Subversion (Central source code repository)	  <p><i>Transforming Lives. Inventing the Future. www.iit.edu</i></p>
	<p>ILLINOIS INSTITUTE OF TECHNOLOGY</p> <h3>Ethical Considerations</h3>
<ul style="list-style-type: none">• Software Licensing<ul style="list-style-type: none">– Development and trial use only– Commercial license before delivery to Finkl	<p><i>Transforming Lives. Inventing the Future. www.iit.edu</i></p>

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<h3>The Future</h3>	
<ul style="list-style-type: none">• Step 2<ul style="list-style-type: none">– Increase program functionality<ul style="list-style-type: none">• Heat treatment records• Part Tracking• Complete Finkl shape database• Steps 3/4<ul style="list-style-type: none">– Migrate to handheld device– Develop thermodynamic modeling functions	
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<h3>Acknowledgements</h3>	
<ul style="list-style-type: none">• A. Finkl & Sons• Spatial Corp.<ul style="list-style-type: none">– 3D ACIS Modeler– HOOPS 3D Application Framework, developed by Tech Soft 3D• Dr. Zhiyong Hu<ul style="list-style-type: none">– Build environment setup and assistance/guidance in programming	
	
	
	
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 Questions

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