Project Plan Report: Heat Treat Subgroup

1.0 Objective

The purpose of IPRO 304 is to create a software package to assist A. Finkl & Sons in tracking of parts in heat treatment furnaces.

Objective for Spring 2008: To reconstruct and improve the furnace loading software developed by IPRO 304 (Fall 2007) resulting in a program with the following attributes:

- Increased ease of use via:

  o Compatibility with popular CAD packages (i.e. ProE or UGS)

  o Solid Modeling

- Software capabilities:

  o Shape display in virtual furnace

  o Movement of shapes around the furnace

  o Resizing of shapes within furnace to match actual part specifications

  o Save and load configurations of specific furnace setups

- Test the software with sample database

- Robust development for future modifications including:

  o A complete and easily updated database of all Finkl part shapes

  o Part tracking/history for quality control

2.0. Background

Finkl is an industrial steel manufacturer of custom, high quality steel parts for other industries (stamp molding for auto, aircraft landing gear, die steel for other manufactures, etc) The company performs the entire process from smelting the steel, casting and forging, heat treating, and machining of their parts. Currently in their heat treatment process at Finkl, approximately 10% of their parts that are below company quality standards. Finkl has no efficient way of tracking where specific parts are in relation to each other while in the furnace. So when a part comes out below standards, it is hard to trace back where that part was in the furnace and why it

was not treated properly. Finkl has enlisted the help of IIT students, which plan to implement a software program that Finkl can use to create a virtual furnace with the parts that will be heat treated and their specific locations in the furnace. When parts come out below quality standards, the program would allow Finkl to examine the location of the parts within the furnace and determine the reason for sub-par quality. The previous semester IPRO was able to develop a software program that displayed the different Finkl shapes; however, the program only displays a single shape at a time without the ability to move or resize the shape. They were also able to model about half of the Finkl shape codes in ProE. . When a large number of parts fail, they must be retreated to meet company quality standards. Taking the time to retreat the process takes both time and money away from the company. If we can help to identify the cause of the heat treatment failure, this would save the company a large amount of money each year.   To be able to determine the cause of the heat treat failure, the team hopes to develop a visual database of the furnace layout to help track parts location within the furnace.

3.0. Methodology

 In order to develop a software program to track the placement of Finkl parts in the heat treat cycle we must:

> - Meet with Finkl to determine the current problem and a better understanding of the problem definition.

> - Examine the software developed by the previous semester IPRO

 Potential solutions to the problem will be:

> - Tested in the sample database provided to us by Finkl

> - Tested with the workmen/Forman at Finkl

The problem faced is that Finkl lacks a method to track and record the physical placement of parts within the furnace for reference when parts produced are not up to company quality standards. To combat this problem the Heat Treatment group of IPRO 304 will focus on creating a program which mirrors the furnace as well as the position of the components within the furnace.

> To accomplish this we must:

> > - Meet with Finkl to establish criteria desired for the program

> > - Look at the methods used currently by Finkl

> > - Find software to accomplish what we wish to design

- Design and compile a program to meet the goals set forth by finkl

Potential solutions to the problem of recording where the parts are withing the furnace will be based on several criteria.

To accomplish this we must:

- Reverse engineer the previous semester's software

- Design a new program based on requirements from Finkl

- Test the program to see if it functions to Finkl's standards

- Based on the program tests and time, improvements may be made to improve the program

The research and data collected will be documented and archived in two locations. One of those being iGroups/iKnow, which will present the material to anyone who wishes to see the work that has been done. Another place the information will be available will be the engineering notebook, which should be electronically published. These two methods provide easy access to all of the work done so that future IPRO groups do not waste time doing work that has already been completed.

To accomplish this we must:

- Organize our tests into easily readable charts

- Post research and testing results on iGroups

The final product will consist of an organized report which summarizes and details all of the findings during this project. The report will consists of all work done including research, design, and testing.

To accomplish this we must:

- Create and organize intro, conclusion and final proposition pages

- Compile and submit all research in on report with the possibility of a prototype program

4.0. Expected Results

The team expects to have looked through the software that was created and have determined how the program operates and how to implement the desired changes to the program with the current development kits used for creating the software. Research methods of programming the desired objectives and implement them. In the end of the semester we expect to have a running software that is capable of:

- loading desired shapes from an existing shape database into the virtual furnace
- scale the shapes with respect to the virtual furnace
- move and orient the shapes in the virtual furnace
- save the arrangement of shapes in the furnace into a database
- load shapes' configurations from the database

Also the team expect to have a complete database of 3D models of all shapes that Finkl heat treats.

After these requirements are met the team expects to come up with a test procedure to analyze the functionality of the program and determine how well it meets the functional requirements. After the tests are conducted, the team will have a working prototype of the program that would be presentable to Finkl and at IPRO day.

5.0 Budget

The heat treat group does not require a budget at the moment since most of the work will be in software development using software for which the school already has obtained licences for.

6.0 Project Milestones

Week:
1. 1/22-1-25
2. 1/28-2/1
3. 2/4-2/8
   -Meet with Finkl
4. 2/11-2/15
   -Draft of project plan
   -Continue looking at old code
   - Meet with Dr. Hu
5. 2/18-2/22
   - Final project plan due
6. 2/25-2/29
   -Begin working on remaining shape codes
7. 3/3-3/7
   -Midterm Report Draft 1
   -Possibly begin coding new program

8. 3/10-3/14
    -Midterm Report Due
        -Current progress
        -Preliminary Analysis
        -Proposed Solutions
        -Testing Draft
9. 3/17-3/21
    -Code testing
10. 3/24-3/28
    -Code Testing
11. 3/31-4/4
    -Modification of code to better suit Finkl's needs
12. 4/7-4/11
    -Meet with Finkl to establish we have given them something they can use
13. 4/14-4/18
    -Finish compiling final code
14. 4/21-4-25
    -Prepare for IPRO Day
15. 4/28-5/2
    -IPRO Day Presentations
    -Final Deliverables
16. 5/5-5/9
    - Final written report due
17. 5/9-5/13
    -Debriefing meeting
    -Post brief with Finkl

7.0. Individual Team Member Assignments

Name	Major	Individual Role
Evan Larkin	Computer Science	Team Leader Programming
Bryan Murillo	Electrical Engineering	Programming
Joseph Pawlak	Computer Science	Programming
Nikolay Popov	Mechanical Engineering	3D Modeling
Nicholas Przybysz	Mechanical Engineering	3D Modeling