Midterm Report
IPRO Team 341 Fall 2004

Revised Objectives:

IPRO 341 - Dr. Paul Fagette - Midterm Progress Report

The IPRO team has made considerable progress in creating animated computer display and an accompanying mechanical model of the substantive changes in physiology of a fetal cardiovascular system. I have included the reports from the various sub-teams.

Pre-Natal Research Group - Archita Shrivastava, Calvin Moy, Shalini Ravella, Sean Pitroda

The pre-natal research group was formed to both learn about pre-natal physiology and in relation to blood flow and pressure, but also to educate the rest of the IPRO team on this topic. The group consisted of Archita, Shalini, Sean, and Calvin. We began by brainstorming how to create a presentation that we would show the team. We decided that the four group members should first perform their own research individually and read all the materials that were sent to us by Dr. Fagette. After reading through and understanding pre-natal flow individually, we communed and started addressing all the details we felt were necessary to include in our presentation. We met four times as a group to lay out a PowerPoint presentation of our research. Every member of the group contributed equally to the material and layout of the presentation. Constructive criticism as well as encouragement was common during our meetings. We tried to include as much detail and information we felt necessary for the presentation, keeping in mind that it was okay to include a lot of detail at this point because they could be removed if needed. After we felt the presentation was complete with all the appropriate information, we presented the PowerPoint to the entire IPRO group.

The PowerPoint was well-received by the team. Dr. Brey, Dr. Fagette, and the other group members voiced further details that should be added as well as some suggestions to make the presentation less technical and more interesting and eye-catching to the general public. After this meeting, the four of us met again to make revisions and add/take out what was suggested at the previous class. We also scheduled, in the previous class, to meet with the animation group to start giving our information to them so they could use Flash to make the team's animation. Our group decided that a layout of the slides detailing which level each slide should be included (general knowledge, pop up information, or extra links) and what order they should be shown, would be the easiest and most logical schematic for the animation group to understand how all of our information intertwined. We arranged the slides into a top layer of general knowledge that would give an overview of prenatal flow with the bare necessities needed to educate a person on this topic. We decided to add layers of detail to the general presentation that could be accessed if viewers clicked on links or pop up screens that contained that extra information. We constructed a poster with the ordered slides and desired layout of our information and made copies to give to the animation group.

Shortly after the poster was given to the animation group, Dr. Ward from the Museum of Science and Industry came and previewed our work. Based on the input she gave us concerning time limits and public responsiveness, we agreed that some changes needed to be made to our information. We met again with the animation group and worked on the language and level of detail of the research. We put our information into more straightforward language and in the form of a story rather than in note form. We also took out some information that we felt was too detailed for the public concern and that added too much time to the length of the entire presentation. At this meeting, the animation group asked us to provide all of the final diagrams and last additions/take-outs. Our goal for the next meeting is to have all of these diagrams and revisions ready to give the animation group and receive any feedback and changes that the group suggests.

Model Group: Sean Pitroda, Chris Tuthill, Suruchi Thakore, Calvin Moy

The objective of this IPRO was to create a display that showed the differences between the pre-natal and post-birth human heart. The members of the IPRO team initially broke up into 4 groups: Prenatal Research, at-Birth Research, Post-Birth Research and Computer Display Design. Once the initial research was completed, members of the Prenatal and Post-birth groups were taken and formed into the model group. Working with Dr. Fagette, an initial plan was made for the design of a prototype pre-natal to post-birth heart.

The model group has decided to use a roller pump, plastic tubing, acrylic containers, colored fluid, and reflective Styrofoam to simulate blood flow and its changes during birth. The plastic containers would serve as basic representations of each of the important organs: placenta, heart, brain, lungs, liver, and the lower half of the body. The tubing would represent the blood vessels and the colored liquid would represent the blood. The reflective Styrofoam would assist in visualizing the flow and the direction of the color liquid. The change that occurs with the onset of birth is shown on our model with a stopcock in the heart, which will eventually be replaced with an electric solenoid, which is controlled by a controller board.

This is a summary of our current progress:

The Plexiglas housing has been cut and constructed using silicone sealer to hold the individual pieces together. The containers representing the placenta, lungs and brain have been attached onto the display housing with the silicone sealer. The other parts have yet to be attached as the placement of the tubing has yet to be decided. The group has also determined the flow path of the colored liquid within the tubing, stopcocks, and one-way valves. The model group plans to test our design once the rest of the containers and tubing have been attached to the Plexiglas housing. Based on its functionality, the design will be modified accordingly to compensate for backflow.

Summary of work done in the 2 weeks the group didn't meet:

Parts of the display were attached to the Plexiglas housing. Two sizes of plastic tubing were obtained and holes were burned into the acrylic containers with a soldering iron. The path of the liquid's flow was determined and a flow chart was made. We discussed how we were going to distinguish the oxygenated blood from the deoxygenated. We are currently planning on attaching LED's to the back of the Plexiglas housing following the path of the tubing. The LED's

would show red or blue depending on the oxygenation of the blood. Other things we discussed include where to position the roller pump, possible usage of stepper motors, drilling holes into stopcocks to manage flow and the type of liquid to be used.

Technology Subcommittee: Eric Dunaway, Justin Ram, Michael Wright

The Technology Subcommittee, part of IPRO 397 - Development of a Pre and Post-Natal Fetal Heart Model for the Museum of Science and Industry, has been hard at work in the first half of the fall semester.

The technology committee was formed during the first general IPRO 397 meeting on September 2, 2005, and was composed of Justin Ram and Michael Wright. The first task of the Technology Subcommittee was to investigate how the group's final project was to be presented as a multi-media experience. The overall group was looking for something that would grab the audience's attention; complete with scrolling text, sound, and animated pictures. It was decided very early, that using *Flash Animation* would serve the purpose of the group the best.

After a week of further investigation, it was discovered that the software to *Flash Animation* was more complicated than originally anticipated. It was felt, by the Technology Group, that learning the software itself might take the rest of the semester, and was therefore not on a feasible timeline. Refusing to let this compromise the overall group's vision, the Technology Subcommittee recruited Eric Duanaway, a 3rdyear Computer Engineering major into the IPRO on September 9, 2005. Eric Dunaway has experience working with *Flash* and *Dreamweaver*, and was a welcomed addition to the group.

The following week, the Technology Committee attained full *Flash* and *Dreamweaver* software packages, as well as a "Pen-Writer" that could "draw" wanted photos into the software program. The committee spent a great deal of time exploring the great many options that the full software package offers, so that the final presentation can be as dynamic as possible.

After the Pre-natal and Post-Natal Research Subcommittees were finished with their research, the Technology Subcommittee transferred all text into the multi-media presentation. Since then, we presented the most up-to-date version to representatives of the Museum of Science and Industry on October 7, 2005. The representatives were excited for the vision that we have for this project and seemed pleased with the current progress.

It is now the focus of the group to fine-tune the text, add audio dialogue to it while it is scrolling, and add animated pictures throughout the presentation. There will be a general timeline that the viewer can follow, rewind, or speed up. It will also have a "basic" presentation that can run autonomously. There are also pop-up text boxes that a viewer can click if one chooses to delve into more information. The final product will be a presentation tailored to the unique individual - each one creating their own path of information that is interesting to them.

The website is a second task that falls under the responsibilities of the Technology Subcommittee. All required information will be posted on the website, as well as the finished version of the presentation for all to see.

To speak of the other committees:

Both the pre-natal and post-natal subcommittees have done a wonderful job researching the pertinent information that needs to be included in the presentation. They have given us the general idea that needs to be put forth, and have given us every tool they possibly could give to make our job easier.

There has since been another subcommittee formed to assemble a 3D model of a functioning heart that will emphasize the changes that occur at birth. It is the hope of both committees that we can sync the two presentations so that they run together.

Post-Natal Team

During this meeting, all students were convened and decided how the project should be divided. From here, ideas on the general outline could be formulated. People were separated into prenatal, postnatal, moment of birth, and computer programming. By the next meeting, the subgroups had to design a PowerPoint on their sub-category outlines. The postnatal subgroup initially consisted of Alex, Anand, Grace, and Kedari. Once everyone in the postnatal group finished writing their individual outlines on the processes after birth, Alex and Grace summed up the outlines into one. Anand and Kedari then transferred this outline into PowerPoint. This PowerPoint was then further revised and edited by Alex and Grace by adding extra facts and organizing the slides into a logical and understandable fashion.

The moment of birth subgroup was combined with the postnatal subgroup. Once this was done, we were split further into three separate subgroups. Suruchi and Chris were in charge of fine-tuning the mechanisms we already discussed, providing a more engineering aspect to the mechanisms. Also, they were in charge of formatting fundamental definitions essential to the understanding of the presentation. Anand and Kedari were in charge of researching on the problems that could potentially occur during the physical changes at birth. Furthermore, Alex and Grace were in charge of elaborating on the breathing diagram, and researching on the various methods of birth.

During this week, more fine-tuning for the PowerPoint was done so that it would be easiest and most efficient for programming to a flash presentation. Pretty much, work was a continuation of the week before.

While the computer group compiled an overall presentation for Flash, and the newly devised model group (Calvin, Chris, Sean, and Suruchi) worked on the model display, the remaining post natal group continued researching on their respective topics. Continuing from last week's tasks, Anand and Kedari worked on the post birth problems and disorders while Alex and Grace worked on the various birth methods and diagrams. Seeing how Dr. Brey's wife, Sylvia, answered many questions on birthing methods, it

helped Alex and Grace narrow down the amount of information we potentially need to present to the large group.

Summary of Actual Results to Date:

Revised Schedule of Events or Tasks:

Updated Individual Assignments and Team Organization:

Barriers and Obstacles: