

Project Architecture Report and Pre-Work Assignment

6.141 - Spring 2012

February 14, 2012

This document describes your Project Architecture Report (PAR) assignment due on February 28, together with a pre-work assignment to bring to class on Tuesday, February 21. The RSS teaching staff understands that some students may not have had much experience designing robots. Do not worry – we are not expecting technical perfection. Rather, we want to see you spend some time considering the problem on your own before tackling it as part of a team.

About the Project Architecture Report

The PAR, or Project Architecture Report, is a 5-7 page, individually-written (not team-written) paper. It is an opportunity for you to work with and communicate your own:

- **understanding** of the Grand Challenge Problem as described in class;
- **assumptions** about what will be given or available to you; and
- **approach** to solving the problem, i.e., designing and implementing a robot that solves the challenge task.

Suggested Outline

We will expect that each report will cover the following topics, along with meaningful diagrams as needed:

Introduction

- Statement of Problem to be Solved (Requirements Specification)
- High-level Description of Your Assumptions and Approach
- System Block Diagram

Discussion of the System

- Inputs, Outputs, Internal Modules and Operation
- Representation / Data Structure / Interconnect Issues

Milestones and Implementation Plan

Conclusion

For a more detailed description of the Challenge task, you may wish to look at the 2011 Challenge description:

<http://courses.csail.mit.edu/6.141/spring2012/pub/challenge/Challenge-Overview.html>

You may also wish to look at the overview of the labs in the course syllabus.

Getting Ready to Write: Pre-Work Assignment due in class February 21

An initial stage of design is channeling your thoughts to notes, lists, and sketches, then translating those rough ideas into a document that an audience of readers can understand and use. At this stage we are asking you to collect your ideas for the content of Project Architecture Report. Some writers may want to fill in this form online, but if you think better with pencil and paper, feel free to print out one or more copies of this document and write or sketch in your ideas. In class on February 21 we will help you to shape those ideas and get ready to write a finished report.

Remember that it may be easiest to figure out parts of the design before you get a sense of the whole system. Keep drafting ideas, even if you are not exactly sure where the design is headed. If you know a great deal about designing some parts of the system, get it into prose and drawings. You might find it helpful to set up some shorter sessions to think about your design, then take periodic breaks to compare your notes and ideas to the Grand Challenge description.

Lists and drawings of ideas are a good place to start. Design often begins with separate ideas that do not seem (at first) to have connections to one another. Putting the ideas into writing and pictures helps you advance and develop these individual concepts. Wherever possible, try to answer the questions below in complete thoughts (subject and verb), so that you are thinking about what needs to be done and how that task will be accomplished.

Questions to Help you Organize the PAR

Use the questions on the following page to help you collect and organize ideas about your response to the Grand Challenge. As you consider these questions, remember that it is OK to list ideas seem to overlap or conflict with each other. You may also find it helpful to answer these questions out of order, beginning with small details or by drawing a rough block diagram. At this early stage of thinking, it's helpful to generate as many ideas as possible. **Bring your answers to the CI-M workshop on February 21 at 1:00 in 32-155.** (Note that the Institute follows a Monday schedule that day because of the Presidents' Day holiday.)

Statement of Problem to be Solved

What tasks does the Grand Challenge problem require a robot to perform?

What is important/significant about the Grand Challenge problem?

Why is the problem interesting?

What makes the problem technically difficult?

What systems need to be designed?

System	Function
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How do the systems need to interact with each other?

Can you foresee any conflicts between the systems that need to be designed?

What hardware and software components will robot need to perform the tasks listed in the Grand Challenge?

High-level Description of Your Assumptions and Approach

Can you summarize (in 2 or 3 sentences) the items you just listed? Do you see a particular pattern (rationale) emerging?

System Block Diagram

[do two or three versions of this, then keep your best one]

System Details (Discussion of Each System Aspect)

This section needs to be a concise, but easy-to-navigate listing of the hardware and software components you plan to design. You might find it helpful to think in terms of what the robot has to do (the tasks necessary to complete the Grand Challenge), then think of what needs to be designed in order for the task to be performed. As mentioned earlier, looking ahead on the syllabus to the list of labs will give you a preview of the things you will be learning in class.

Inputs

Outputs

Internal Modules and Operation

Representation / Data Structure / Interconnect Issues

Milestones and Implementation Plan

You and your team will be working on this robot from approximately March 21, when the course challenge is announced, to May 9, the Friday before the course competition. You may find it helpful to create a Gantt chart or use some other project-management software to help you think about how you'll use the available time. Consider as well the number of weeks you have and what other commitments you might encounter during that time. Even at this early stage, it's helpful to try and estimate how long everything will take.

As you estimate time, ask yourself:

- Is there anything particularly complicated or risky in your design?
- How will you do this? What steps are necessary?

Milestone	Start date	End date	Notes
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Conclusion

Briefly summarize your design strategy (is there an overall philosophy, such as speed vs. accuracy)? Sometimes crafting a pair of sentences like, "This robot accomplishes [does] x, y, z. It is able to do this by..." can help shape your thinking. It's also appropriate to list some caveats. "Designing and testing X and Y simultaneously may be somewhat risky." The conclusion is also a place to pose a more cautious and/or a more ambitious version of the design.