16-450 Robotics Systems Engineering

Version 1.4

Project Detail Design

The system detailed design makes the conceptual design specific. It provides all of the details, resolves all the issues, and makes all the choices need to implement the system. Where conceptual design was analogous to the architectural design for a building, the detailed design would be the blueprints and the construction plan.

The detailed design precisely defines how the system is built and using what components and parts. It should provide a complete description of the system and illustrations, in the form of dimensioned drawings of the system, subsystems, as needed, and the components. Assembly diagrams and description show how the parts and components come together. Multiple views may be needed and all the parts should be identified. A complete parts list supports the system description. Similarly for software, a description of all of the software modules with appropriate object or functional models is needed. Software state diagrams, command and data flow, and command and message dictionaries may be appropriate.

With the detailed design someone should be able to obtain the needed parts, code the software, and assemble a working system.

The detailed design should make clear how the system will meet functional and non-functional requirements. This may be supported by tracing requirement to design attributes. Performance and other non-functional requirements should be detailed with necessary models. The relationship between requirements, conceptual design and detailed design is often supported by a traceability matrix.

Guidelines for the detailed design:

- Describe the system
- Provide scaled drawings of the system(s) and components
- Include a complete parts list with salient properties
- Explain the fabrication and implementation process
- Provide an assembly diagram, including wiring diagrams, plumbing diagrams and any other schematics
- Write assembly instructions or describe process, if needed.
- Provide software module and interaction description and diagrams (object-oriented or structured design)
- Define system states and operational modes to support the concept of operation (from conceptual design)
- Define temporal aspects with statecharts or other models and support the concept of operation
- Described fault recovery and degraded modes, if any
- Detail the installation plan including size, weight, power, and other resource needs
- Provide usage guidelines and safety restrictions
- Provide references to source material

Length of the detailed design not limited, but 10 pages of text, without figures, and in addition to any conceptual design is a reasonable guideline.

The document must be submitted online as a PDF file. The file must be named in the following pattern: <teamname/acronym>_design_v<#>.pdf