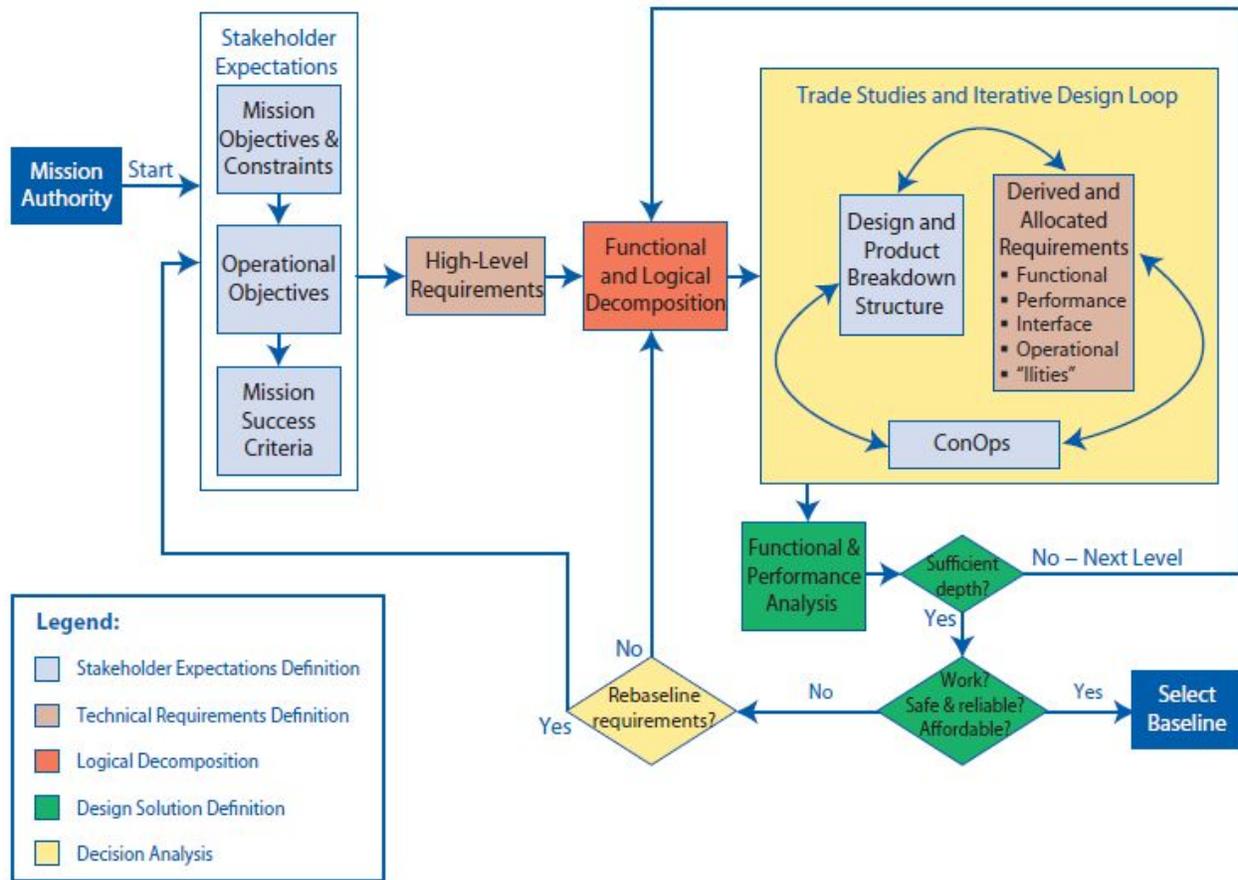


The Beginning of the Design Loop



- Preliminary Due Sunday at 6 PM (2/7/21)
- You should assume that all documentation will be graded.

Table of Contents

Mission Objective	2
Functional Organization	2
Requirements	2
Developing Requirements	2
Example: Navigation and Card Reader Engineering Requirements	3

Mission Objective

One Section

For those teams that have a unique mission, please submit an updated set of mission objectives. For those doing the standard mission, rewrite the mission objectives in your own words. <http://web.csulb.edu/~hill/ee400d/Maze%20Project.pdf>

Functional Organization

(i.e., position responsibilities)

One Section

Submit an updated descriptive paragraph of the responsibilities for each team member (i.e., The material from your last assignment.)

Requirements

N Subsections based on your Functional Organization.

Developing Requirements

By: Christopher Hirunthanakorn

The objective of this section of the assignment is to reinforce what you learned about the different levels of requirements and apply those concepts to your own project. By completing this assignment, you will hopefully have a better understanding of requirements and be able to avoid the common mistakes that students make like having a specific sensor or component already selected when writing requirements.

For this assignment, you will need to make a list of questions related to level 1 requirements (design independent) and propose level 2 requirements (design dependent) that are tied to your position/responsibilities. The end goal is to have a set of level 2 requirements that we can review/discuss and a plan of action for some of the tests, experiments, or calculations your team will need to perform.

As you try to come up with the level 2 requirements, you will end up trying to figure out which of the level 1 requirements it was derived from (flow down). Because Professor Hill and I are still developing the level 1 requirements, you may not have that information to work with as there are only a few L1 requirements listed on the Maze Project document. As you identify the details that you are lacking, it can lead to the list of questions that we need to consider. Ideally, this will also help us find any level 1 requirements we had missed. If you would like to practice making the distinction between L1 and L2 requirements, feel free to list some suggestions for L1 requirements.

If you have any questions, please contact Professor Hill or me. We have included an example below. Make sure to indicate if a requirement was derived from another requirement(s)

as shown. Some requirements can be derived from multiple sources. On the flip side, one requirement can branch out into multiple requirements.

Please submit only one document per project. Indicate which team member suggested the question or requirement by putting their name in parentheses at the end of it. It would be easier for us to process this assignment if the questions are grouped together and the level 2 requirements are grouped together.

Example: Navigation and Card Reader Engineering Requirements

Here is the start of a requirements section that would be generated by the Navigation and Card Reader Engineer.

Name:

Christopher Hirunthanakorn

Program/Project Objectives **Mockup of the Program/Project Objectives**

L1.1 The robot will be participating in a competition as defined in the "Rules of the Game." The robot earning the most points wins. See the rulebook for how points are awarded. Some points are awarded based on the **time** required for your robot to complete/solve the game/maze.

L1.2 The robot will be discovering cards placed throughout the maze during the mapping phase as defined in the "Rules of the Game".

L1.3 The lines of a maze have a width of 8 pts (2.82 mm or 1/72").

L1.4 A maze path has a minimum distance of 2.25" from edge-to-edge. With an 8 pt line (L1.3) center-to-center, a maze square is 2.861" x 2.861."

:
:

Game Questions

- How many cards of each type will the robot need to encounter?
- How are the cards different from each other?
 - Different colors?
 - Unique signature?
- What are maze line widths
-

Robot Questions

Proposed level 2 requirements

After each requirement, please include at least two paragraph(s). The first paragraph(s)/section should discuss the calculations, experiments, etc conducted to determine the performance (i.e., not functional) specified in the L2 requirements.

The second paragraph should cover the test to be conducted to verify that the robot met the requirement (Functional or Performance).

- L2.1 To provide our team with a competitive advantage our robots shall travel at a speed greater than _____ in/sec and **less than _____ in/sec**. This requirement is based on L1.1. To gauge the speed of our competitors, we did a back of the envelope calculations included in this [blog post](#). This calculation takes into consideration the motor, motor gear ratio, power train gear ratio, wheel diameter... The blog post also presents the experiment(s) we ran to check our calculation.

Proprietary (*The following information is proprietary and will not be shared during design reviews*). To exceed the anticipated speed of the other robots, our robot will... **I told you it was proprietary**. Calculations based on this technique provide the upper speed limit, defined in this requirement.

Verification test is tbs

- L2.2 The robot shall detect a room boundary within X seconds. This requirement was derived by simple multiplication from L1.3 (line width) and L2.1 (maximum speed). *Verification test is tbs*

- L2.3 The robot shall be able to detect, identify, and record a card type within Y seconds. This requirement was derived from L1.2, L2.1 (max speed), **possibly more**.

The need to detect a card and then identify it, could result in 1 or more requirements based on your implementation (This is why it is a level 2 requirement). If the robot never stops then you have a single requirement. Specifically, you would need to perform some tests or calculations to figure out how much time would be necessary to identify the card because of the speed the robot is traveling. If the robot stops when it detects a card, then you would have at least two requirements.

- L2.4 Etc.