Whole Picture

Solving large problems is tough -- but approach them logically and you will succeed

Problem Solving

Large problems share many properties:
- They are daunting -- there's so much to do!
- We don't know where to begin
- Not sure we know all of the tasks that must be done to produce a solution
- Not sure we know how to do all of the parts -- new knowledge may be required
- Not sure it is within our capability -- maybe an expert is needed

Assume you will succeed; not trying concedes defeat

Problem Decomposition

“Divide and conquer” is a political strategy, military strategy & IT strategy

Top-level Plan --
1. Describe (in any language) a series of steps that produce a solution
2. For each step, solve it or decompose further
3. For steps needing decomposition, repeat 2
4. Assemble solutions and test correctness
5. When solution fully assembled, evaluate

1. Give Steps to a Solution

Specify (in any language) a series of steps that produce a solution
- For a huge problem the steps may at first be vague, but they can be & must be made more precise as the whole picture emerges
- The goal is an algorithm(s), so ...
- List & describe the inputs
- List & describe the outputs
- Be guided in figuring out the steps by the need to transform the inputs into the outputs

2&3. Solve or Decompose

For each step, solve it or decompose it further, i.e. apply same technique
- Most “top level” steps can't be brained out, and need further decomposition
- “Top level” steps often seem huge, too
- The technique allows one to concentrate on only one problem at a time
- As before, focus on inputs, outputs, process to transform inputs into outputs

PERT

PERT is Program Evaluation & Review Technique ... developed in 1950s
- Diagrams show the dependencies visually

Build GUI
Setup Control Keys
Build Mouse Keypad
Build Display Grid
Write Functions for CK
Primp & Coolify
4. Assemble Parts

Assemble Solutions & Test Correctness
- Putting solutions together can be tough because of different assumptions made while solving the parts -- it always happens.
- When working alone it is common to combine parts along the way and to test continuously.
- Because of the need to test, pick a good order to solve the problems.

Summary

Large problems can be solved by the ‘divide and conquer’ technique
- The process is "top down" -- get a top level solution even if it is vague, imprecise.
- Whenever you cannot produce a solution to a step directly, reapply the technique.
- The start and first several steps will be daunting … but the process works!
- Get part of solution working quickly if possible.