Announcements

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Monday is the President's Day holiday
- The first lab of next week is canceled because of the holiday, but the labs will be open on Tuesday for last-minute help on Proj2b

Next Friday is the second Midterm

A Survey is posted in "Announcements"
- Please answer it … it will improve the class

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Whole Picture

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

Problem Solving

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Large problems share many properties:
- They are daunting -- there's so much to do!
- We don't know were 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

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"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

More Specifics

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We will step through the process, using Project 2 as an example:

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- Problem decomposition is mostly common sense
- Process is not algorithmic
- Problem decomposition is to help you, so apply it as needed

| New | View | Check | Clear |

UP | DN | Squares: 1
Watch Time: 5 | Seconds | UP | DN
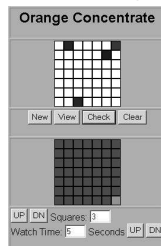
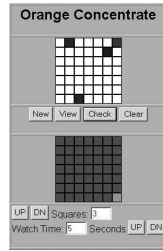## 1. Give Steps to a Solution

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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

You will be naming things

- Be guided in figuring out the steps by the need to transform the inputs into the outputs

What Are Steps for OC?

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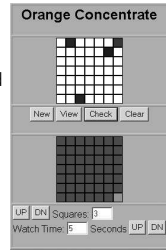
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What Are Steps for OC?

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Orange Concentrate:
- Build Basic GUI
- Build mouse-sensed keypad
- Build the pattern array
- Set up control keys
- Write functions for ctrl keys
- Set up customizing keys
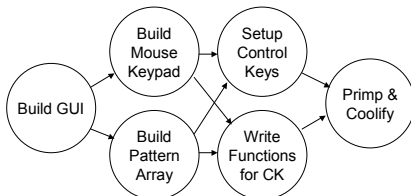- Primp design & make cool

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Can any of these be done directly?

PERT

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

Build GUI → Build Mouse Keypad → Setup Control Keys → Primp & Coolify

Build GUI → Build Pattern Array → Write Functions for CK → Primp & Coolify

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2&3. Solve or Decompose

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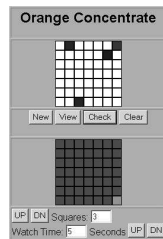- Most "top level" steps can't be brained out, and need further decomposition
- "Top level" steps often seem huge, too
- The technique allows one to concentrate on only one problem at a time
- As before, focus on inputs, outputs, process to transform inputs into outputs

Often, "last" decomposition done during solution

2&3. Solve or Decompose

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"Build mouse-sensed keypad"

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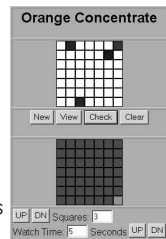Watch Time: 5 Seconds UP | DN

2&3. Solve or Decompose

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"Build mouse-sensed keypad"
- Layout GIF 7x7 grid
- Build onClick e-handler
- Setup to change grid color …
- Define GIF prefetch array
- Prefetch brown & orange
- Build mouse e-handlers
- Update colors in e-handlers

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Need to learn about mouse events

4. Assemble Parts
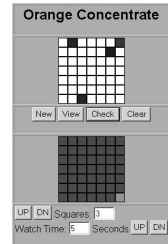
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Assemble Solutions &Test Correctness

- 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

Getting something working quickly is best

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4. Assemble Parts

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Proj2 solves & assembles parts together in a 'good' order

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4. Assemble Parts

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Proj2 solves & assembles parts together in a 'good' order

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- Most parts of Project 2 can use the developing solution for testing -- that's 'good'
- Notice step 2B4 in Project 2 was included simply to test
- Parts mismatch is common problem, but not in Proj2

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Summary

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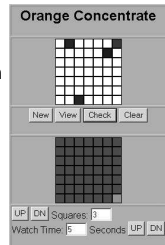
Large problems can be solved by the 'divide and conquer' technique

- 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