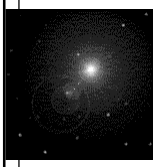

A Course on Algorithm

Design & Analysis

Today's Topic

Unit background and administrivia

Introduction to Algorithms

DESIGN & ANALYSIS OF ALGORITHM

- Javed I. Khan
  Email: javed@kent.edu
  Office Hours: MON 7:30 -- 8:00 p.m.
  WED 2:00 -- 4:00 p.m. & 7:30-8:00 p.m.
  Phone: 672-4004 ext. 217

- TA
  to be announced.

- Web Page:
  http://www.mcs.kent.edu/~javed/class-ALGOOS/

Books

- Introduction to Algorithms, T. Corman.
- Lecture Material Given in the Class
- Live Lectures & Discussions

Course Format

- Class Lectures
  - The concept of algorithm design and analysis will be explained in the class.
  - You need to carefully follow the presentation and participate.
  - Carefully listening is more important than taking detail notes !
- Random Quiz:
  - There will be random quizes to test your alertness in the classes on topics covered in the same day.
- Projects
  - Three individual class projects/experiment.
  - Estimated time requirement 20+20+40=80 hours.

What is Expected Out of You?

- At least 12 hours per week
- Learning by doing
- Questions and exercises
- Reading the book
- Taking active part in class discussions
  - Read/Listen Think Do **Ask**

Grading

Type	Number	Weight
End Term Exam	1	20%
Mid Term Exam	1	20%
Take Home Assignments	4-5	20%
Unannouced Quizes	3-5	20%
Programming Projects	3	20%

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Class Mechanics

- "ALG2000S@maui.mcs.kent.edu".
- Need to send email to the above with subject-field set to "ALG2000S@maui.mcs.kent.edu" to obtain further instruction.
- To be sent by email:
- A random course id (CID) will be mailed to you by TA. All your grades will show this ID.
- Use Computer/Email as much as possible:
  - Reports preferably in computer (for ease)
  - But, no penalty for old fashioned report.

DESIGN & ANALYSIS OF ALGORITHM

Honor Policy

- We assume that you will follow the honor code.
- All projects, assignments have to be done individually by you.
- Any copy will result in zero grade for both parties.
- Also, you should not copy from web.

Why you should take a course on Design and Analysis of Algorithms?

Why Algorithm?

- Engineers use parts and components to build bridges, automobiles, aircraft.
- Computer Engineers use 'algorithms' to build software systems.
- All solutions are not equal!
- The difference between an amateur and a professional is the knowledge and perfection of the 'parts'.

Why Algorithm?

- This class will equip you will a set of basic 'parts' those you will frequently need for the rest of your life.
- In this class you will also learn the techniques for building, selecting, or even designing the best parts for your systems, and the techniques for obtaining the best assembly.
- You will learn how to write efficient programs.

This class will change forever the way you will develop a computer program!

Introduction

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Problems of Large Programs

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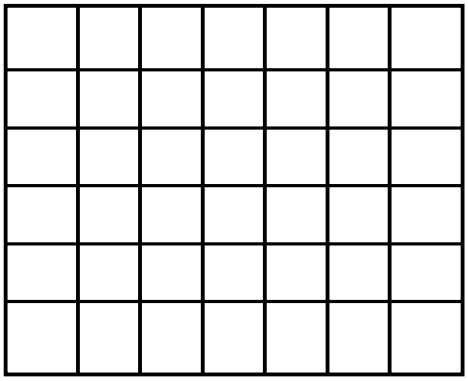
1. The patchwork approach
2. Problem specification
3. Program organization
4. Data organization and data structures
5. Algorithm selection and analysis
6. Debugging
7. Testing
8. Maintenance

Game of Life



The neighbors of a given cell are the eight cells those touch it vertically, horizontally, or diagonally.
Every cell is either living or dead.

Rules for the Game of Life

- A living cell stays alive in the next generation if it has either 2 or 3 living neighbors;
- it dies if it has 0, 1, 4, or more living neighbors.
- A dead cell becomes alive in the next generation if it has exactly three neighboring cells, no more or fewer, that are already alive.
- All other dead cells remain dead in the next generation.

DESIGN &
ANALYSIS OF
ALGORITHM

0	0	0	0	0
1	2	3	2	1
1	1	2	1	1
1	2	3	2	1
0	0	0	0	0

and

0	1	1	1	0
0	2	1	2	0
0	3	2	3	0
0	2	1	2	0
0	1	1	1	0

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ALG00S, javed@kent.edu
Javed I. Khan@1999

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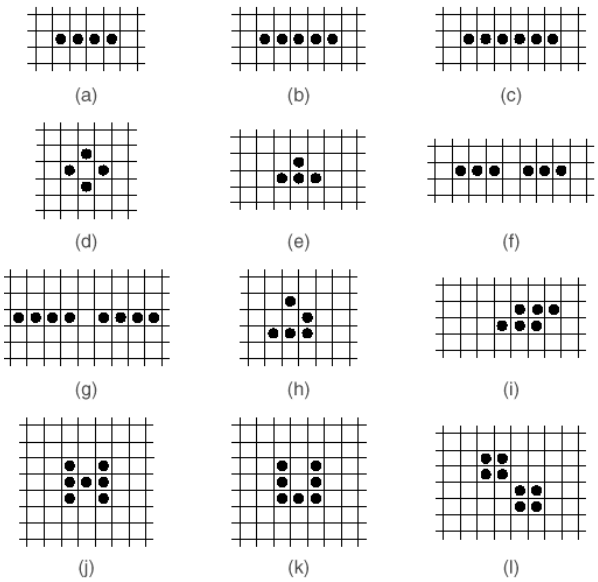
ALGORITHM



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Javed I. Khan@1999

How to Implement

?

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Algorithm for Game of Life

- Initialize an array called map to contain the initial configuration of living cells.
- Repeat the following steps for as long as desired: For each cell in the array do the following:
  - Count the number of living neighbors of the cell.
  - If the count is 0, 1, 4, 5, 6, 7, or 8, then set the corresponding cell in another array called newmap to be dead; if the count is 3, then set the corresponding cell to be alive; and if the count is 2, then set the corresponding cell to be the same as the cell in array map (since the status of a cell with count 2 does not change).
- Copy the array newmap into the array map.
- Print the array map for the user.

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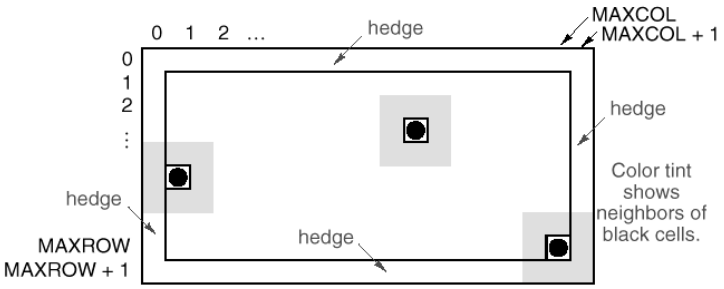
Javed I. Khan@1999

Simplifying Neighbors Count



- Code

Next Class

- Analysis of the algorithm
- How to improve it.