COMPUTATIONAL GEOMETRY

COMP 163

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- www.cs.tutts.edu/comp/163
- T.A. : depends

- Office hours:
  - Email for appointment
  - Bad times: - any morning, Tuesday, Thursday
    - MW 3:00-5:45
  - Good times: - Thursday
    - Before class
    - MW after 5:45
MY PREREQUISITES

* O-notation
* Recurrences, divide & conquer, recursion
* Trees + basic data structures
* Basic graph concepts ... Euler's thm.
* Proof by induction/contradiction
MY PLAN

* BROAD view of C.G. (w/ a few exceptions) -> more topics, fewer details

* 2 threads: 25 classes not counting the midterm

* homework: 25
  midterm: 20
  final: 20
  project: 30
  interview: 5
MY PLAN

* BROAD view of C.G. (w/ a few exceptions)
  more topics, fewer details
* 2 threads: 25 classes not counting the midterm

* homework 25  → 1pt per session
  handed out every 1-2 weeks
  due after ~7-10 days
* midterm 20
* final 20
* project 30
* interview 5
MY PLAN

* BROAD view of C.G. (w/ a few exceptions) ➔ more topics, fewer details
* 2 threads: 25 classes not counting the midterm

* homework 25
  midterm 20
* final 20
  project 30
  interview 5

} each will cover ½ course
MY PLAN

* BROAD view of C.G. (w/ a few exceptions)
  → more topics, fewer details

* 2 threads: 25 classes not counting the midterm

* homework  25
  midterm  20
  final   20
  project 30
  interview 5

SOMETHING YOU ENJOY

Online demo, topic of your choice
Explain theory & implement

... or: solve an open problem
prepare an excellent presentation
(can be flexible)
MY PLAN

* BROAD view of C.G. (w/ a few exceptions) → more topics, fewer details

* 2 threads: 25 classes not counting the midterm

* homework: 25
  midterm: 20
  final: 20
  project: 30
  interview: 5  →  5 minute discussion in my office

friendly
almost free points
TOPICS

MODEL OF COMPUTATION

BASIC GEOMETRIC OBJECTS & OPERATIONS

Straightedge & compass

RAM
TOPICS

CONVEX HULL
computing & updating
TOPICS

(MINIMUM) WIDTH

DIAMETER

OF POINT SETS, POLYGONS, ETC.
TOPICS

ART GALLERY

HOW TO GUARD

TYPES OF GUARDS
TOPICS

SEGMENT INTERSECTION & PLANE SWEEP METHOD

OTHER INTERSECTION PROBLEMS
TOPICS

TRIANGULATIONS

ALGORITHMS & PROPERTIES
TOPICS

POINT LOCATION
TOPICS

LINE ARRANGEMENTS

DUALITY
TOPICS

HAM SANDWICH CUTS

BORSUK-ULAM thm.

Hairy Ball thm
Topics

Unit Distance Graph

Painting the Plane

Fun Paul Erdős Problems
- e.g. Sylvester-Gallai thm
- distinct slope problem
- Erdős-Szekeres thm.
- empty k-gon
Topics

Voronoi Diagrams

&

Delaunay Triangulations
TOPICS

LARGEST EMPTY CIRCLE

SMALLEST ENCLOSED CIRCLE

PROXIMITY GRAPHS
TOPICS

LINEAR PROGRAMMING
(2D solution)

PARAMETRIC SEARCH
TOPICS

OTHER METRICS/DISTANCES

CURVE SIMILARITY (distance)

POLYGONAL APPROXIMATION
TOPICS

DATA DEPTH

SPANNERS & DETOURS
TEXTBOOK

• Good for some formal details of several topics but not mandatory

• Many topics not in book

• My notes will be online w/ many links