

TCS2023 COMPUTATIONAL GEOMETRY

Module 1

Introduction: Convex Hull, Degeneracies and Robustness, Application Domains, Line Segment intersection, The Doubly-Connected Edge List, Computing the Overlay of Two Subdivisions.

Module 2

Polygon Triangulation, Guarding and Triangulations, Partitioning a Polygon into Monotone Pieces, Triangulating a Monotone Polygon.

Module 3

Linear Programming, The Geometry of Casting, Half-Plane Intersection, Incremental linear Programming, Randomized Linear Programming, Unbounded Linear Programs, Linear Programming in Higher Dimensions.

Module 4

1- Dimensional Range Searching, Kd- Trees, Range Trees, Higher Dimensional Range Trees, General Set of Points, Fractional Cascading

Module 5

Point location and Trapezoidal Maps, A Randomized Incremental Algorithm, Dealing with Degenerate Cases, Definition and basic properties of Voronoi Diagrams, Computing the Voronoi Diagram.

Module 6

Arrangements and Duality, Computing the Discrepancy, Duality, Arrangements of Lines, Levels and Discrepancy.

Module 7

More Geometric Data Structures, Interval Trees, Priority Search Trees, Segment Trees.

Text Book:

Mark de Berg, Marc van Kreveld, Mark Overmars, Otfried Schwarzkopf, "Computational Geometry Algorithms and Applications", Springer, 2000.

Reference Book:

Michael J. Laszlo, "Computational Geometry and Computer Graphics in C++", PHI, New Delhi, 1999.