INRIA - NKUA Meeting

Sophia-Antipolis, Feb 14-15, 2012

Follow-up of INRIA visit to Athens, May 2010

Ioannis Emiris

Outline

Bilateral agreement * Department of Informatics & Telecoms * Theory division * Algerbaic/Geometric computing

National & Kapodistrian University of Athens and INRIA Sophia-Antipolis

- Several point-to-point contacts
- Partner of INRIA International Internships

- Bilateral agreement (Fall 2010)
- Coordinator: I.Emiris,
  Deputy coordinator: D.Thilikos (Math)
- Activities:
  * Exchange of academic personnel
  * Student exchange
  * Exchange of non-academic personnel, in specific circumstances
  * Joint research activities (bilateral, regional/European framework)
  * Exchange of good practices (e.g., joint software development, innovation practices)

Department of Informatics & Telecommunications

www.di.uoa.gr/en/

Part of the School of Natural Sciences

Three divisions: Theoretical CS, Computer Systems, Telecoms & Signal Processing.

42 Faculty

According to the 3 ARWU Shangai rankings, in the top 75-100 CS departments world-wide.

3 IEEE Fellows, one ACM Fellow, 3 ERC Ideas Startup grants

Division of
Theoretical Computer Science

theory.di.uoa.gr

10 faculty
2 ERC Startup Grants (Probabilistic algorithms, Crypto/security)

14 PhD students (mostly European funding)
12 Postdocs / Collaborators

Research areas

Game theory, randomized algorithms,
E. Koutsoupias, D. Achlioptas

Combinatorial optimization,
V. Zissimopoulos, S. Kolliopoulos

Theory of programming languages, P. Rondogiannis

Cryptography/Security, A. Kiayias

Scientific computing, N. Misirlis, F. Tzaferis

Graphics/Biometrics, T. Theoharis

Algebraic/geometric computing, I. Emiris

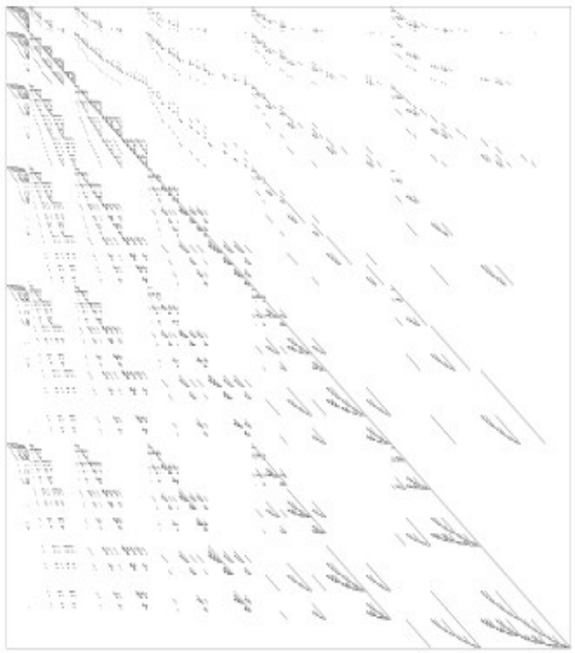
Lab of
Algebraic & Geometric algorithms

ΕρΓΑ: **erga.di.uoa.gr**

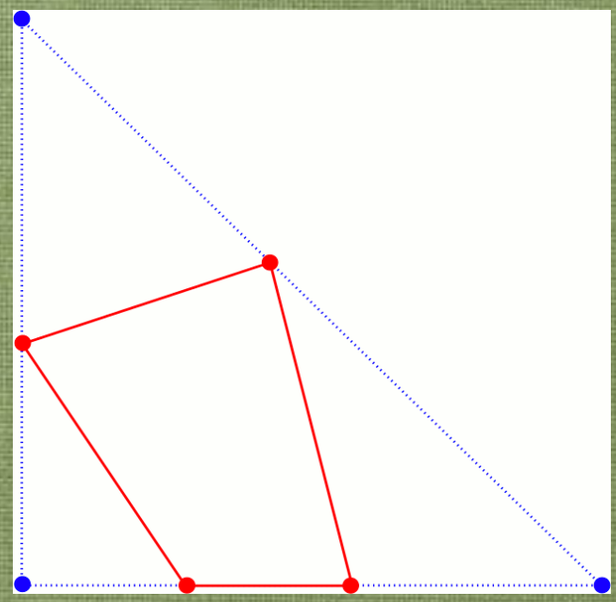
People:
1 faculty, 3 affiliated Profs/researchers
3 PhD students, 2 Postdocs
+ collaboration with GALAAD (ex-Associated team)

Current Projects:
SAGA: ShApes, Geometry, Algebra (Marie Curie Net)
CGL: Computational Geometric learning (FET-Open)
Θαλής: Geometric computing (Greek ministry)

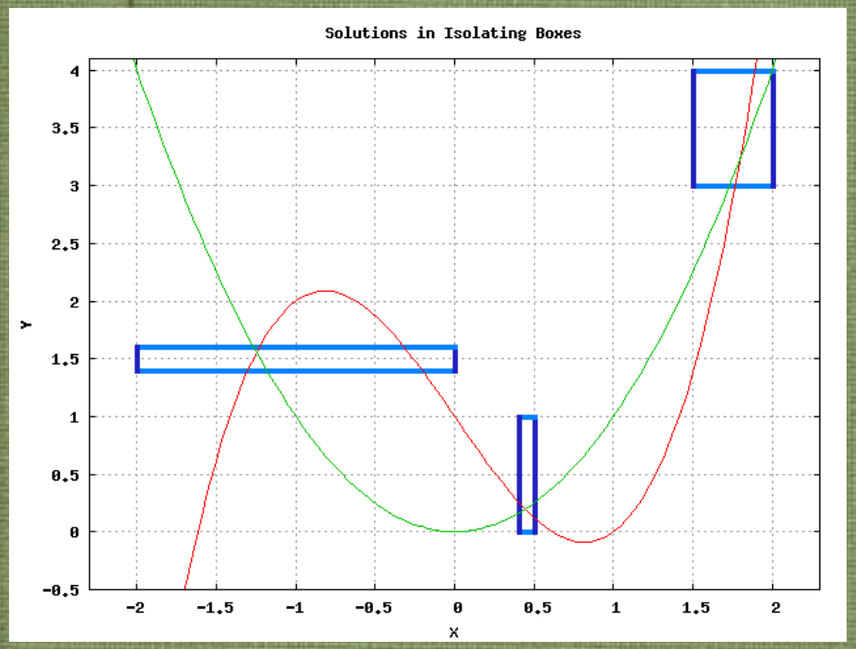
Algebraic computing



Polynomial system solving via Resultant matrices
Implementation in Maple, C
Structured matrices *[E-Mourrain-Pan]*

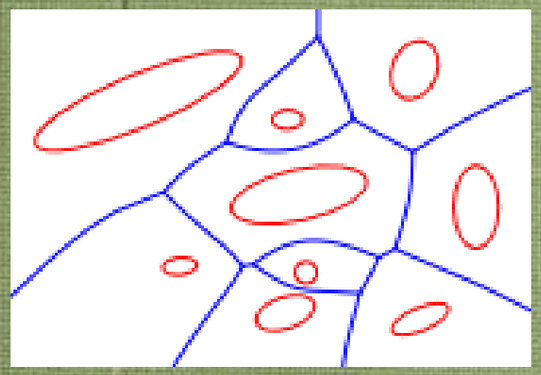


Sparse elimination theory
Newton polytope, Sparse resultant, mixed volume
[Canny-E,J.ACM'00]

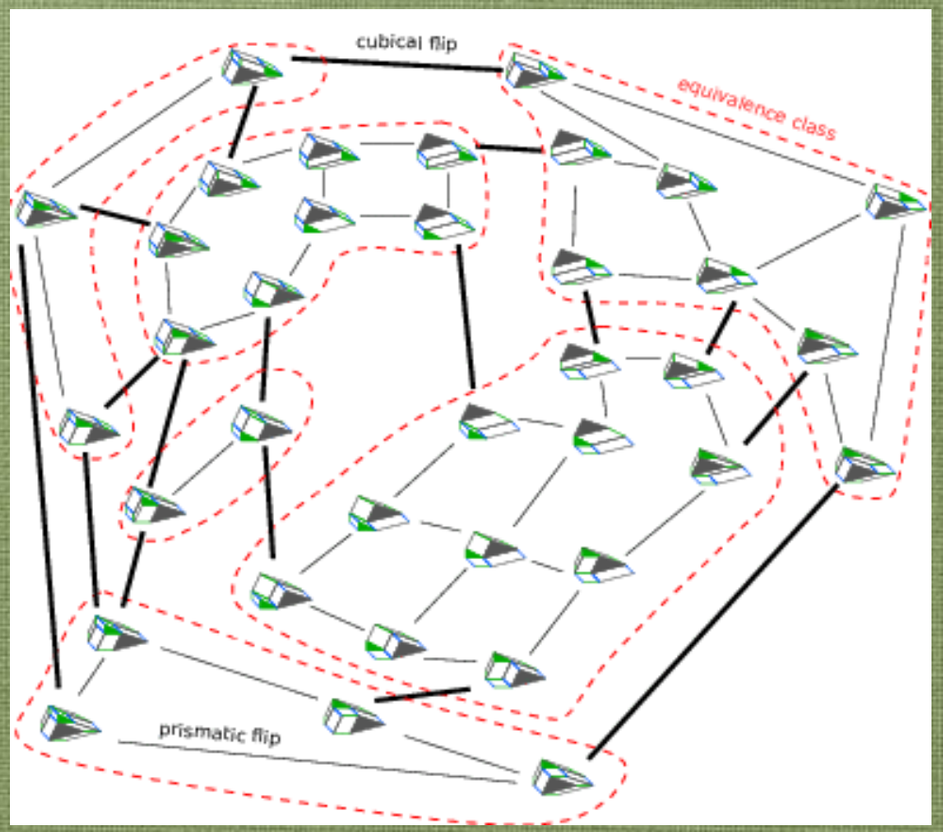


Real solving, fast implementation (Synaps)
Competitive to numeric solvers
[Tsigaridas-E,TCS'08]
Expected complexity, Systems, optimization
[E-Galligo-Mourrain-Tsigaridas,ISSAC'10]

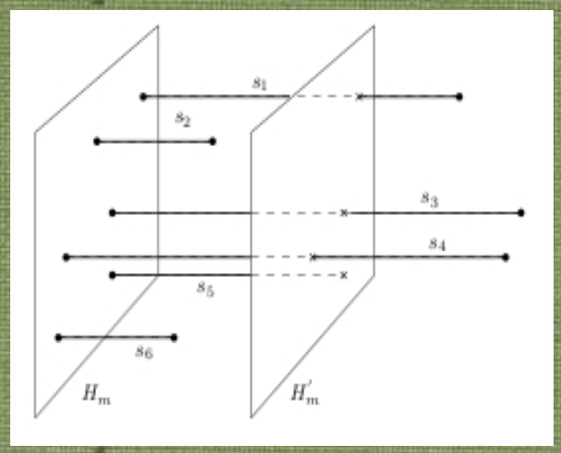
Geometric computing



Nonlinear Computational geometry
Voronoi diagrams, arrangements
Ellipses in real time (CGAL/Synaps, 1sec/ellipse)
[E-Karavelas,SODA'03], [E-Tzoumas,SPM'07,'09]

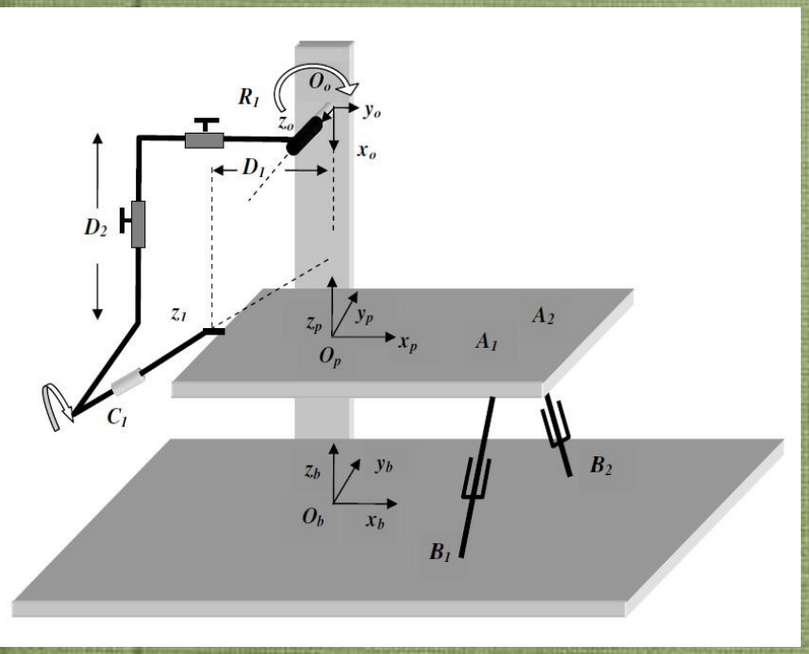


Newton polytope of resultant, up to 10 dim
Output sensitive approach, CGAL code
[E-Fisikopoulos]
Reduce implicitization to linear algebra

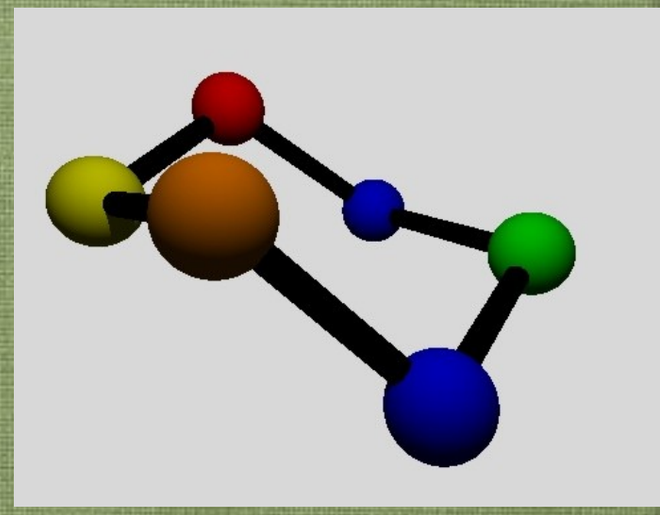


High-dim search, Approximate Nearest neighbors
Adaptive data-structures *[E-Malamatos-Tsigaridas]*

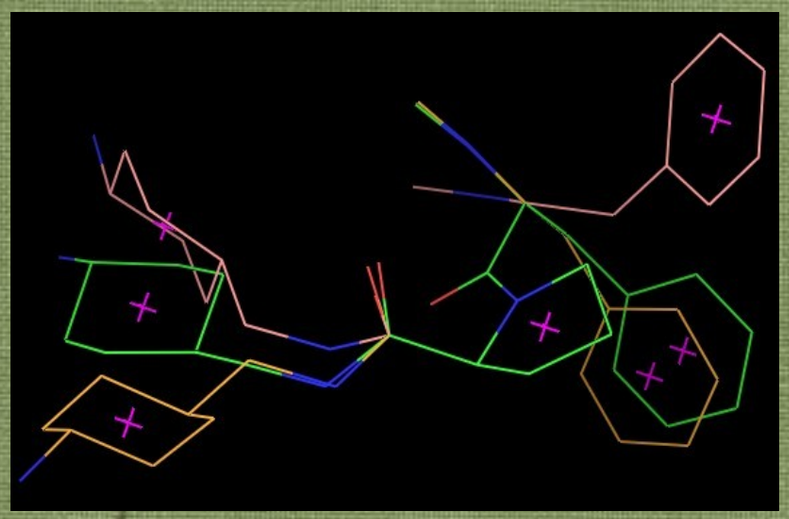
Kinematics



Parallel robot calibration *[Daney-E,ICRA'01]*
Hybrid platform for physiotherapy
[E-Daney-Sirseloudis'11]
Sparse polynomial systems



Rigidity, Distance matrices, PSD matrices
[E-Mourrain,Algorithmica'99]
Embeddings of 11-bar mechanism *[IFTOMM'11]*



Structure from NMR
Transmembrane proteins
Pharmacophores, docking *[E-Manocha-Fritzilas'06]*