From Computational Geometry to Radiation Cancer Treatment

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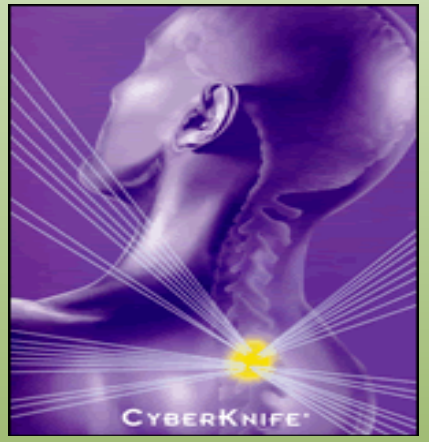
My Research

- Computational geometry
- Radiation cancer treatment, medical imaging, and other medical applications
- Many medical problems are amenable to geometric solutions



Adapted from www.itwm.fhg.de

0	0	0	0	0	0	0
0	0	1	0	3	0	0
0	0	2	1	5	4	5
3	5	2	2	4	3	4
3	1	4	3	4	4	4
0	0	3	0	2	0	0
0	0	0	0	0	0	0

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My Broader Impact Focus

- Algorithms, software, and hardware for medical problems (e.g., problems in radiation cancer treatment planning and medical imaging)
- Motivation: Can geometric algorithms make direct, real impact on saving lives?
- NSF broader impact criterion #5: **Highlight the benefit to society**

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My Broader Impact Activities

- Algorithm development, analysis, implementation, experiments, and evaluations in medical settings and systems
- We work closely with medical researchers and practitioners; we solve “their” problems, not “our” problems
- We do not “back off” from the “real” medical problems, so that our solutions will be truly useful clinically
- Five full US patent applications (two already issued); algorithms and software used in clinical radiation cancer treatment at several hospitals (hundreds of patients treated); licensing by three US companies (e.g., Varian)

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Connections

- Collaborating with several medical schools in the US
- Working with US medical companies
- Visiting medical researchers often and staying for collaborated work (sometimes for weeks)
- Publishing in medical journals/conferences
- Organizing *DIMACS Workshop on Medical Applications in Computational Geometry*

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Broader Impact Activities help …

- Interdisciplinary studies
- Fresh problem sources (even for theory)
- Enriching theoretical components
- Exciting to see and show results in real life
- Success can bring more connections, more opportunities, and more successes
- …

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A GOOD Activity is …

- Can it really help solve the target applied problems (e.g., can it be clinically applicable and effective)?
- Can the results be accepted, used, and recognized by the target applied community?
- Can the work make the fellow theoretical researchers feel excited?

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Join Us!

- More collaborations with medical researchers and practitioners: Absolutely crucial!
- Algorithmists: Learn new problems in a different, applied field (e.g., the basic medical knowledge and settings, constraints, criteria, requirements, etc), and get heavily involved in implementation and medical experiments of algorithmic solutions, together with medical people

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My Advice

- Be willing to pay the price (learn a new applied field, the problems, the real applications, etc)
- Build close connections with medical people
- Gain the trust of the medical collaborators (solve some of their key problems for a good start)
- Be ready to get the hands “dirty” (implementation, medical experiments, …)

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