



The Mathematics of Interior Design

Former UCLA math postdoctoral scholar Sai-Kit Yeung (Kit) and UCLA computer graphics PhD student Lap-Fai (Craig) Yu are passionate gamers who were looking to improve the quality of their video gaming experience, specifically the realism of virtual indoor environments. Says Kit, "Game developers can model a whole city, like New York, but you can't go inside most of the buildings because it takes too much effort and cost to model the interiors." Now, with their Make It Home software, Kit and Craig have creatively solved the interior modeling problem by a stochastic optimization method, which allows a user to configure furniture and objects in a virtual room automatically, generating multiple functional arrangements for up to 30 objects in 20 seconds. For non-gamers, the applications in interior design are equally exciting. Unlike furniture retailer IKEA's online kitchen planner that allows shoppers to manually place items such as cupboards and sinks into their spaces to see how well they fit, Make It Home automatically generates optimal layouts for any given room

in seconds, taking into account accessibility and visibility constraints like doors and windows. They also found that there was no significant difference in aesthetic preference by users between the synthesized results and layouts selected by human designers. The research team, including UCLA applied math professor **Stanley Osher**, UCLA computer science professor **Demetri Terzopoulos** and former UCLA math professor and Hong Kong University of Science and Technology President **Tony Chan**, also sees applications in film, theme park design, city planning and military troop organization. Kit, who will join the Singapore University of Technology and Design this fall as an assistant professor, plans to take the software to the next level using Stan Osher's level set method to allow even more complicated representation and arrangement of objects.

To see Make It Home's automatic furniture optimization in action, click here:
<http://www.math.ucla.edu/~saikit/projects/furniture/furniture.mov>

UCLA Math at the Institut Henri Poincaré in Paris

Von Neumann algebras have emerged as playing a fundamental role in a number of mathematical areas, such as group theory, ergodic theory, non-commutative functional analysis, and descriptive set theory. Building on a long tradition in this field, UCLA Mathematics has assumed a leading role over the last decade through a constant flow of visiting researchers, exceptional graduate students and a series of influential conferences, held on a bi-annual basis. This culminated in a major international research program, "Von Neumann algebras and ergodic theory of group actions," held in spring 2011 at the **Institut Henri Poincaré** in Paris. The trimester, co-organized by Department chair **Sorin Popa**, whose work in the last 10 years revolutionized these subjects, had substantial participation of UCLA faculty, current and past postdocs and graduate students. It offered four graduate courses and 17 research level mini-courses, a third of which were given by UCLA faculty (**Yehuda Shalom**, **Dima Shlyakhtenko**, Sorin Popa) and former UCLA postdocs. Two major workshops, " II_1 factors, rigidity, symmetries and classification" and "Geometric and measured group theory," brought together over 50 prominent figures in these areas. The program saw fruitful cross-pollination between the areas of group theory, ergodic theory and von Neumann algebras, resulting in several new research directions and breakthroughs.

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Von Neumann algebras and ergodic theory of group actions
Paris, April 11 - July 8, 2011

Organized by Damien Gaboriau, Sorin Popa and Stefaan Vaes

School for PhD students

April 11 - April 22 at the CIRM in Marseille
 An invitation to von Neumann algebras and ergodic theory of group actions
 Lecturers: Y. Benoist, C. Houdayer, F. Paulin, G. Skandalis

II_1 factors: rigidity, symmetries and classification
 May 2 - June 1 : intensive courses
 Lecturers: U. Haagerup, A. Ioana, V. Jones, N. Ozawa, J. Peterson, S. Popa, D. Shlyakhtenko, S. Vaes, D. Voiculescu
 May 23 - May 27 : workshop

Geometric and measured group theory
 June 14 - July 1 : intensive courses
 Lecturers: A. Furman, D. Gaboriau, A. Kechris, Y. Kida, A. Lubotzky, N. Monod, Y. Shalom, A. Thom, A. Veitch
 July 4 - July 8 : workshop

- Program coordinated by the Centre Emile Borel of the IHP. Registration: www.ihp.fr
- Participation of PhD students and postdocs is strongly encouraged.
- For more information, please contact Sylvie Lhermitte: wsg2011@ihp.jussieu.fr

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