Workshop on Geometric Group Theory

Peking University, Beijing, China
December 16-17, 2017

Speakers:

Xiaoming Du (South China University of Technology)

Huabin Ge (Beijing Jiaotong University)

Sang-Hyun Kim (Seoul National University)

Yi Liu (BICMR)

Jiming Ma (Fudan University)

Yunhui Wu (Tsinghua University)

Yilong Yang (Tsinghua University)

Shengkui Ye (Xi'an Jiaotong-Liverpool University)

Organization Committee:

Xiang Fu (BICMR)

Wenyuan Yang (BICMR)

Workshop venue:
Room 82J12, Jiayibing Building, Jingchunyuan 82, BICMR (镜春园82号甲乙丙楼82J12
教室)

Hotel:
FX Hotel ZhongGuanCun(富驿时尚酒店中关村店).
Address: No.68 North 4th Ring West Road (South of Haidian Bridge) Haidian District,
Beijing 100080 China.

Schedule

	Saturday (Dec. 16)	Sunday (Dec. 17)
8:30-8:50	Registration	
8:50-9:40	Sang-Hyun Kim (1)	Yi Liu (2)
9:40-9:50	Coffee break	
9:50-10:40	Sang-Hyun Kim (2)	Yi Liu (3)
10:40-11:10	Coffee break	
11:10-12:00	Yi Liu (1)	Sang-Hyun Kim (3)
	Lunch	
14:00-14:50	Yunhui Wu	Yilong Yang
14:50-15:10	Coffee break	
15:10-16:00	Shengkui Ye	Xiaoming Du
16:00-16:20	Coffee break	
16:20-17:10	Jiming Ma	Huabin Ge
	Free discussion	
18:00	Dinner	

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Mini-courses:

Sang-hyun Kim (Seoul National University)

Title: Diffeomorphism Groups of One-Manifolds

Abstract:

Let M be a compact interval or a circle. We study algebraic properties of Diff^r(M), the group of C^r diffeomorphisms of M. In the first half of the mini-course, we investigate r=0 (homeomorphisms), particularly on the cohomological aspects. For the second half, we focus on the following question: which finitely generated groups arise as subgroups of Diff^r(M)? We survey classical theories of Hölder, Denjoy, Kopell and Thurston regarding this matter, along with some new results (joint with Thomas Koberda).

Yi Liu (BICMR)

Title: Special cube complexes and hyperbolic 3-manifolds

Abstract:

In this mini-course, we discuss special cube complexes and their applications in the study of hyperbolic 3-manifolds. In the first part, we will introduce special cube complexes following Haglund--Wise, and recall their relation with right-angled Artin groups (RAAGs). The second part will be a brief introduction to the Virtual Special Cubulation of (closed) hyperbolic 3-manifolds (due to Agol and Wise). The introduction will mostly be on the framework level. At the end we will survey on more recent results which use closely related techniques.

Research talks:

Xiaoming Du (South China University of Technology)

Title: On the torsion generating sets of the mapping class groups of surfaces

Abstract:

The mapping class groups of surfaces can be generated by only torsion elements. This talk will discuss how to reduce the number and the order of such torsion elements. In the case of extended mapping class groups, which include the orientation reversing mapping classes, we prove that such groups can be generated by two torsion elements when the genus of the surface is no less than 5. The order of these two generating elements are 2 and $4g+2$.

Huabin Ge (Beijing Jiaotong University)

Title：Characterizing 3-ideal hyperbolic polyhedra in hyperbolic 3-space by combinatorial Ricci flow.

Abstract：

Around 1980, Thurston showed that "almost every" 3-manifold admits a complete hyperbolic metric. To get such a metric, he proposed to ideally triangulate the manifold and realize each tetrahedron as a hyperbolic ideal tetrahedron. He also gave a system of gluing equations in the shape parameter of these ideal tetrahedrons, whose solution corresponds to the complete hyperbolic metric.

In the 1990s, Casson discovered a powerful technique for solving Thurston's gluing equations. The main idea is to study the combinatorial structure of the triangulation and the dihedral angle structure of each tetrahedron. Following Casson's program, Rivin completely describes all convex ideal polyhedra by combinatorial and angle structures. In this talk, we shall use combinatorial Ricci flow methods, initiated by Bennett Chow and Luo Feng, to approach Casson-Rivin's program.

We shall extend Koebe-Andreev-Thurston's Circle Pattern Theorem, Rivin's theorem on ideal hyperbolic polyhedra and Chow-Luo's theory on combinatorial Ricci flows. Our results suggest an algorithm exponentially fast to find (ideal) circle patterns and ideal hyperbolic tetrahedrons with the given combinatorial type and dihedral angles. This is joint work with Bobo Hua and Ze Zhou.

Jiming Ma (Fudan University)

Title: Hyperbolic 4-manifolds over the 120-cell

Abstract:

Since there is no hyperbolic Dehn filling theorem in higher dimension, it is difficult to construct concrete hyperbolic manifolds in dimension at least four. We will talk about eight-colorable small covers over the 120-cell, which give us a set of closed hyperbolic 4-manifolds. This is a joint work with Fangting Zheng.

Yunhui Wu (Tsinghua University)

Title: Translation lengths of parabolic isometries of CAT(0) spaces and their applications

Abstract:

In this talk we will give a sufficient and necessary condition on parabolic isometries of positive translation lengths on complete visibility CAT(0) spaces. One consequence is that each parabolic isometry of a complete simply connected visibility manifold of nonpositive sectional curvature has zero translation length. Applications on the geometry of open negatively curved manifolds will also be discussed.

Yilong Yang (Tsinghua University)

Title: Expansion in finite simple groups

Abstract:

In this talk we explore various expansion type phenomena in finite simple groups. We shall talk about the diameter bounds of the Cayley graphs of finite simple groups, various types of product theorems, and some related results on ultraproducts of finite groups.

Shengkui Ye (Xi'an Jiaotong-Liverpool University)

Title: The action of Aut(F_n) on manifolds and Euler characteristics
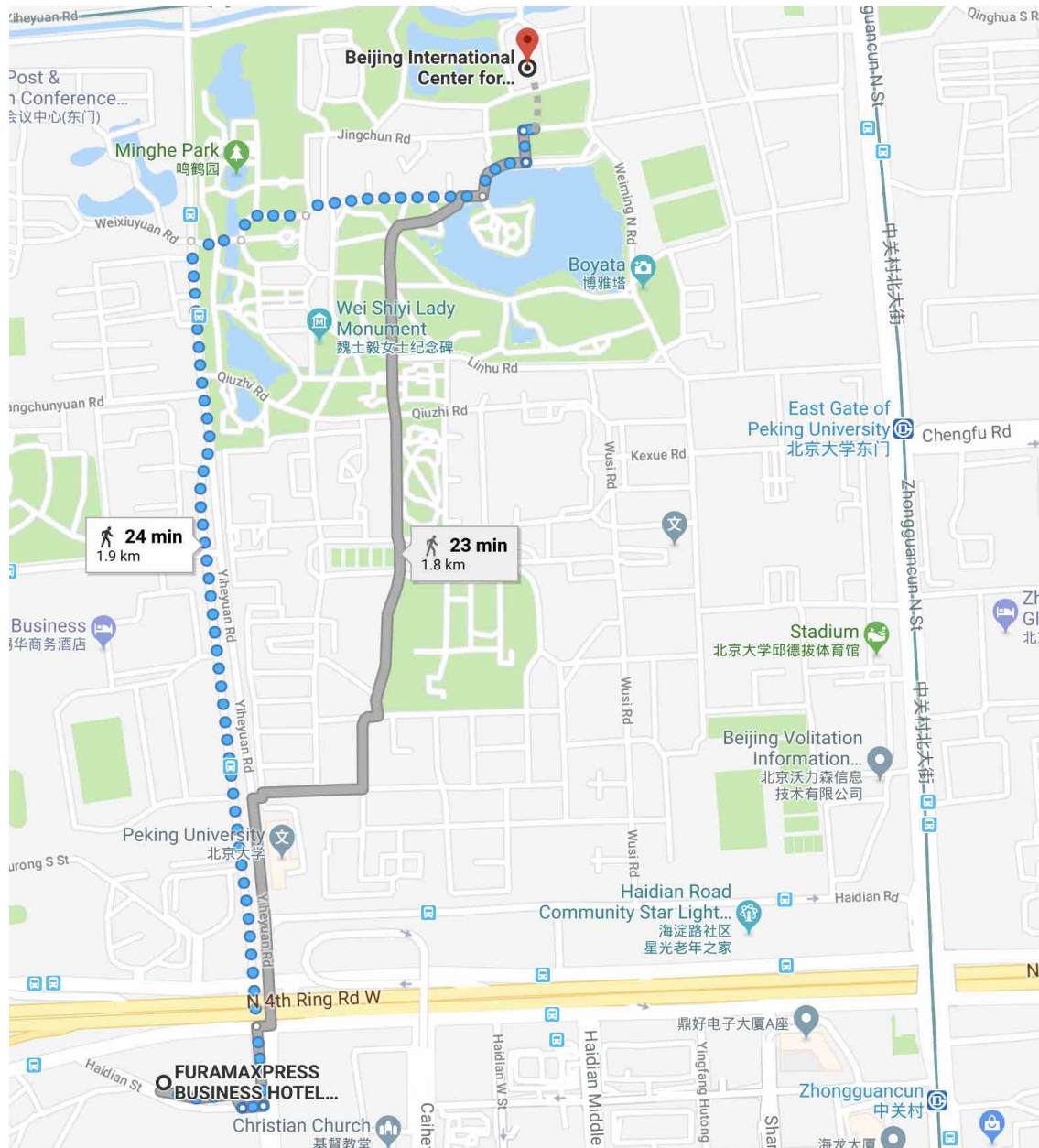
Abstract:

Let M be an orientable manifold of Euler characteristic not divisible by six. Then any group action of the automorphisms group Aut(F_n) of the free group F_n on M is trivial, when the dimension of M is less than n-1.

Maps:

Arrive to BICMR (from hotel):
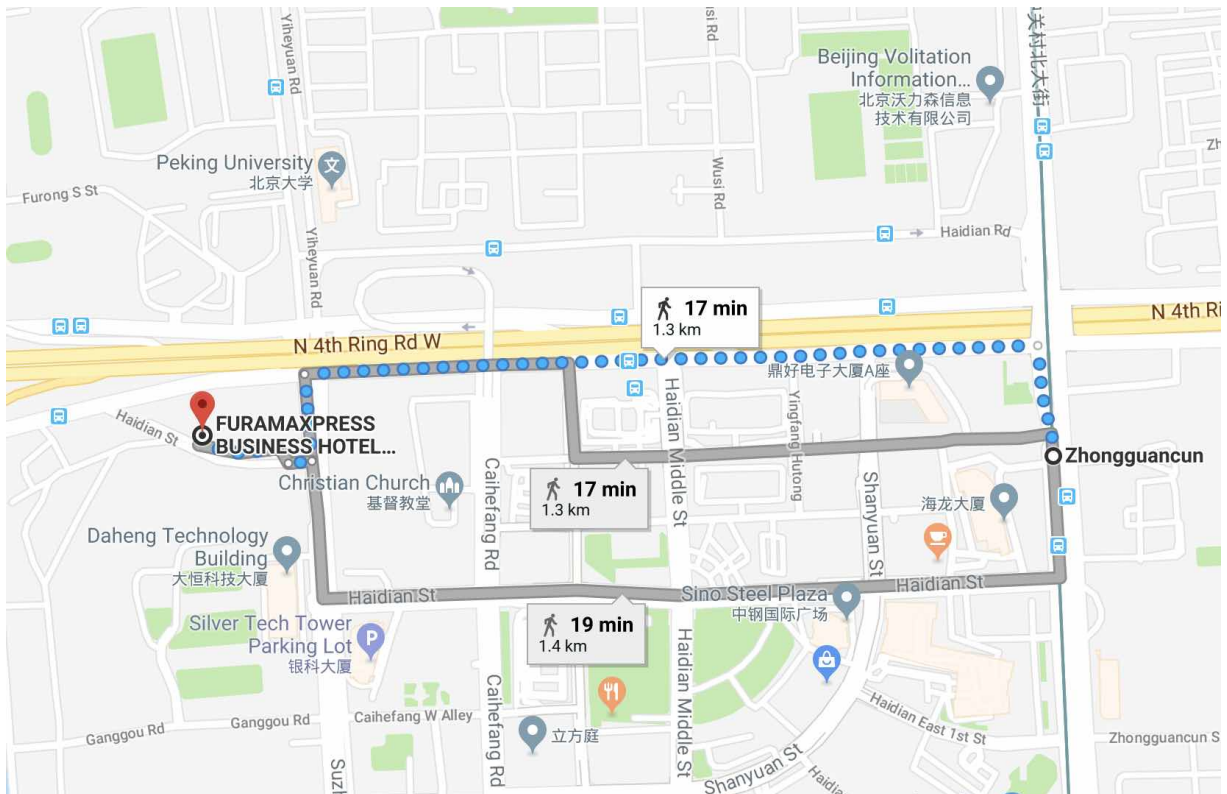Walk from **FX Hotel ZhongGuanCun** to **BICMR**.

Here is some tips on how to arrive to BICMR from Airport and Railway station:
http://bicmr.pku.edu.cn/content/page/9.html

Arrive to Hotel (from Zhongguancun station):

Walk from **Zhongguancun Station** (Subway Line 4, Exit A1) to our hotel "**FX Hotel ZhongGuanCun**".

Participants：

Haimiao Chen	chenhaimiao@btbu.edu.cn	Beijing Technology and Business University
Zhi Chen	zzzchen@ustc.edu.cn	HeFei University of Technology
Xiaoming Du	scxmdu@scut.edu.cn	South China University of Technology
Qiang E	eqiang@dlmu.edu.cn	Dalian Maritime University
Xiang Fu	fuxiang@math.pku.edu.cn	Peking University
Huabin Ge	hbge@bjtu.edu.cn	Beijing Jiaotong University
Qilong Guo	guoqilong1984@hotmail.com	China University of Petroleum
Sang-hyun Kim	s.kim@snu.ac.kr	Seoul National University
Suzhen Han	suzhenhan@pku.edu.cn	Peking University
Zunwu He	519971914@qq.com	Academy of Mathematics and Systems Science
Youlin Li	liyoulin@sjtu.edu.cn	Shanghai Jiao Tong University
Yi Liu	liuyi@math.pku.edu.cn	Peking University
Jiming Ma	majiming@fudan.edu.cn	Fudan University
Ruifeng Qiu	rfqiu@math.ecnu.edu.cn	East China Normal University
Shida Wang	swang9@uoregon.edu	University of Oregon
Jianchun Wu	wujianchun@suda.edu.cn	Soochou University
Yunhui Wu	yunhui_wu@mail.tsinghua.edu.cn	Tsinghua University
Mengjian Xu	348769636@qq.com	Beijing Normal University
Wenyuan Yang	wyang@math.pku.edu.cn	Peking University
Yilong Yang	yilongyang0829@gmail.com	Tsinghua University
Zhiqing Yang	yangzhq@dlut.edu.cn	Dalian University of Technology

Shengkui Ye	Shengkui.Ye@xjtlu.edu.cn	Xi'an Jiaotong-Liverpool University
Bin Yu	binyu1980@163.com	Tongji University
Fei Yu	yufei@zju.edu.cn	Zhejiang University
Faze Zhang	zhangfaze85@163.com	Northeast Normal University
Qiang Zhang	zhangq.math@mail.xjtu.edu.cn	Xi'an Jiaotong University
Xuezhi Zhao	zhaoxve@mail.cnu.edu.cn	Capital Normal University
Yanqing Zou	yanqing_dut@163.com	Dalian Minzu University