

**Symposium
On
Dependable Software Engineering
Theories, Tools and Applications
(SETTA 2016)**

November 9-11, 2016

**Institute of Software,
Chinese Academy of Sciences,
Beijing, China**

**Symposium
On
Dependable Software Engineering:
Theories, Tools and Applications
(SETTA 2016)**

November 9-11, 2016

**Institute of Software,
Chinese Academy of Sciences,
Beijing, China**

INTRODUCTION

Formal methods emerged as a disciple area in computer science and software engineering half a century ago. An international community is formed researching, developing and teaching formal theories, techniques and tools for software modeling, specification, design and verification.

However, the impact of the theories, techniques and tools on the improvement of qualities of the daily used software systems is far from being convincing to software engineering practitioners. The gap between the development of formal methods and the advances in software technologies is not being seen becoming narrower. More precisely, the relation between formal methods and software technologies is not clearly understood.

This is clearly reflected by the challenges in application of formal techniques and tool in engineering large-scale systems with multi-dimensional complexities. Large systems include Cyber-Physical Systems (CPS), Networks of Things, Enterprise Systems, Cloud-Based Systems, etc.

This background is the motivation of this Symposium on Foundations, Practice and Trends in Formal Software Engineering Methods. The theme of the symposium is to promote research sharing, exchange of ideas and discussions on

- Theories, techniques, tools and their applications, the understanding on their impacts, weakness and what practical problems in software design they can solve effectively;

- Relations and common foundations of difference theoretical frameworks and their techniques so as to scale up their application to handle complex system design and verification;
- "Big and bold" ideas about how to make it more relevant to engineering practitioners by advancing formal methods research and development and improving education;
- Research and experiments on domain specific applications of formal techniques and tools.

The **program of the symposium** will consist of

- regular presentations on research findings related to the above thematic points,
- reports of progress of ongoing research and/or projects,
- position papers that propose challenges in fundamental research and technology development,
- industrial application cases and experiences of application of formal methods,
- presentations from PhD students on their research.

The **purpose of the symposium** is to bring international researchers to exchange research results and ideas with the Chinese computer science and software engineering community. It is the hope to develop understanding of the research of different groups so as to build up closer and interest-driven research collaboration. The symposium is aiming at its academic excellence and its objective is to grow up to become a flagship conference on formal software engineering conference in China.

To achieve these goals and contribute to the sustainability of the formal methods research, it is important for the symposium to attract young researchers into the community. Thus, this symposium encourages participation of young researchers and students.

BACKGROUND AND OBJECTIVES

The aim of the symposium is to bring together international researchers and practitioners in the field of software technology. Its focus is on formal methods and advanced software technologies, especially for engineering complex, large-scale artifacts like cyber-physical systems, networks of things, enterprise systems, or cloud-based services. Contributions relating to formal methods or integrating them with software engineering, as well as papers advancing scalability or widening the scope of rigorous methods to new design goals are especially welcome.

Being hosted in China, the symposium will also provide a platform for building up research collaborations between the rapidly growing Chinese computer science community and its international counterpart. The symposium will support this process through dedicated events and therefore welcomes both young researchers considering international collaboration in formal methods and established researchers looking for international cooperation and willing to attract new colleagues to the domain.

Authors are invited to submit papers on original research, industrial applications, or position papers proposing challenges in fundamental research and technology. The latter two types of submissions are expected to contribute to the development of formal methods either by substantiating the advantages of integrating formal methods into the development cycle or through delineating need for research by demonstrating weaknesses of existing technologies, especially when addressing new application domains.

Submissions can take the form of either normal or short papers. Short papers can discuss ongoing research at an early stage, including PhD projects. Papers should be written in English. Regular Papers should not exceed 15 pages and Short Papers should not exceed 6 pages in LNCS format (see LNCS authors' instructions for details). The proceedings will be published as a volume in Springer's LNCS series. The authors of a selected subset of accepted papers will be invited to submit extended versions of their papers to appear in a special issue of the Formal Aspect Computing journal.

TOPICS

Topics of interest include, but are not limited to:

- Requirements specification and analysis
- Formalisms for modeling, design and implementation
- Model checking, theorem proving, and decision procedures
- Scalable approaches to formal system analysis
- Formal approaches to simulation and testing
- Integration of formal methods into software engineering practice
- Contract-based engineering of components, systems, and systems of systems
- Formal and engineering aspects of software evolution and maintenance
- Parallel and multicore programming
- Embedded, real-time, hybrid, and cyber-physical systems
- Mixed-critical applications and systems
- Formal aspects of service-oriented and cloud computing
- Safety, reliability, robustness, and fault-tolerance
- Empirical analysis techniques and integration with formal methods
- Applications and industrial experience reports
- Tool integration

IMPORTANT DATES

Abstracts: June 19, 2016

Submission of papers: June 19, 2016 (AOE time, UTC-12)

Notification to authors: July 15, 2016 August 1, 2016

Camera-ready version: August 6, 2016 August 25, 2016

ORGANIZATION COMMITTEE

General Chair

Huimin Lin Institute of Software, Chinese Academy of Sciences, China

Program Co-chairs

Martin Fränzle University of Oldenburg, Germany

Deepak Kapur University of New Mexico, USA

Naijun Zhan Institute of Software, Chinese Academy of Sciences, China

Publicity Chairs

Nils Müllner Mälardalen University, Sweden

Lijun Zhang Institute of Software, Chinese Academy of Sciences, China

Local Organization Chairs

Andrea Turrini Institute of Software, Chinese Academy of Sciences, China

Shuling Wang Institute of Software, Chinese Academy of Sciences, China

Peng Wu Institute of Software, Chinese Academy of Sciences, China

Zhilin Wu Institute of Software, Chinese Academy of Sciences, China

PROGRAM COMMITTEE

Erika Ábrahám	RWTH Aachen University, Germany
Farhad Arbab	CWI and Leiden University, The Netherlands
Sanjoy Baruah	University of North Carolina, USA
Michael Butler	University of Southampton, UK
Deepak D'Souza	Indian Institute of Science, India
Yuxin Deng	East China Normal University, China
Xinyu Feng	University of Science and Technology of China, China
Martin Fränzle	University of Oldenburg, Germany (Chair)
Goran Frehse	Université Joseph Fourier Grenoble 1-Verimag, France
Lindsay Groves	Victoria University of Wellington, New Zealand
Dimitar Guelev	Bulgarian Academy of Sciences, Bulgaria
Fei He	Tsinghua University, China
Holger Hermanns	Saarland University, Germany
Deepak Kapur(Chair)	University of New Mexico, USA
Axel Legay	IRISA/INRIA, Rennes, France
Xuandong Li	Nanjing University, China
Shaoying Liu	Hosei University, Japan
Zhiming Liu	Southwest University, China
Xiaoguang Mao	NUDT, China
Markus Müller-Olm	Westfälische Wilhelms-Universität Münster, Germany
Raja Natarajan	Tata Institute of Fundamental Research, India
Jun Pang	University of Luxembourg, Luxembourg
Shengchao Qin	Teesside University, UK
Sriram Rajamani	Microsoft Research, India
Jean-François Raskin	Université Libre de Bruxelles, Belgium
Stefan Ratschan	Czech Academy of Sciences, Czech Republic
Martin Steffen	University of Oslo, Norway
Zhendong Su	UC Davis, USA
Cong Tian	Xi'dian University, China
Tarmo Uustalu	Tallinn University of Technology, Estonia
Chao Wang	Virginia Tech, USA
Farn Wang	National Taiwan University, TW, China
Heike Wehrheim	University of Paderborn, Germany
Wang Yi	Uppsala University, Sweden
Naijun Zhan(Chair)	Institute of Software, Chinese Academy of Sciences, China
Lijun Zhang	Institute of Software, Chinese Academy of Sciences, China

ADVISORY BOARD

Chaochen Zhou(Coordinator)	Institute of Software, Chinese Academy of Sciences, China
Jifeng He	East China Normal University, China
Cliff Jones	Newcastle University, UK
Deepak Kapur	University of New Mexico, USA
Wei Li	Beihang University, China

STEERING COMMITTEE

Zhenhua Duan	Xi'dian University, China
Martin Fränze	University of Oldenburg, Germany
Kim Larsen	Aalborg University, Denmark
Xuandong Li	Nanjing University, China
Zhiming Liu	Southwest University, China
Sriram Rajamani	Microsoft Research, India
Ji Wang	NUDT, China
Kwangkeun Yi	Microsoft Research, India
Naijun Zhan (Chair)	Institute of Software, Chinese Academy of Sciences, China

KEYNOTE SPEAKERS

Prof. Edward A. Lee, University of California at Berkeley, USA

Title: Dependable Cyber-Physical Systems

Abstract:

Cyber-physical systems are integrations of computation, communication networks, and physical dynamics. Applications include manufacturing, transportation, energy production and distribution, biomedical, smart buildings, and military systems, to name a few. Increasingly, today, such systems leverage Internet technology, despite a significant mismatch in technical objectives. A major challenge today is to make this technology reliable, predictable, and controllable enough for "important" things, such as safety-critical and mission-critical systems. In this talk, I will analyze how emerging technologies can translate into better models and better engineering methods for this evolving Internet of Important things.

Prof. Sriram Sankaranarayanan, University of Colorado Boulder, USA

Title: From finitely many simulations to flowpipes

Abstract:

Flowpipe construction techniques generalize symbolic execution for continuous-time models by computing future trajectories for sets of inputs and initial states. In doing so, they capture infinitely many behaviors of the underlying system, thus promising exhaustive verification. We examine the progress in this area starting from techniques for linear systems to recent progress in reasoning about nonlinear dynamical systems. We demonstrate how this area of research transforms fundamental results from dynamical systems theory into useful computational techniques for reasoning about cyber-physical systems. This progress has led to increasingly popular tools for verifying cyber-physical systems with applications to important verification problems for medical devices and automotive software. We demonstrate how recent approaches have exploited commonly encountered properties of the underlying continuous models such as monotonicity, incremental stability and structural dependencies to verify properties for larger and more complex systems. Despite this progress, many challenges remain. We present some of the key theoretical and practical challenges that need to be met before flowpipe construction can be a true "technology" for verifying industrialscale systems.

**Prof. Mingsheng Ying, University of Technology Sydney, Australia and
Tsinghua University, China**

Title: Toward Automatic Verification of Quantum Programs

Abstract:

Programming is error-prone. Programming a quantum computer and designing quantum communication protocols are even worse due to the weird nature of quantum systems. Therefore, verification techniques for quantum programs and quantum protocols will be indispensable whence commercial quantum computers and quantum communication systems are available. In the last 10 years, various verification techniques for classical programs including program logics and model-checking have been extended to deal with quantum programs. This talk summarizes several results obtained by the author and his collaborators in this line of research.

PROGRAM

All talks are given in (see Conference venue below)

**Lecture Hall, the 4th Floor, Building 5,
Institute of Software, Chinese Academy of Sciences**

November 8 – Tuesday

14:30–17:00 Registration

November 9 – Wednesday

08:00–17:00 Registration

08:30–09:00 Welcome ceremony (chair: Deepak Kapur)

**09:00–10:10 Invited talk by Prof. Edward A. Lee (chair: Deepak Kapur):
*Dependable Cyber-Physical Systems***

10:10–10:45 Tea break

10:45–12:05 Session: Concurrency (chair: Lijun Zhang)

10:45–11:15 Xiaoju Dong, Yuxi Fu and Daniele Varacca, *Place Bisimulation and Liveness for Open Petri Nets*

11:15–11:45 Qingguo Xu, Robert De Simone and Julien Deantoni, *Divergence Detection for CCSL Specification via Clock Causality Chain*

11:45–12:05 Joost-Pieter Katoen, Hao Wu and Xiaoxiao Yang, *Performance Evaluation on Modern Concurrent Data Structures (short paper)*

12:15–14:00 Lunch

14:00–15:30 Session: Probabilistic systems I (chair: Andrea Turrini)

14:00–14:30 Andrzej Mizera, Jun Pang and Qixia Yuan, *GPU-accelerated Steady-state Computation of Large Probabilistic Boolean Networks*

14:30–15:00 Yuxin Deng, Wenjie Du and Daniel Gebler, *Behavioural Pseudometrics for Nondeterministic Probabilistic Systems*

15:00–15:30 Ernst Moritz Hahn and Arnd Hartmanns, *A Comparison of Time- and Reward-Bounded Probabilistic Model Checking Techniques*

15:30–16:00 Tea break

16:00–17:20 Session: Program verification (chair: Sriram Sankaranarayanan)

16:00–16:30 Tianhai Liu, Shmuel Tyszberowicz, Mihai Herda, Bernhard Beckert, Daniel Grahl and Mana Taghdiri, *Computing Specification-Sensitive Abstractions for Program Verification*

16:30–17:00 Tatsuya Abe, Tomoharu Ugawa, Toshiyuki Maeda and Kousuke Matsumoto, *Reducing State Explosion for Software Model Checking with Relaxed Memory Consistency Models*

17:00–17:20 Ruifang Zhao, Ke Liu, Hongli Yang and Zongyan Qiu, *Identifying XML Schema Constraints Using Temporal Logic (short paper)*

18:00–19:30 Reception

November 10 – Thursday

08:30–11:30 Registration

**09:00–10:10 Invited talk by Prof. Sriram Sankaranarayanan (chair: Naijun Zhan):
*From finitely many simulations to flowpipes***

10:10–10:45 Tea break

- 10:45–11:45 Session: Real-time systems (chair: Sanjoy Baruah)**
- 10:45–11:15 Bingbing Fang, Guoqiang Li, Daniel Sun and Hongming Cai, *Schedulability Analysis of Timed Regular Tasks by Under-Approximation on WCET*
- 11:15–11:45 Kim Guldstrand Larsen, Axel Legay, Marius Mikučionis, Cyrille Jegourel, Danny Bøgsted Poulsen and Sean Sedwards, *Importance Sampling for Stochastic Timed Automata*
- 11:45–13:00 Lunch**
- 13:00–18:00 Excursion**
- 18:30–22:00 Banquet**

November 11 – Friday

- 08:30–17:00 Registration**
- 09:00–10:10 Invited talk by Prof. Mingsheng Ying (chair: Joost-Pieter Katoen)**
Toward Automatic Verification of Quantum Programs
- 10:10–10:45 Tea break**
- 10:45–12:15 Session: Program logic (chair: Xinyu Feng)**
- 10:45–11:15 Zhilin Wu, *Semipositivity in Separation Logic with Two Variables*
- 11:15–11:45 Søren Enevoldsen, Jiri Srba, Kim Guldstrand Larsen and Andreas Dalsgaard, *Distributed Computation of Fixed Points on Dependency Graphs*
- 11:45–12:15 Mikkel Hansen, Kim Guldstrand Larsen, Radu Mardare, Mathias Ruggaard Pedersen and Bingtian Xue, *A Complete Approximation Theory for Weighted Transition Systems*
- 12:15–14:00 Lunch**
- 14:00–15:30 Session: Verification (chair: Fei He)**
- 14:00–14:30 Jacopo Mauro, Gereon Kremer, Erika Abraham, Florian Corzilius and Einar Broch Johnsen, *Zephyrus2: On the Fly Deployment Optimization using SMT and CP Technologies*
- 14:30–15:00 Qiang Wang, *Exploiting Symmetry for Efficient Verification of Infinite-State Component-based Systems*
- 15:00–15:30 Waqar Ahmed and Osman Hasan, *Formalization of Fault Trees in Higher-order Logic: A Deep Embedding Approach*
- 15:30–16:00 Tea break**
- 16:00–17:20 Session: Probabilistic systems II (chair: David Jansen)**
- 16:00–16:30 Yong Li, Wanwei Liu, Andrea Turrini, Ernst Moritz Hahn and Lijun Zhang, *An Efficient Synthesis Algorithm for Parametric Markov Chains against Linear Time Properties*
- 16:30–17:00 Ratul Saha, Madhavan Mukund and Jagadeesh Chandra Bose R P, *Time-bounded Statistical Analysis of Resource-constrained Business Processes with Distributed Probabilistic Systems*
- 17:00–17:20 Debasmitta Lohar, Anudeep Dunaboyina, Dibyendu Das and Soumyajit Dey, *Failure Estimation of Behavioral Specifications (short paper)*
- 17:20–17:30 Closing (chair: Deepak Kapur and Naijun Zhan)**
- 18:30–21:30 PC dinner**

CONFERENCE VENUE: Lecture Hall, the 4th Floor, Building 5, Institute of Software, Chinese Academy of Sciences

ISCAS MAP, with road names in English



ISCAS MAP, with road names in Chinese



LUNCH VENUE: The 2nd Floor, ISCAS Canteen, Building 7

RECEPTION VENUE: The 2nd Floor, ISCAS Canteen, Building 7

EXCURSION AND BANQUET VENUE

Excursion schedule

- **13:00** Meet at the **south gate of ISCAS**
Travel to the **Hehua Market (荷花市场)** by coach
- **13:30** Arrive at the **Hehua Market**, where the excursion starts
Walk around **ShiChaHai (什刹海)** and
Nan Luo Gu Xiang (南锣鼓巷, a.k.a., South Luogu Alley)
- **18:00** Meet at **the north end of Nan Luo Gu Xiang** (the Meeting Point)
10-min Walk to the **restaurant Huajia Yiyuan (花家怡园四合院总店)**
- **22:00** Return to ISCAS by coach

Important notes

1. You may show the following to a taxi driver when you need get to the **ISCAS** on your own.
我要去中国科学院软件研究所，位于中关村东路海淀交通支队附近，地址是中关村南四街4号中国科学院软件园区。
2. You may show the following to a taxi driver when you need get to the **Hehua Market** on your own.
我要去荷花市场，位于什刹海附近，地址是地安门西大街51号。
3. You may show the following to a taxi driver when you need get to **the north end of Nan Luo Gu Xiang** on your own.
我要去鼓楼东大街南锣鼓巷。
4. You may show the following to a taxi driver when you need get to **the restaurant Huajia Yiyuan** on your own.
我要去花家怡园四合院总店，地址是东直门内大街235号。
5. If you need any help, please call **Shuling Wang (+86-18612791263)**.

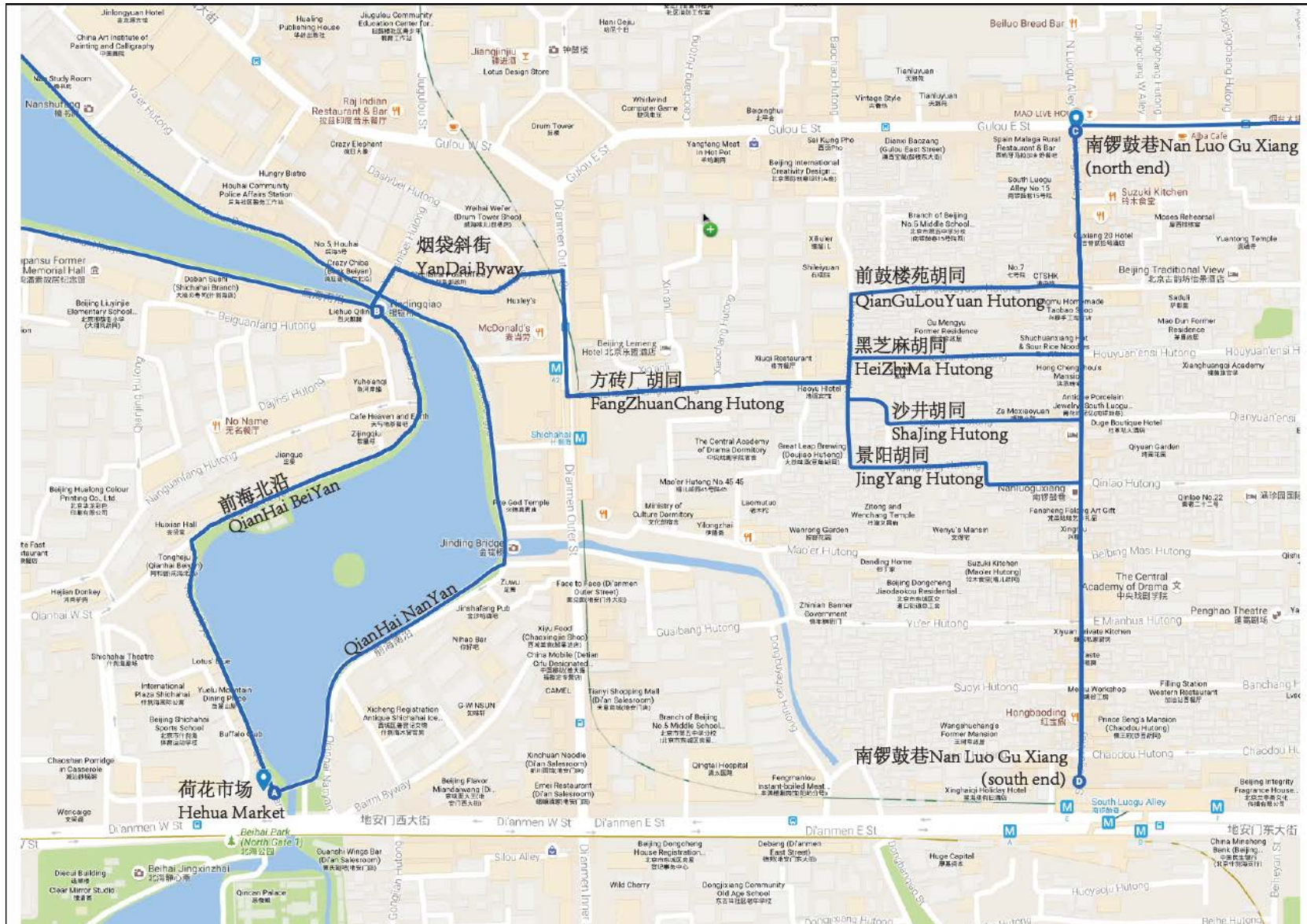
A dedicated link at Google Maps

<https://www.google.com/maps/d/viewer?mid=1eCs--snkaJ9s3VYzfSxQ4LgWsg>

Four maps to guide the excursion, with the following map legend

- A Hehua Market (荷花市场)
- B Yindingqiao (银锭桥) between Qianhai Lake and Houhai Lake, both parts of ShiChaHai (什刹海)
- C north end of Nan Luo Gu Xiang (南锣鼓巷), the Meeting Point
- D south end of Nan Luo Gu Xiang (南锣鼓巷)
- E Huajia Yiyuan (花家怡园四合院总店)

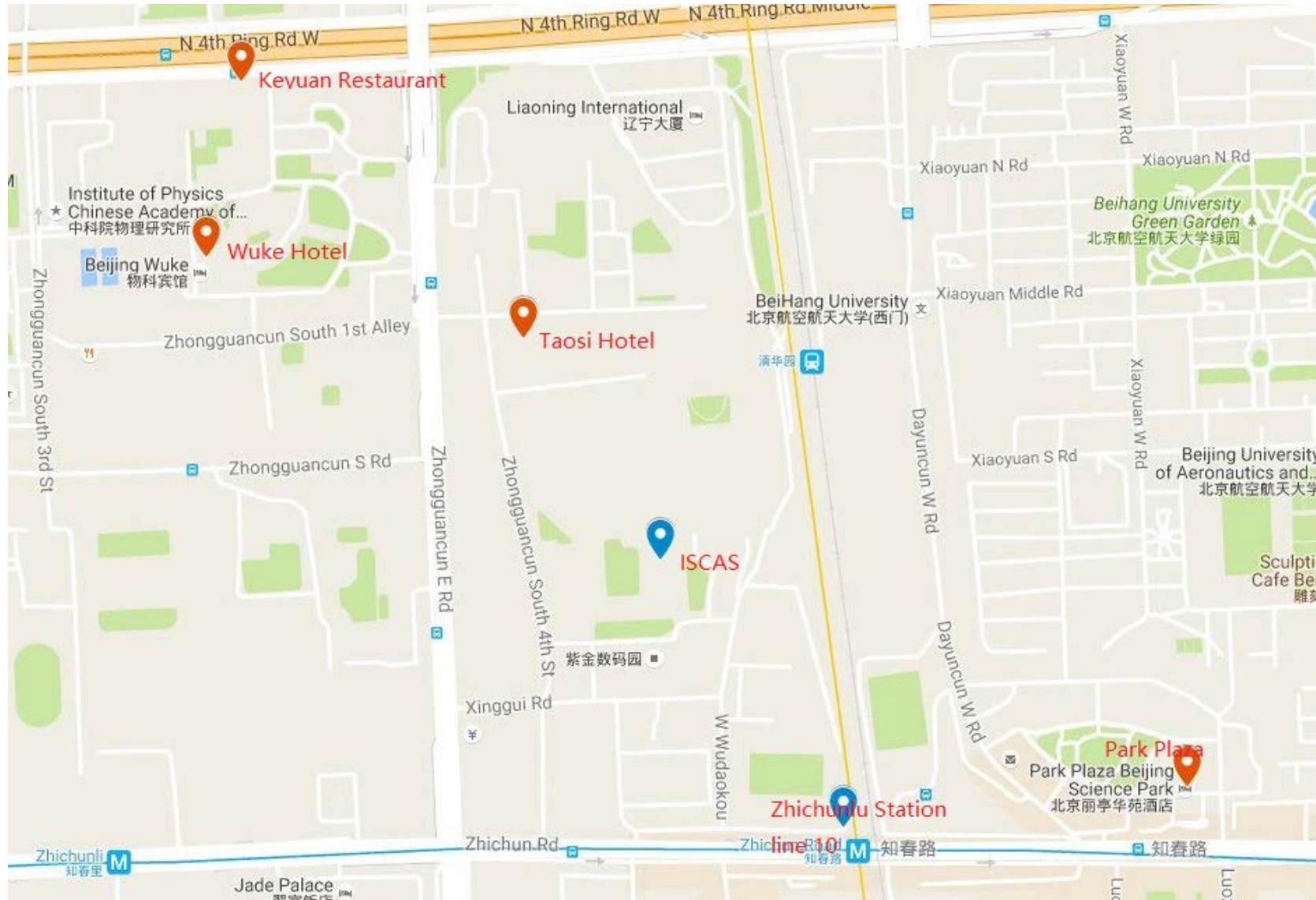
Excursion Overview:



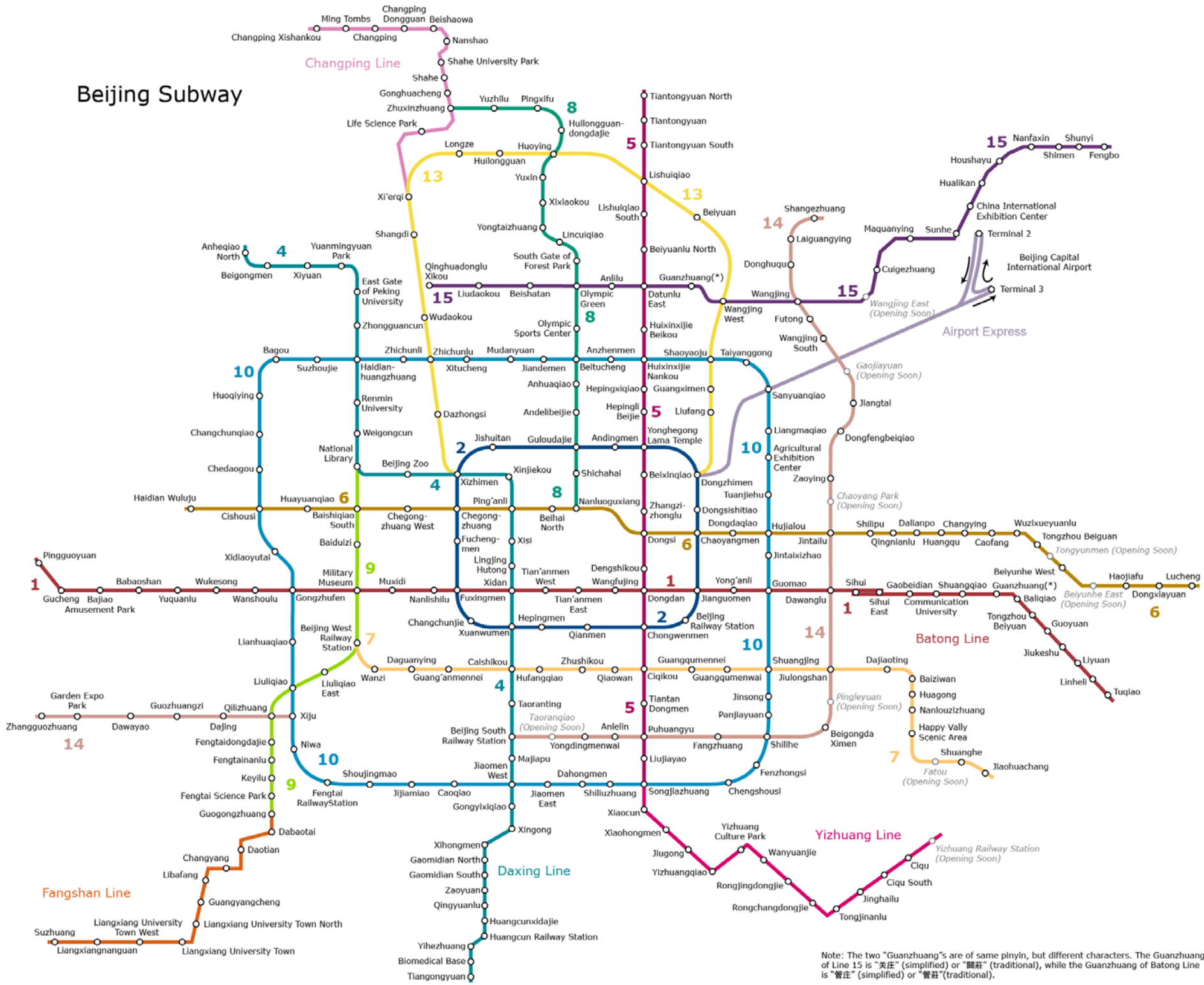
Directions from C (north end of Nan Kuo Gu Xiang, the Meeting Point) to E (Huajia Yiyuan, the banquet restaurant)



MAP OF THE HOTELS



Beijing Subway



Note: The two "Guanzhuang"s are of same pinyin, but different characters. The Guanzhuang of Line 15 is "关庄" (simplified) or "關莊" (traditional), while the Guanzhuang of Batong Line is "管庄" (simplified) or "管莊" (traditional).

TOURIST INFORMATION

Beijing offers several historical and modern places worth of a visit including:

- the **Forbidden City** (now called the Palace Museum),
- the **Tian'anmen square**,
- the **Temple of Heaven**,
- the **Lama Temple**/Yonghegong Lamasery,
- the **Summer Palace**,
- the **Old Summer Palace**/Yuanmingyuan park,
- the **Ming Tombs**,
- the **Beihai park**,
- the **Olympic Park and the Olympic Forest Park**,
- and many, many other places of interest, all of them easily reachable by subway.

The **Great Wall in Badaling or Mutianyu** is also worth of a visit; it can be reached by public transportation such as bus or even train (Badaling only).

For more information, you may visit the **Beijing Tourist Information Center**:
<http://english.visitbeijing.com.cn>