Global Interaction Research Initiative

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Abstract

This paper describes the Global Interaction Research Initiative – GIRI at the IT University. It briefly outlines the overall research challenges, the proposed research strands, proposed application areas, the organization of GIRI, and a status as of the time of writing.

Global Interaction

Information technology is at the very core of modern human activity — technology, business, social life, engineering, production, logistics, health, education, research, democracy, governance, entertainment, etc. Moreover, information technology is the indispensable engine powering the global world. In his analysis of the 'flatteners' of the globe, Thomas L. Friedman[1] argues that globalized trade, outsourcing, supply chaining, and political forces have changed the world permanently for good and bad – and that the 'flatteners' are all tied to the advent of core digital technologies like the Internet, the PC, the web, workflow software, video-conferencing, etc.

By coining the concept of "Global Interaction", this research initiative wants to put focus on two fundamental megatrends of information technology.

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[1] Friedman TL. The World Is Flat: A Brief History Of The Twenty-first Century. Penguin Books 2005.

Global

First, from an application perspective, information technology is core to globalization and global collaborative and social interaction amongst people, organizations, and societies. The word "global" in global interaction emphasize this type of application of information technology. This research initiative takes its outset in this megatrend and wants to create technologies designed for global interaction – technically as well as usabilitywise. For example, by studying the fundamental interactive and communicative processes in globally distributed software engineering we want to create programming and debugging environments, which to a much greater extent foster the tight collaboration and mental commitments from a distributed team of software engineers. Hence, from an application point of view, GIRI wants to study and create technologies that are designed for globally distributed interactive collaborative and social processes.

Interaction

Second, from a computer science perspective, global interaction points toward a new perspective on computer science. The word "interaction" in global interaction emphasizes a novel scientific – theoretical as well as experimental – view on information technology. Theoretically, due to the advancement of computing technology including e.g. multi-core processors, distributed computing, virtualization, grid and cloud computing, and ubiquitous computing, the theoretical model for understanding and creating new technologies need to move from a computational to an interactional perspective. Experimentally, recent research in computer science has been focused on Ubiquitous Computing (UbiComp) and the challenges associated with creating technologies embedded into the fabric of peoples' everyday life². UbiComp is, howev-

er, mainly focused on local interaction in e.g. local sensor networks, software architecture that scale to individuals or small groups, and to locally confined spaces like the so-called "Smart Space" or buildings like a hospital. None of this research scales globally – neither technically nor from an interaction design perspective. Hence, from a scientific point of view there is a need for understanding, designing, running, and programming technologies for global interaction.

Research Challenges

So - what's broken? Well, nothing is really broken. Looking at the current use of information technology for global collaboration, this indeed seems like a tremendous success. Global software engineering, for example, is the globalization of production and services *par excellence*; massive offshoring and outsourcing takes place in the software industry with respect to software programming, testing, maintenance, and services. And many see this model of global software development as an ideal for globalizing other production and service businesses, like accounting, banking, and even healthcare. The core argument in Friedman's book is exactly that information technology is the premise for modern globalization – ranging from the Internet protocols (TCP/IP, HTTP, SMTP, etc.) to higher-level CSCW systems like teleconferencing, workflow systems, and shared project repositories. As such, the global interaction of today builds on the research results of yesterday.

The problem is, however, that if we take a closer look – some would say a more scientific rather than a journalistic look – these global processes pose huge challenges and stress to the technologies, people, and organizations involved. Even in global software engineering – which has all the benefits of dealing with processes, manufacturing tools, and products

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² Marc Weiser, Scientific American 1991.

with are entirely digital – tremendous tension exists. There are numerous examples of failed or troubled projects, and research has tried to analyze what the core challenges and best practices in global software engineering are[3].

These – and many other – examples show that new technologies for global interaction need to be researched in order to continuously support and advance global interaction. Fundamental research into the underlying theoretical models, runtime architectures, programming environments, and user interface technologies need to be initiated in order to create a new technological platform for global interaction. In other words, global interaction of tomorrow relies on research results of today.

Research Strands & Application Areas

The internal organization of GIRI is illustrated in figure 1 and consists of four research strands (rows in figure 1) and a number of application areas (columns). Research projects within GIRI are shown as 'blobs' (#1-#6).

In order to understand, design, and build software systems for global interaction we propose an interdisciplinary portfolio of four research strands. Like the strands of a rope, these four research strands will together form a tightly integrated research agenda towards understanding and building global interaction. The research strands are the following:
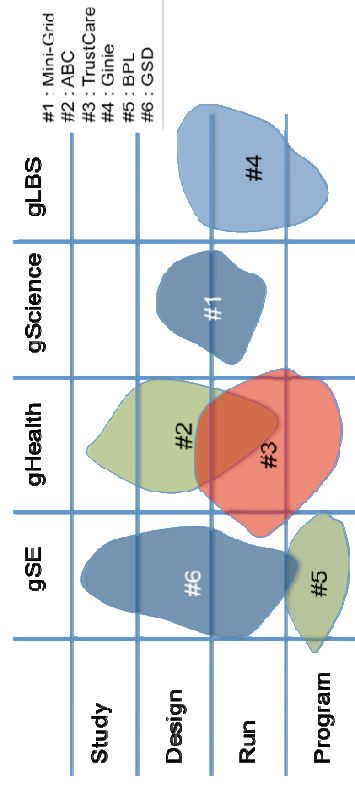
1. Analyzing Global Interaction
2. Design for Global Interaction

[3] For an overview see e.g. J.E. Bardram. Activity-Based Computing Support for Agile and Global Software Engineering, Proceeding of the CSCW 2008 workshop on Supporting Distributed Teams, San Diego, CA, 2008

3. Software Architectures and Platforms for Global Interaction
4. Programming Tools for Global Interaction

Whereas the number of research strands is expected to remain stable, application areas may evolver over the time span of GIRI. The application areas will often be tied to the specific projects that we run; currently we are targeting project within the following areas:

- Global Software Engineering (gSE)
- Global Healthcare (gHealth)
- Global Science (gScience)
- Global Location-Based Systems (gLBS)

	gSE	gHealth	gScience	gLBS
Study				
Design		#2	#1	
Run		#3		#4
Program	#5			

#6 (in gSE across Study/Design)

#1 : Mini-Grid
#2 : ABC
#3 : TrustCare
#4 : Ginie
#5 : BPL
#6 : GSD

figure 1. The GIRI organization of research strands, application areas, and projects.

Research Projects

A research project will typically focus on one application area but will involve several research strands. Hence, projects are of an interdisciplinary nature. We do, however, expect a small

number of projects which are more mono-disciplinary in nature, i.e. focusing on one research question solely. For example, a project focusing on general programming constructs for large distributed and interactive systems.

Organization

GIRI will have the following management structure:

- Research Director, overall responsible
- Research Manager, responsible for a research strand
- Project Manager, responsible for each project

International Partners

The following international partners are being approached for setting up close collaboration.

- Peking University (a formalized funded project has started)
- Georgia Institute of Technology (there are already close collaboration at the individual level)
- Tata & InfoSys
- IMM Bangalore
- India Institute of Technology
- Microsoft Research

Auxiliary Functions

GIRI will organize and use a set of supporting functions, including:

- The PIT laboratory
- IT and research assistants

- PR and Communication support
- Research administration

Funding

In general, GIRI will be funded from different sources. Research grants for specific projects within the GIRI umbrella will be applied at the national and European research agencies, as well as funding for PhD scholarships in general will be applied for. Specifically, we have currently the following research project funded as part of the initiative (numbers refer to figure 1):

- The PC Mini-Grid project (#1)
- The Activity-Based Computing (ABC) project (#2)
- The Trustworthy Healthcare (TrustCare) project (#3)
- The Genie project on location-based services (#4)
- The Bi-graph Programing Language (BPL) project (#5)
- The Global Software Development (GSD) project (#6)

However, since fundraising takes time and may delay initiating the research initiative, there is a need for ensuring some basis funding. This basis funding is for setting up the auxiliary functions, and to initiate research projects by staffing them with PhDs and PostDocs. In many cases, it is important to be able to start a research project once you have the right person(s), and then later look for funding of it. Especially funding for PostDocs seems to be important, since these are not to a large degree funded by research grants. Basis funding is also required in order to match ("medfinansiere") external research funding.

Status

A longer version of this document exists, and is constantly evolving. At the time of writing, most of the positions have been staffed. The research projects listed above have been subsumed under GIRI. PR and communication (incl. web site) is in the making. A set of Key Performance Indicators (KPIs) has been developed. Fundraising for a EU STREP project and the GSD (#6) is in progress. All scientific staff at ITU has been informed about GIRI.