

## **Short description of the proposed bilateral project “Towards a more useful software metric tool”**

Software metrics and software metrics tools are wide research areas and changes in this field may bring important step forward to a success of software projects in general. However, the state of the art in the field shows that there is no wider acceptance of techniques and therefore still no significant improvements. A new software metrics tool with advanced performances would play important role in these improvements.

The main problem in wider application of software metrics techniques and tools lays in limitations and inappropriateness of existing tools, but also in imperfection of contemporary techniques. The most important of them follows:

1. Many techniques and tools are appropriate for only one programming language or one type of programming languages, which is a great limitation if we know that currently most software projects are implemented in more than one programming language.
2. Support of object-oriented metrics is still weak, which is in opposite to wide application of object-oriented approach in software development.
3. Many techniques/tools compute numerical results with no real interpretation of their meanings. These results possess no or low value to practitioners who need suggestion or advice how to improve their project based on metrics' results.
4. The technique/tool should discourage cheating by programmers which is possible if they know the internal characteristics of employed technique/tool. In that case they are spending more time to avoid critical point significant to technique than to reach real quality.
5. Current techniques/tools are not sensitive to the existence of additional code that has no importance to project but is important to support the project (i.e., additional code for testing).
6. Sometimes is not clear which specific software metric have to be applied to accomplish the specific goal. Frequently, the reason for this confusion is the gap between the real quality parameter for software projects and strictly defined mathematical functions of software metrics.

The proposed bilateral project would primarily deal with problems 1 and 2 and means to solve them.

The solution will be based on well-proven techniques known from compiler construction. This will be the basis to deal with the rest of the problems at a later stage.

Construction of a more useful software metrics tool will be done in three relatively independent activities: a) definition of an intermediate representation for (almost) all programming languages, including object-oriented ones; This representation will be based on abstract syntax trees (ASTs) known from compiler construction and annotated with additional data that could help in computation of various software metrics values; b) construction of translators from sources of different programming languages into an intermediate form; c) implementing different software metrics calculations on an intermediate form. By implementing software metrics calculations only on an intermediate form, a all-purpose tool (i.e., independent of the source programming language) will be obtained.

The implementation and testing will start with one procedural and one object-oriented programming language (e.g., Pascal and Java) and with standard software metrics functions (e.g., cyclometric complexity).

## Short biographies of project leaders for the proposed bilateral project: “Towards a more useful software metric tool”

### Prof. dr. Zoran Budimac

Zoran Budimac was born in 1960 in Sombor (Serbia). Got his PhD thesis in 1994., in the field of computer science from the University of Novi Sad, entitled: “A Contribution to a Theory of Functional Programming Languages and to an Implementation of their Processors”. He is a full professor at the Univ. of Novi sad since 2004.

Among other courses he currently teaches also (related to the proposed bilateral project):

- “Advanced topics in software engineering: software metrics” for master students of informatics
- “Software engineering” for bachelor students of informatics.

He was a Head of the project supported by the Ministry of Science (RS) “Development of (intelligent) techniques based on software agents for application in information retrieval and workflow”, project no. 1844, 2002 – 2006. He is now a researcher in the project 144017 entitled “Abstract methods and applications in computer science” (also supported by the Ministry of Science, RS). Besides these two projects he also took part/lead 10 other (mostly international) research/educational projects.

The list of (related) papers:

1. Gordana Rakić, Zoran Budimac, Towards the Better Software Metrics Tool. To appear in Proc. of “PRIM 2009”, Subotica, Serbia.
2. Gordana Rakić, Zoran Budimac, Towards the Better Software Metrics Tool - motivation and the first experiences. 8<sup>th</sup> Workshop “Software Engineering Education and Reverse Engineering”, Durres, Albania, September 8 - 13, 2008, presentation, (<http://www2.informatik.hu-berlin.de/swt/intkoop/daad/durr2008/talks/5%5B7%5DRakic%20metrics.PPT>)
3. Ivanović M., Budimac Z., Putnik Z., Short Comparison of Tasks and Achievements of Different Groups of Students with the Common Software Engineering Course. In Proc. of 2009 International Conference on Software Engineering Theory and Practice (SETP-09), Orlando, Florida, USA, 13-16 July 2009, in print.
4. Budimac, Z., Putnik, Z., Ivanović, M., Bothe, K., Schuetzler, K., Conducting a Joint Course on Software Engineering Based on Students Teamwork, *Informatics in Education* vol. 7(1), 2008, pp.17-30.
5. Bothe, K, Schützlner, K., Budimac, Z., Zdravkova, K., Bojić, D., Stoyanov, S., JCSE - ein länderübergreifendes Multimediaprojekt zur Lehre in der Softwaretechnik, *Softwaretechnik-Trends* vol. 24(2), 2004.

## **Prof. dr. Marjan Heričko**

Marjan Heričko got his PhD thesis in 1998., in the field of computer science from the University of Maribor. He is a full professor at the Univ. of Maribor since 2008.

Among other courses he currently teaches also (related to the proposed bilateral project):

- IS architectures and Patterns
- Component-Based Development in Java
- Production Information Systems
- Information Processing Organization

He has been a project or work co-ordinator in several applied projects for industrial partners, e.g. IZUM, Iskratel, Infonet, RRC Računalniške storitve, RC IRC Celje, Telekom Slovenije, Mobitel, Hermes SoftLab, Nova KBM, Zavarovalnica Maribor, Energy Agency of the Republic Slovenia, BuyITC, such as:

- Conceptual Design of an e-business System Based on ebXML
- Reference Model for Further Integration of e-business into the Juridical System
- Design and Implementation of Datawarehouse and Electronic Data Exchange
- Technological Reengineering of the COBISS System
- Electronic Fee Collection for Flee-Flow Traffic
- Business Documents Management and Archival System
- Transition to Object-Technology and Component-Based Development

and in several International projects

- BI-HU/06-07-011 Application of OO Metrics to Estimate .NET Project Software Size
- BI-AT/07-08-001 The Use of Advanced Tools for Knowledge Management in Small and Medium Enterprises
- Joint Slovenian-Russian project SMIF - Software Metrics Integration Framework

The list of (related) papers:

1. HERIČKO, Marjan, ŽIVKOVIČ, Aleš., The size and effort estimates in iterative development, *Information and Software Technology*, June 2008, vol. 50, iss. 7-8, pp. 772-781
2. HERIČKO, Marjan, ŽIVKOVIČ, Aleš, ROZMAN, Ivan. An approach to optimizing software development team size. *Inf. process. lett.*, Oct. 2008, vol. 108, iss. 3, pp. 101-106.
3. HERIČKO, Marjan, ROZMAN, Ivan, ŽIVKOVIČ, Aleš. A formal representation of functional size measurement methods. *J. syst. softw.* [Print ed.], 2006, vol. 79, iss. 9, pp. 1341-1358.
4. HERIČKO, Marjan, BELOGLAVEC, Simon. A composite design-pattern identification technique. *Informatica (Ljublj.)*, 2005, vol. 29, pp. 469-476.
5. ROZMAN, Ivan, JURICH, Matjaž B., GOLOB, Izidor, HERIČKO, Marjan. Qualitative and quantitative analysis and comparison of Java distributed architectures. *Softw. pract. exp.*, 2006, let. 36, iss. 14, pp. 1543-1562.

## **Members of the project**

### **University of Novi Sad, Serbia**

1. Zoran Budimac, professor
2. Zoran Putnik, teaching assistant, PhD student
3. Gordana Rakić, teaching assistant, PhD student
4. Živana Komlenov, teaching assistant, PhD student
5. Ivan Pribela, teaching assistant, master student

### **University of Maribor, Slovenia**

1. Marjan Heričko, professor
2. Aleš Živković, assistant professor
3. Tatjana Welzer-Družovec, professor
4. Luka Pavlič, PhD student
5. Andrej Krajnc, PhD student
6. Čit Gerlec, PhD student