

# Statement of Research Interests

Mikoláš Janota

## 1 Background

When I was in secondary school I was developing programs for the Department of Semiconductor Physics at Charles University, later I worked as a programmer for a company producing electronic display systems<sup>1</sup>. During my studies at university I have been working for a company producing HW and SW for computer maintenance systems<sup>2</sup>; in this firm I had the opportunity to lead a four-member group to develop a larger software system.

I have always been interested in mathematics. I was the fifth in Prague in a mathematical contest in the second year of secondary school<sup>3</sup>. I have always been attracted by combining mathematics and programming. In the first and second year at university I developed two programs for simplifying algebraic expressions. In the hindsight this was one of the nicest work I've done so far. I find automated reasoning quite fascinating.

In a seminar on multi-agent systems (MAS) at our university we formed a small group that investigated application of MAS on establishing a schedule of lectures<sup>4</sup>. I have implemented a prototype system in the language 3APL<sup>5</sup>.

In 2003 I attended the Formal Approaches to Multi-Agent Systems (FAMAS 2003) conference<sup>6</sup>. Particularly I found interesting the presentation “A Framework for the Formal Analysis of Multi-Agent Systems” which was my first encounter with the application of automated theorem proving in software verification.

Therefore, since 2003 I've been trying to learn more about the field. In my Master's Thesis<sup>7</sup> I investigated nowadays approaches to software verifica-

---

<sup>1</sup>See <http://www.gema.cz>

<sup>2</sup>See <http://www.cmms.cz>

<sup>3</sup>See <http://home.pf.jcu.cz/~mo/>

<sup>4</sup>It was inspired by a real situation at our university. Each student can sign-up for as many classes as he wants. The schedule of smaller lectures is a result of “negotiations” between the lecturers and students.

<sup>5</sup>For the language 3APL see <http://www.cs.uu.nl/3apl/>.

<sup>6</sup>Which was part of ETAPS 2003.

<sup>7</sup>See <http://www.ms.mff.cuni.cz/~janom9am/BIG/diplomka.pdf>

tion, namely Hoare-style annotations and predicate abstraction. By running examples on different tools I tried to demonstrate their pros and cons. The Thesis was closed by some of my personal suggestions concerning the specification languages and tool support.

## 2 Current Research Interests

I am interested in making specification languages (like JML) and verification tools (like ESCJava) more suitable for real-world applications. Particularly, I am interested in:

- Design of specification languages. Making them more suitable for application.
- Building a library of annotated programs. Such a library could serve as a benchmark for verification tools (similarly as TPTP<sup>8</sup> for automated theorem provers).
- Automated theorem proving. Particularly combining resolution-based automated theorem provers with decision procedures.

## 3 Motivation for Postgraduate Degree in Computer Science

The experiences with professional application development made me very much interested in techniques and methods that make the development more efficient and less error prone. I feel there is a lack of formal methods employed in software development. I strongly believe, that the methodologies of software development do not exploit the full potential of formal methods. Therefore I believe that the research in formal methods is useful and needed. I would like to extend my knowledge of formal methods. I find being part of the research very much personally rewarding.

---

<sup>8</sup>See <http://www.cs.miami.edu/~tptp/>.