Software Test Program: A Software Residency Experience
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ABSTRACT
The Software Test Program (STP) is a cooperation between Motorola and the Center for Informatics of the Federal University of Pernambuco. It has been conceived with inspiration on the Medical Residency, adjusted to the software development practice. A Software Residency includes the formal teaching of the relevant concepts and deep practice, with specialization on some specific subject; here the focus is on software testing. The STP has been of great benefit to all parties involved.

Categories and Subject Descriptors
K.3.2 [Computers and Education]: Computer and Information Science Education – computer science education, curriculum, information systems education

General Terms
Experimentation, Human Factors, Economics

Keywords
Training Experience, Software Engineering, Software Residency.

1. INTRODUCTION
Nowadays there are many models for software development and educational processes. Unfortunately, existing software development methodologies are not strongly linked to academia. As an alternative to reduce this gap we have proposed and experimented a Software Residency Model, which is based on the philosophy of Medical Residency, adjusted to the software development practice. The Center for Informatics (CIn) of the Federal University of Pernambuco (UFPE) and Motorola have been adopting an instance of this model known as the Software Test Program, aiming at educating professionals highly specialized in software testing. This area was chosen due to the importance of testing in the software development process [2], and further because software testing does not seem to be covered in enough detail in most undergraduate curricula in Brazilian universities.

This article is organized as follows. Section 2 provides an overview of the Software Residency model, while Section 3 describes the STP experience. Section 4 concludes the paper discussing achievements obtained with this innovative model.

2. A SOFTWARE RESIDENCY MODEL
As in the medical context, a Software Residency includes the formal teaching of the relevant concepts (role expected to be played by a teaching center, typically a university) and deep practice, with specialization on some specific subject. The practical background is expected to be acquired in the software industry (similar to hospitals in a Medical Residency).

The resident cycle is summarized in Figure 1.

![Figure 1: The Residency Cycle](image)

Final year undergraduate students (or professionals with a university degree) in Computer Science or Engineering can apply to the program and undergo a selection process based on their curriculum and university records.

After this selection, the residents engage simultaneously on formal and practical training. Throughout the entire residency period the residents also get involved with the elaboration of a monograph. Typically, a monograph is a 40 to 80 page technical report describing, for instance, the design or implementation of a tool, some test activity or standard with a significant contribution to the program itself, to the academy or to the industry in general.

The formal training consists of a series of courses relevant to the residency focus; simultaneous to hands-on training, which includes practical activities on a real working environment.

The residency period can vary from 6 to 12 months. During all the time the residents are continuously supervised and assessed. At the end, the monographs are evaluated through a formal workshop and the residents are ready for several professional opportunities.

3. THE SOFTWARE TEST PROGRAM
The Software Test Program (STP) is a pioneer program to implement a Software Residency model; in Brazil it is definitely

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an original initiative. It has gained considerable attention from government agencies, such as the Brazilian Ministry for Science and Technology, due to the evident benefits for all the parties involved: universities, industry and residents. It has also generated increasing interest from the residents: the STP has received applications from most states in Brazil.

In the STP program, CIn-UFPE is responsible for the formal teaching (including resident supervision), and Motorola provides the necessary industrial environment. The residents first attend several courses which give them general background on Software Engineering [1], and in particular in a software development process. They start with an overview of the RUP [3] and then each course explores one discipline in detail: project management, requirement analysis, analysis and design, implementation (object orientation with Java), software testing, and configuration management. The testing courses include an introductory course covering the general concepts about the test process. Then the process is detailed, describing when and how the test artifacts are created as well as who is responsible for them. The focus of the course is on planning the test activities and designing test cases based on software requirements.

As part of this general background on Software Engineering, the STP also includes a course on software quality. In this course the main concepts, regarding both product and process, are presented. Some ISO models (9001, 12207 and 15504) are covered, but the course focuses on CMM and CMMI (continuous and staged) [4].

Following this general background on Software Engineering, the residents attend more advanced courses on software testing. The first course is on Test Automation, whose concepts are illustrated through the use of some test tools (free and commercial). The residents also attend a course on Test Design for Embedded Applications using J2ME. In this course they synthesize the knowledge acquired from the previous test courses, and learn how to plan, design, implement, execute and analyze test cases for J2ME applications. They also prepare test cases based on a Motorola certification for J2ME (http://qpsqa.com/motorola).

During the residency period, the residents further attend courses on specific Motorola tools and processes.

4. CONCLUSION
Our experience so far (after training three teams of residents) is that the residency model is very promising, with significant achievements: to CIn-UFPE, to Motorola, to the Brazilian government, and to the residents. As a federal university, CIn-UFPE has been playing its expected social role of educating human resources who can (not only after the degree, but during it) act in industry. The proximity with the industry also provides important feedback for the research at CIn-UFPE, now partially funded by Motorola through MSc and PhD scholarships (complementarily to the STP). The university provides a special degree certificate, of complementary studies, for students who conclude the STP.

Motorola has benefitted from the collaboration of highly qualified residents in software testing; the amount of test execution and automation carried out so far is significant. Research achievements should also contribute to the Motorola testing process. Concerning costs, the residency model also proves very attractive. The cost per head count equivalent (two residents as one head count) in STP is around half the market cost.

Furthermore, the program is run with government incentives, which makes it even more attractive. Despite the investment through incentives, the operational cost to the government is very low, contrasting with the social impact of such a program; this is clearly a benefit to the government itself.

The residents acquire a specialized background on a subject with great demand and scarce human resources. Each resident receives a scholarship, during the entire residency period, whose amount is comparable to that received by government funded PhD students. Further, every single resident that concluded the STP is now engaged in a professional activity in the Software Engineering area, or in more advanced studies at the MSc or at the PhD level.

In summary, after running the program for 20 months, 58 software test engineers were formed: 39 former residents are now working in IT companies, and 21 are pursuing MSc or PhD degrees (some are both working and studying). Currently, the STP is running with two resident teams in parallel, with 54 students in total.

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6. REFERENCES