My Natural Programming Project is working on making programming languages and environments easier to learn, more effective, and less error prone. We are taking a human-centered approach, by first studying how people perform their tasks, and then designing languages and environments that take into account people’s natural tendencies. We are designing new programming languages for people who are not professional programmers (sometimes called “end-user programmers”) based on how people think about expressing algorithms and tasks. We also are working on improving programming environments and libraries for professional programmers. For example, by studying programmers working on every-day bugs, we found that they continuously are asking “Why” and “Why Not” questions, so we developed the “Whyline” debugging tool which allows programmers to directly ask these questions of their programs and get a visualization of the answers. The WhyLine increases productivity by about a factor of two. When reverse-engineering unfamiliar code, we saw that programmers frequently need to trace feasible execution paths, so we developed a new visualization tool to directly present this information. We studied the usability of APIs, such as the Java SDK and the SAP eSOA APIs, and discovered some common patterns that make programmers up to 10 times slower in finding and using the appropriate methods, so we developed new tools to compensate. This talk will provide an overview of our studies and resulting designs and tools, which benefit from applying both Software Engineering and Human-Computer Interaction approaches.

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