Dig’s COPE Funded by NSF

NSF awarded Professor Danny Dig a four-year research grant titled "SHF: Large: Collaborative Research: Science and Tools for Software Evolution." The work is in collaboration with fellow Illinois CS Professors Ralph Johnson, Brian Bailey, and Darko Marinov, as well as Professor Don Batory of the University of Texas at Austin.

With this $2.2 million grant, Dig and his colleagues plan to develop a new change-oriented programming environment (COPE). COPE will address a fundamental problem in how large software is developed.

Beginning with empirical studies, the researchers are investigating the current vocabulary that programmers use to communicate change. They are interviewing industry programmers to get a sense of common changes that are tedious, repetitive, and error-prone.

These studies will be used to develop new tools that help programmers write, customize, and automate changes that they make frequently in their code. Additionally, COPE tools will allow programmers to manipulate, compose, and use changes that have been previously scripted and automated.

“We are poised to completely revolutionize the way software developers do software development,” says Dig.

COPE will integrate with version control systems to better support software evolution. Such integration will enable programmers to understand changes at higher levels of abstraction.

“Once we build up the high levels of COPE,” says Dig, “we will be able to represent the whole evolution of history in terms of these high-level changes.”

The researchers will disseminate their results through presentations, books, publications, open-source code, industrial collaborations, and educational activities. A version of COPE will be used to revamp the software engineering curriculum at the University of Illinois and the University of Texas.

Professor Roth Awarded a DARPA DEFT Grant

Professor Dan Roth received a grant of $2.5 million from DARPA’s Deep Exploration and Filtering of Text (DEFT) program. By building on existing natural language processing technologies, the researchers aim to build a semantic inference engine that goes deeper than a mere keyword search.

Google, a keyword search engine, can access information if you know the word in the text. But a keyword search engine doesn’t possess ambiguity and variability.
Roth’s team wants to go deeper and actually understand what is being expressed in the text. To achieve this, the inference engine will incorporate co-referencing. For example, “Barack Obama,” “President of the US,” “commander in chief,” are all the same thing. They co-refer. Every time one of those phrases occurs in a document, it is talking about the same entity.

Intelligence analysts have a vast number of documents to research, but they need to answer a specific question. For example, “Did China buy arms from Vendor A?” Analysts want to be able to send that query and have related documents returned. But in a keyword search for “China,” “arms,” and “sale,” many returned documents will not be relevant.

Additionally, analysts are interested in smart filtering, an additional layer on top of the initial keyword search, which can throw out all the places where “arms” and “sale” just happen to match.

The current state of the art can be seen in a tool the researchers developed called Wikifier. An analyst can feed any text into Wikifier, which looks for text containing important concepts and entities, and links those bits of text to the appropriate entries in Wikipedia. This tool represents the first step in their 4.5-year project.

For a demo of Wikifier, see: http://cogcomp.cs.illinois.edu/page/demo_view/Wikifier

Radu Teodorescu (PhD CS ’08) of Ohio State University. Together they will investigate an integrated approach to boost energy efficiency by mitigating and tolerating parameter variations at near threshold voltage (NTV), a region where supply voltage is only slightly higher than threshold voltage.

Lowering a chip’s supply voltage will significantly increase power efficiency, but requires addressing the challenges of lower frequencies and parameter variations—deviations of process, voltage, and temperature values from nominal specifications.*

The researchers’ advancements will provide for technologies beyond the military ones. In the first year alone, at Illinois, Torrellas intends to develop a novel variation-tolerant architecture of a highly power-efficient clustered many-core chip. Intel Corporation intends to use the researchers’ new models and architectures when it is beneficial.

Torrellas calls this project “practical” and says that students who work on it are “exposed to very practical matters.” “Many of them interact with companies such as Intel, AMD and IBM. So it is a great experience for them.”

Torrellas Receives a PERFECT Grant to Improve Power Efficiency

Professor Josep Torrellas leads a project that has received a $2.8 million grant from DARPA to explore ways to improve power efficiency in embedded computer systems. Funded under DARPA’s Power Efficiency Revolution For Embedded Computing Technologies (PERFECT) program, the 5.5-year, 3-phase project seeks to increase efficiency from the current 5 GFLOPS/w to the program’s targeted 75 GFLOPS/w.

Energy efficiency gains would provide longer battery life, lower operating costs, and higher clock speeds without having to use a sophisticated cooling system. Greater power efficiency would mean that more devices or computations could be run simultaneously in situations where the peak available electrical power is capped.

Torrellas’ project, “Parameter Variation at Near Threshold Voltage: The Power Efficiency Versus Resilience Tradeoff,” includes team members Nam Sung Kim of the University of Wisconsin and