NAIST® Research Highlights

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NAIST researchers have found a new way to increase the cost-effectiveness of software testing by incorporating fault prediction.

Software engineering

Acceptance testing accelerated

Simulation approach helps optimize the cost-effectiveness of software testing

Quality assurance is crucial in software development: as programs become more complicated and increasingly integrated, it is essential to identify modules where faults are likely to occur. One way of doing this is 'acceptance testing', where developers check the software performs in accordance with the needs of the end user.

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Akito Monden and colleagues at NAIST have collaborated with industry to develop a simulation approach to assess the cost-effectiveness of fault prediction in acceptance testing. The result is both academically stimulating and provides tangible benefits to software developers[1]. The idea for this work arose from an initial discussion between Monden and researchers from the Nippon Telegraph and Telephone West (NTT West) corporation about potential areas of collaboration. "I introduced them to several of our ongoing research topics, when they expressed interest in using the fault prediction technique in acceptance testing," Monden recalls. "Assessing the cost-effectiveness of this approach was, of course, a priority for them — it was then that I got the idea to incorporate a simulation approach."

In software engineering research, it was unprecedented to apply a simulation approach to optimize the cost-effectiveness of software testing using fault prediction results. Monden notes that the overwhelming majority of fault prediction research is focused on improving the fault prediction *accuracy*. While this is academically challenging, it is not a priority for industry practitioners. In contrast, the NAIST research team's work "exactly targets industry as it focuses on the reduction of 'cost' — or effort — of acceptance testing, which is the main interest of practitioners."

The simulation assessed resource allocation strategies for acceptance testing based on fault prediction results. Using data from NTT West as a test case, they found that the best strategy was to let the 'test effort' (or cost) be proportional to the number of expected faults in a module, multiplied by the common logarithm of the module size. By using this strategy, they found that the test effort could be reduced by an impressive 25 per cent.

This work is a success story for academic-industry collaboration, proving that addressing industrial priorities and probing areas of academic interest are not mutually exclusive pursuits. Monden explains that the collaboration with NTT West "acted as a bridge to transfer research findings, such as fault predictions, to address industry priorities, such as reduction of testing efforts." The team's next step is to test the technique on larger software systems.

Reference

1. Monden, A., Hayashi, T., Shinoda, S., Shirai, K., Yoshida, J., & Barker, M. Assessing the cost effectiveness of fault prediction in acceptance testing. *IEEE Transactions on Software Engineering*, **39**, 1345-1357 (2013).

More information about the group's research can be found at the Software Engineering webpage:
http://se-naist.jp/