The Wolfe Pack
The Nero Wolfe Literary Society

Archie's Corner
ARCHIE SOFTWARE?

ERROR LOCALIZATION TOOL FOR SOFTWARE TESTING NAMED AFTER ARCHIE

From our roving reporter, Bettina Silber

The following are excerpts from a very long technical thing I just came across.

The URL http://danroy.org/papers/MIT-LCS-TR-927.pdf (last updated 30-Jan-2011) may "redirect." If it does not work, try typing it manually -- for those interested in the whole long technical thing.

It's "our" Archie, all right – scroll down to the bottom of the online page -– and won't his mother be pleased.

SCROLL DOWN TO READ THE SALIENT POINTS OF ARCHIE'S SOFTWARE.

Efficient Specification Assisted Error Localization and Correction

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ABSTRACT

We present a new error localization tool, **Archie**, that accepts a specification of key data structure consistency constraints, then generates an algorithm that checks if the data structures satisfy the constraints. We also present a set of specification analyses and optimizations that (for our benchmark software system) improve the performance of the generated checking algorithm by over a factor of 3,900 as compared with the initial interpreted implementation, enabling **Archie** to efficiently support interactive debugging. We evaluate **Archie**'s effectiveness by observing the actions of two developer populations (one using **Archie**, the other using standard error localization techniques) as they attempted to localize and correct three errors in a benchmark software system. With **Archie**, the developers were able to localize each error in less than 10 minutes and correct each error in (usually much) less than 20 minutes. Without **Archie**, the developers were, with one exception, unable to locate each error after more than an hour of effort. These results illustrate **Archie**'s potential to substantially improve current error localization and correction techniques.

1. INTRODUCTION

Error localization is a key prerequisite for eliminating programming errors in software systems and, in many cases, the primary obstacle to correcting the error — the fix is often obvious once the developer locates the code responsible for the error. The primary issue in error localization is minimizing the distance between the error and its manifestation as observably incorrect behavior. The greater this distance, the longer the program executes in an incorrect state and the harder it can become to trace the manifestation back to the original error. This issue can become especially problematic for data structure corruption errors — these errors often propagate from the original corrupted data structure to manifest themselves in distant code that manipulates other derived data structures, obscuring the original source of the error. This paper presents a new error localization tool, **Archie***, describes the optimizations required to make **Archie** efficient enough for practical use, and discusses the results of a case study we performed to evaluate its effectiveness in helping developers to localize and correct errors. Our results indicate that, after optimization, **Archie** executes efficiently enough for interactive use on our benchmark software system and that it can dramatically improve the ability of developers to localize and correct errors in this system. These results illustrate **Archie**'s potential to substantially improve current error localization and correction techniques.

*** Archie is named after Archie Goodwin, the assistant to Rex Stout's fictional detective Nero Wolfe. The basic idea is that, under Wolfe's direction, Archie does all the work required to localize the crime to a specific suspect, then Wolfe uses his superior intelligence to solve the crime.**