

# A Type-Directed Approach to Program Repair

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**Abstract.** Developing enterprise software often requires composing several libraries together with a large body of in-house code. Large APIs introduce a steep learning curve for new developers as a result of their complex object-oriented underpinnings. While the written code in general reflects a programmer’s intent, due to evolutions in an API, code can often become ill-typed, yet still syntactically-correct. Such code fragments will no longer compile, and will need to be updated. While compiler error messages provide helpful information to the programmer regarding the location of such errors, they provide little in the way of suggesting corrections to those errors. We describe an algorithm suitable for integration into a compiler that automatically repairs code expressions based on the provided almost correct code. These suggestions would then be presented to the programmer. Using a novel graph-theoretic approach, we efficiently solve instances of this repair problem to synthesize a correct expression from the salvageable parts of a broken one.

## 1 Introduction

## 2 Motivating Examples