Clone Detection Using Abstract Syntax Trees

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Abstract—Clones are the piece of Software, which is creating from the copy of the original software. To be more specific, the idea behind software cloning is to create a new software that replicates the aspect and usefulness of the original software in possible. It is important to understand that cloning does not have to involve any source code in the original software. Software Cloning typically occurs in the source code for the original software is not available. In a result, software cloning does not imply source code copying. Since software cloning goes way beyond simply executing a similar user interface. The goal in cloning is to create a new software program that mimics everything the original software does and the way in which it does.

Keywords- Code clone, Syntactic method, Clone detect, Clone removal, Abstract Syntax Trees(AST)

I. INTRODUCTION

Code duplication falls in the development of large software systems. The improvised form of replication consists in copying, and eventually modifying, a block of existing code that apply a piece of required functionality. Duplication segments are called clones and proceed of copying by slight modifications is also called cloning. Code cloning or copying code fragments and making minor, non–functional alterations, is identified for developing software systems dominant to duplicated code segments or code clones. using the copy and– paste attributes than writing instructions from scrape or applying correct replicating mechanisms, based on invocation or inclusion [4]. Code cloning occurs for other variety of reasons: the short term cost of forming the proper abstractions may be heavier the cost of replicating code and takes place when the developer is alert to the extant of code performs the functionality similar to, or the same as, the functionality required [1].

II. CLONE ANALYSIS

Clone Detection is an advanced analysis engine that quickly detects duplicate patterns within code and allows you to find code clones and difficult-to-detect copy-paste bugs.

A. TOKEN BASED VS AST

The analysis based token-suffix trees provides assorted advantages than other techniques. It measures well due to linear complexity in both time and space, which makes it very attractive for large systems. Moreover, no parsing is necessary and, hence, the code may be even incomplete and incorrect order of the code. Another advantage for a tool builder is that a token-based clone detector can be adjusted to a new language in very short time. As opposed to text-based techniques, this token-based analysis is independent of layout ( parameters are not quite true for Baker’s technique, which is line based; however, if one uses the original string based technique, line splitting do not have any effect). Token-based analysis are more authentic than metrics that concludes abstractions of a piece of code. since, the level of thickness is typically whole functions rather than individual statements.

For instance, the two program snippets left and right in Listing 1 are considered a clone by a token-based analysis because their token sequence is identical: return id ; } int id ( ) { int id; Although from a lexical point of view, these are in fact rightful clones, a maintenance programmer would hardly consider this finding useful [2].

The Listing 1 as follows

```
return result; return x; }
}
int foo() { int bar() { int y; int a;
```

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B. **SYNTACTIC ANALYSIS:**

Syntactic clones can be found to some extent by token based techniques if the candidate sequences are split in a post processing step into ranges where opening and their corresponding closing tokens are completely implemented in a sequence. For example, by counting matching opening and closing brackets, we could exclude many spurious clones such as the one in Listing. programming languages have many types of establishing tokens after brackets. If, then, else, and end if, constitutes syntax delimiters in Ada. In particular, end if is an interesting example as two continuous tokens form one delimiter and both individual delimiters in syntactic contexts. If one wants to handle these delimiters reliably, one is about to start imitating a parser by a lexer.

### III. CLONE DETECT PROCESS USING AST's

As a first step in the clone detection process, the source code is parsed and an AST is produced. Three main algorithms are applied to find clones. The basis of the first algorithm is the Basic algorithm to detect sub-tree clones. The second one is sequence detection algorithm which concerned with the detection of variable-size sequences of sub-tree clones. It is also used essentially to detect statement and declaration sequence clones. The third algorithm focus in more complex near-miss clones by seeking to generalize other clones. The resulting detected clones can then be pretty printed.

### IV. CLONE REMOVAL

![General Structure of the Code Clone Removal Process](image)

Code clone removal is two-staged. In the first stage, a detailed analysis of detection of code clones is performed using the abstract syntax tree. This clone detection presents simple and practical methods for finding exact and near miss clones over arbitrary program segments in source code by using abstract syntax trees. In the second stage, we focus on how the results of stage one can be presented in order to guide an interactive refactoring/clone removal process.

### V. CONCLUSION:

The clone detection method is implemented using abstract syntax trees (ASTs), which for finding exact and near miss clones for arbitrary fragments in the source code. Since detection done in the program structure. clones can be factored in the source using standard transformational methods.

The approach is based on variations of methods for compiler common sub expression elimination using hashing. The method is straightforward to implement using standard
parsing technology which detects clones in arbitrary language. It also constructs and computes macros that removes the clones without affecting the operation of the program.

REFERENCES


Authors Profile

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