RELEASE 3 DOCUMENTATION

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ABSTRACT

As a part of Software Engineering Lab ,we extended 2 open source projects and added functionalities to both of them and further developed new metrics for computing relevant output code snippets.
We extended open source projects like FaCoY and nlp2code which helps the programmers to get **relevant code snippets in Java language** and made an Eclipse plugin combining the functionality of both the tools and added some new features to them as part of SE tool.

WORK DONE

1. RELEASE 1

- Extended open source project FaCoY, a project for statically finding code fragments which may be semantically similar to user input code. FaCoY implements a query alternation strategy: instead of directly matching code query tokens with code in the search space, FaCoY first attempts to identify other tokens which may also be relevant in implementing the functional behavior of the input code.
  FaCoY is more effective than online code-to-code search engines; (2) FaCoY can detect More semantic code clones (i.e., Type-4) in BigCloneBench than the state-of-the-art; (3) FaCoY, while static, can detect code fragments which are indeed similar with respect to runtime execution behavior; and (4) FaCoY can be useful in code/patch recommendation.
- We developed an eclipse extension for the tool as part of release 1 which was not available before so that user can directly use Facoy functionality from code editor itself without going to browser and searching about it.

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2. RELEASE 2

- After release 1 we realised that although FacoY may help user to get similar code snippets which are relevant to him, what about people who don't know how to code but have the idea in mind. Can we do something about it. Then we stumbled upon nlp2code as a potential option to add to our plugin.
- Developers increasingly take to the Internet for code snippets to integrate into their programs. To save developers the time required to switch from their development environments to a web browser in the quest for a suitable code snippet we integrated NLP2Code, a content assist for code snippets. Unlike related tools, NLP2Code integrates directly into the source code editor and provides developers with a content assist feature to close the vocabulary gap between developers' needs and code snippet meta data.
- With the help of nlp2code we managed to provide a set of new features on top of FaCoy through our eclipse plugin. Now the user could search the code snippet in natural language query as well as search for similar code snippets related to his code directly from the editor.

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3. RELEASE 3

- Now after release 2 we realised that our UI was clumsy and further we can improve the code results we get by introducing some metric which gives the similarity of code snippets with respect to structural similarity of our input code.
- Therefore we improved the UI By using Eclipse Dialog Box and using HTML content by overriding its member functions to suit to our needs which was very tough to do as there were hardly any resources on the internet regarding the syntax of the same. So after improving the UI and making it look clean and simple we started working on some kind of similarity metric which gives similarity between 2 code snippets.
- Finally we added our metric to calculate similarity between code snippets on top of Facoy semantic similarity to give user most relevant code with respect to his code
- We also gave user options to cycle through available code based on his preference.
- Gave shortcuts to provoke extension quickly.
- Added buttons in menu bar to provoke the extension quickly additionally to giving user to search for similar code in Java by adding (?) at the end of his natural language query.

FINAL TOOL FEATURES

- Eclipse plugin for Facoy and nlp2code.
- Modified the eclipse plugin to handle natural language queries as well as code snippets.
- Given shortcuts to provoke extension quickly.
- Gave user options to cycle through available code based on his preference.
- Nice and clean UI.
- Added buttons in menu bar to launch extension quickly.
- Structural Similarity metric to compare code similarity between input and retrieved code snippets for relevant code snippets.
- A complete Eclipse plugin which provide convenience to users to search code from code editor itself thus saving time and energy.

- ## Use Cases of the plugin

  Some of the use cases of our plugin are as follows:-

  1. ### API usage

     Using SO posts to retrieve results of similar code snippets in the form of simple and easy to use API calls hiding all the unnecessary details.

  2. ### Algorithms completion

     While implementing algorithms we can use natural query to complete our code like "bubble sort in java?" will automatically complete your sorting algorithm code and can be used in many different ways.

  3. ### Searching similar codes snippets of given code

     Using Facoy to search for similar code snippets for syntax help for new programmers and people who do not remember code syntax much is a very important feature to have and a very useful use case.

  4. ### Code Cloning similarity finder

     We can find similarity between codes and give analysis based on it by defining some score for code cloning and it can be a prime use case of this extension.

5. Code/patch recommendation

It can help find correct code or patches to buggy code or non working codes.

6. Structural Similarity finder

With the help of our similarity metric implemented in the plugin we can find structural Similarity between 2 code snippets.

- ## TEST CASES

We show 2 test cases to demonstrate our tool.

TEST CASE 1

User has following code in his code editor

```
System.out.println(“Hello World”);
System.exit(0);
```

Now upon selecting the whole code for which he wants to find similar code snippets he Invokes our plugin which gives him the following results with a similarity score.

```
Similarity score: 0.80
public class HelloWorld {
        public static void main(String[] args) {
        // Prints "Hello, World" to the terminal window.
         System.out.println("Hello, World");
        }
}
```

The user can copy following code to his editor through our copy code button or view next Code through our next code button or terminate the search through close button.

TEST CASE 2

User does not know what is the syntax of code for the idea he want to code.
For eg. he wants to sort the array in java
So enters sort array in editor and invokes the plugin by putting (?) after natural language Query to search for code snippets.

```
int array[] = { 2, 5, -2, 6, -3, 8, 0, -7, -9, 4 };
Arrays.sort(array);
printArray("Sorted array", array);
int index = Arrays.binarySearch(array, 2);
System.out.println("Found 2 @ " + index);
```

He gets the following snippets in his code editor pasted which he can tweak to his adjustment.

- **CONCLUSION**

After tinkering around with so many open source tools, we finally succeeded in extending 2 open source tools Facoy and Nlp2code and made an eclipse extension for it with many new features combining the features of both tools, to create a plugin which could help developers in their work within the editor thus increasing their productivity.