Software Requirements Specification for Software Engineering: subtitle describing software

Team 6, EcoOptimizers

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Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

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Insert your content here.

9 Functional Requirements

9.1 Functional Requirements

1. **Requirement:** The tool must accept Python source code files.

Fit Criteria: The tool successfully processes valid Python files without errors and provides feedback for invalid files.

2. **Requirement:** The tool must identify specific code smells that can be targeted for energy saving.

   Fit Criteria: The tool should be able to detect and report at least 80% of the follwing code smells using predefined rules or existing linters. Code smells include: Large Class (LC), Long Parameter List (LPL), Long Method (LM), Long Message Chain (LMC), Long Scope Chaining (LSC), Long Base Class List (LBCL), Useless Exception Handling (UEH), Long Lambda Function (LLF), Complex List Comprehension (CLC), Long Element Chain (LEC), Long Ternary Conditional Expression (LTCE).

3. **Requirement:** The tool must suggest at least one appropriate refactoring for each detected code smell to decrease energy consumption or indicate that none can be found.

   Fit Criteria: The suggested refactored code demonstrates a measurable improvement in energy measured in joules.

4. **Requirement:** The tool must implement an algorithm to choose the most optimal refactoring based on measured energy consumption.

   Fit Criteria: The algorithm evaluates multiple refactoring options and selects the one that results in the lowest energy consumption for the given code smell.

5. **Requirement:** The tool must produce valid refactored python code as output or indicate that no possible refactorings were found.

   Fit Criteria: The output code is syntactically correct and adheres to Python standards, validated by an automatic linter.

6. **Requirement:** The tool must report to the user any discrepancies between the original and suggested refactored code.

   Fit Criteria: Discrepancy reports to user clearly highlight differences in outputs

7. **Requirement:** The tool must allow users to input their original test suite as a required argument.

   Fit Criteria: Users can specify a path to their test suite, and the tool recognizes and utilizes it for testing the refactored code.

8. **Requirement:** The tool must ensure that the original functionality of the code is preserved after refactoring.

   Fit Criteria: The tool runs the original test suite against the refactored code, and passes 100% of the tests.

9. **Requirement:** The tool must be compatible with various Python versions and common libraries.

   Fit Criteria: The tool operates correctly with the latest two major versions of Python (e.g., Python 3.8 and 3.9) and commonly used libraries.

10. **Requirement:** The tool must generate comprehensive reports on detected smells, refactorings applied, energy consumption measurements, and testing results.

    Fit Criteria: Reports are clear, well-structured, and provide actionable insights, with users able to easily understand the results.

11. **Requirement:** The tool must provide comprehensive documentation and help resources.

    Fit Criteria: Documentation covers installation, usage, and troubleshooting, receiving positive feedback for clarity and completeness from users.

10 Look and Feel Requirements

10.1 Appearance Requirements

Insert your content here.

10.2 Style Requirements

Insert your content here.

11 Usability and Humanity Requirements

11.1 Ease of Use Requirements

Insert your content here.

11.2 Personalization and Internationalization Requirements

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11.3 Learning Requirements

Insert your content here.

11.4 Understandability and Politeness Requirements

Insert your content here.

11.5 Accessibility Requirements

Insert your content here.

12 Performance Requirements

12.1 Speed and Latency Requirements

1. **Requirement:** The tool must analyze and detect code smells in the input code within a reasonable time frame.

   Fit Criteria: The tool should complete the analysis for files up to 1,000 lines of code in under 5 seconds, and for files up to 10,000 lines in under 30 seconds.

2. **Requirement:** The refactoring process must be executed efficiently without noticeable delays.

   Fit Criteria: The tool should refactor the code and generate output in under 10 seconds for small to medium-sized files (up to 5,000 lines).

12.2 Safety-Critical Requirements

1. **Requirement:** The tool must ensure that no runtime errors are introduced in the refactored code that could result in data loss or system failures.

   Fit Criteria: The tool should pass all tests from the user-provided test suite after refactoring, confirming that the original functionality remains intact. The output code is syntactically correct and adheres to Python standards, validated by an automatic linter.

12.3 Precision or Accuracy Requirements

1. **Requirement:** The tool must reliably identify code smells with minimal false positives and negatives.

   Fit Criteria: Detection accuracy should exceed 90% when validated against a set of known cases.

2. **Requirement:** The tool must maintain the functionality of the original provided code in all its reccommended refactorings.

   Fit Criteria: The tool should pass all tests from the user-provided test suite after refactoring, confirming that the original functionality remains intact.

3. **Requirement:** The tool must produce valid refactored python code as output or indicate that no possible refactorings were found.

   Fit Criteria: The output code is syntactically correct and adheres to Python standards, validated by an automatic linter.

12.4 Robustness or Fault-Tolerance Requirements

1. **Requirement:** The tool should gracefully handle unexpected inputs, such as invalid code or non-Python files.

   Fit Criteria: The tool should provide clear error messages and recover from input errors without crashing, ensuring stability.

2. **Requirement:** The tool must have fallback options if a specific refactoring attempt fails.

   Fit Criteria: In the event of a failed refactoring, the tool should log the error and propose alternative refactorings without stopping the process.

12.5 Capacity Requirements

1. **Requirement:** The tool should efficiently manage large codebases.

   Fit Criteria: The tool must process projects with up to 100,000 lines of code within 2 minutes, maintaining performance standards.

12.6 Scalability or Extensibility Requirements

1. **Requirement:** The tool should be designed to allow easy addition of new code smells and refactoring methods in future updates.

   Fit Criteria: New code smells or refactorings can be incorporated with minimal changes to existing code, ensuring that current functionality remains intact.

12.7 Longevity Requirements

1. **Requirement:** The tool should be maintainable and adaptable to future versions of Python and changing coding standards.

   Fit Criteria: The codebase should be well-documented and modular, facilitating updates with minimal effort.

13 Operational and Environmental Requirements

13.1 Expected Physical Environment

Insert your content here.

13.2 Wider Environment Requirements

Insert your content here.

13.3 Requirements for Interfacing with Adjacent Systems

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13.4 Productization Requirements

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13.5 Release Requirements

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14 Maintainability and Support Requirements

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15 Security Requirements

15.1 Access Requirements

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16.1 Cultural Requirements

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25 Waiting Room

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26 Ideas for Solution

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Appendix — Reflection

The information in this section will be used to evaluate the team members on the graduate attribute of Lifelong Learning. Please answer the following questions:

1. What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain specific knowledge from the domain of your application, or software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, or writing, or presentation, or team management, etc. You should look to identify at least one item for each team member.

2. For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?