

| Type            | Refactoring Techniques              | Consumption ( $\mu$ J ) |          | Effect | Delta  |
|-----------------|-------------------------------------|-------------------------|----------|--------|--------|
|                 |                                     | Original                | Refactor |        |        |
| Object-Oriented | Replace Method with Method Object   | 44.68                   | 48.363   | ↓      | -3.682 |
|                 | Replace Inheritance with Delegation | 43.52                   | 43.754   | ↓      | -0.232 |
|                 | Introduce Parameter Object          | 45.03                   | 44.771   | ↑      | 0.258  |
|                 | Move Method                         | 70.07                   | 69.786   | ↑      | 0.28   |
|                 | Collapse Hierarchy                  | 52.40                   | 51.967   | ↑      | 0.433  |
|                 | Inline Class                        | 74.78                   | 72.361   | ↑      | 2.419  |
| Mobile          | No low memory resolver              | -                       | -        | -      | 0      |

The definition of the object-oriented refactorings can be found in [1].

The definition of Mobile anti-pattern can be found in [2].

The evaluation of the refactorings with respect to energy efficiency is presented in [3].

[1] M. Fowler, *Refactoring: Improving the Design of Existing Code*, Boston, MA, USA: Addison-Wesley, 1999.

[2] J. Reimann, M. Brylski, and m. A\ss, Uwe, "A Tool-Supported Quality Smell Catalogue For Android Developers," *Softwaretechnik-Trends*, vol. 34, no. 2, 2014.

[3] J. J. Park, J.-. Hong, Eui, and S.-. Lee, Ho, "Investigation for Software Power Consumption of Code Refactoring Techniques." pp. 717-722.

| Name                         | Measurement type | Original | After refactoring | Delta J    | Delta (μJ) | I minute estimation |
|------------------------------|------------------|----------|-------------------|------------|------------|---------------------|
| Binding resources too early  | file-based       | 11903    | 11276             | 627        | 627000000  |                     |
|                              | energy profiling | 981      | 706               | 275        | 275000000  |                     |
|                              | Delta-B          | 19566    | 16032             | 3534       | 3534000000 |                     |
| Average                      |                  |          |                   | 1478.66667 | 1478666667 | 10561904.76         |
|                              |                  |          |                   |            |            |                     |
| Releasing resources too late | file-based       | 11903    | 11276             | 627        | 627000000  |                     |
|                              | energy profiling | 981      | 706               | 275        | 275000000  |                     |
|                              | Delta-B          | 19566    | 16032             | 3534       | 3534000000 |                     |
| Average                      |                  |          |                   | 1478.66667 | 1478666667 | 10561904.76         |

The definition of the energy anti-patterns and its evaluation with respect to energy efficiency is presented in [1].

[1] M. Gottschalk, "Energy Refactorings," Carl von Ossietzky University, 2013.