

Fragment retrieval on models for model maintenance: Applying a multi-objective perspective to an industrial case study

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Resumen(Abstract).

Context: Traceability Links Recovery (TLR), Bug Localization (BL), and Feature Location (FL) are amongst the most relevant tasks performed during software maintenance. However, most research in the field targets code, while models have not received enough attention yet.

Objective: This paper presents our approach (FROM, Fragment Retrieval on Models) that uses an Evolutionary Algorithm to retrieve the most relevant model fragments for three different types of input queries: natural language requirements for TLR, bug descriptions for BL, and feature descriptions for FL.

Method: FROM uses an Evolutionary Algorithm that generates model fragments through genetic operations, and assesses the relevance of each model fragment with regard to the provided query through a fitness configuration. We analyze the influence that four fitness configurations have over the results of FROM, combining three objectives: Similitude, Understandability, and Timing. To analyze this, we use a real-world case study from our industrial partner, which is a worldwide leader in train manufacturing. We record the results in terms of recall, precision, and F-measure. Moreover, results are compared against those obtained by a baseline, and a statistical analysis is performed to provide evidences of the significance of the results.

Results: The results show that FROM can be applied in our industrial case study. Also, the results show that the configurations and the baseline have significant differences in performance for TLR, BL, and FL tasks. Moreover, our results show that there is no single configuration that is powerful enough to obtain the best results in all tasks.

Conclusions: The type of task performed (TLR, BL, and FL) during the retrieval of model fragments has an actual impact on the results of the configurations of the Evolutionary Algorithm. Our findings suggest which configuration offers better results as well as the objectives that do not contribute to improve the results.