

Towards bug localization in models in game software engineering

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Introduction

- Almost one out of every two developers is involved in the video games sector
- Politowski et al. argue that the way in which developers deal with bugs must inevitably be different in video games than in traditional software since the artifacts used are also different

Introduction

Current bug localization approaches only focuses on source code



Lack of specific bug localization approaches



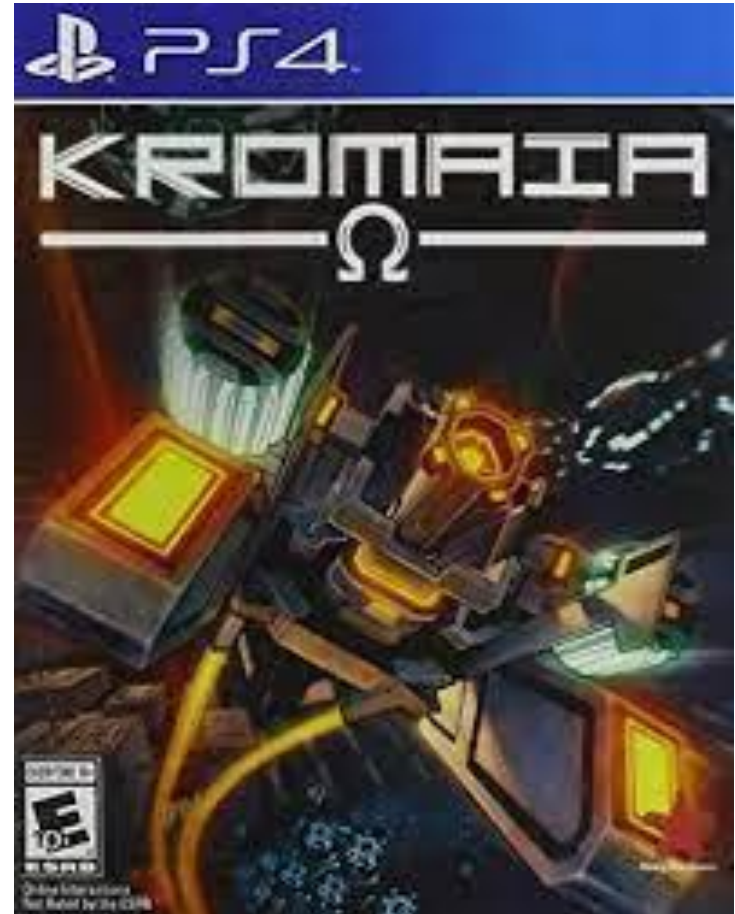
Longer development time



Delays in the deadlines and postponement of the launch date

Background

- Industrial partner: Kraken Empire' studio
- Case study: Kromaia 3D video game



Background

- In-game content is specified with the Shooter Definition Model Language (SDML), a DSL model for the video game domain.
- SDML defines aspects such as:
 - anatomical structure,
 - amount and distribution of vulnerable parts, weapons, and defences in the structure/body of the character, and
 - movement behaviours associated to the whole body or its parts

Background

- The models are created using SDML and interpreted at runtime.
- The simulations are a duel between a boss and a human player. In the simulation, both the boss and the simulated player try to win the match.

Baseline

BLiMEA

Multi-objective evolutionary algorithm

Two fitness functions:

- Information Retrieval (IR)
- Modification timespan

Input

Bug description and a set of software models

Output

Set where each model fragment receives two fitness values:

- Similarity to the bug description
- Timespan to the most recent model fragment modification

Approach

Our approach (preliminary)

Target: Leverage game simulations to locate bugs in the software models of video games (by means of NPCs)

Aim: Find the most relevant game simulation to locate the target bug

Input

Set of software models (in which we want to locate the bug)

Output

Ranked list of simulation traces that are ordered by their relevance in locating the bug (an evolutionary algorithm performs a search that is guided by the fitness function)

Fitness function

Reward simulations that are farthest from what developers expected (i.e., the further from what the developers expected, the more relevant when it comes to locating a bug)

Preliminary results

- BLiMEA was successful in CSE. However, the BLiMEA results in GSE obtained lower values in the main measures (precision, recall, and F-measure).
- We have performed preliminary test of the ideas, although we do not have enough results to conduct a quantitative evaluation.
- Intuitive idea: Fun heuristics can help design better guides to locate bugs in video games

Conclusion

- BL in general software is done through bug reports and defect localization principle
- Not specific for GSE, perhaps not enough? (rise of video games, problems developers have in locating bugs, ...)
- Novel research direction for GSE, CSE could also be benefited from (potentially transferable)

Thank you!

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