Virtual Reality in Software Engineering: A future of Software Development, Modeling, and Quality Assurance

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Abstract

This project aims at exploring novel immersive experiences for software engineers in the course of their software development activities. Specifically, we aim at exploring novel applications of Virtual Reality (VR) to visualize software quality characteristics, such as code smells and technical debt. We are developing a platform that 1) extract information from code repositories, 2) construct a virtual reality environment that represents the repository and its code qualities, and 3) provide an interactive immersive experience so the software engineers can effectively understand quality characteristics pertaining to their codebase.

1. Introduction

VR can augment the level of human movement and perception in the area of software engineering. As VR has gained popularity in the medical and education field due to the use of real-time motion, feedback, and spatial cognition [1] [2] , we are motivated to explore VR technologies in software development, modeling, and quality assurance.

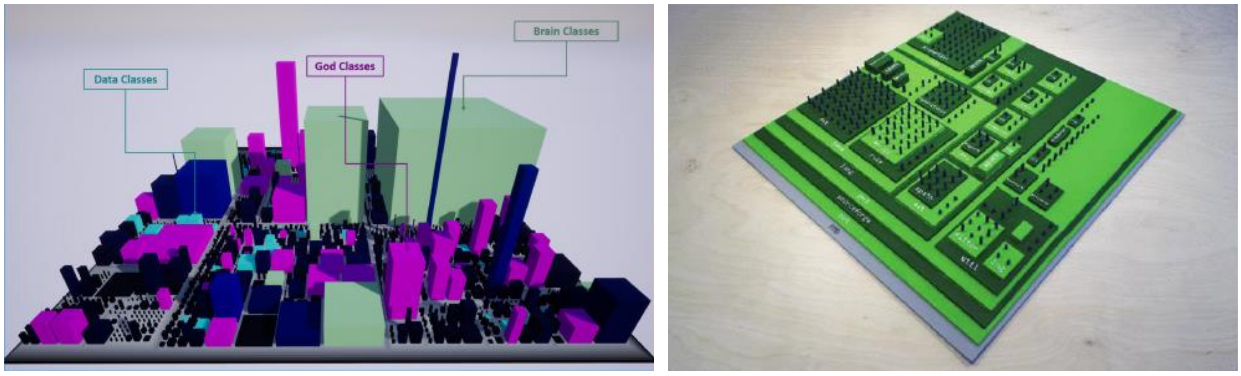
In our research, we are working on visualizing the factors related to software development, modeling and code quality metrics in an immersive VR device. The main objective of our research to encourage software companies to use 3D immersive visualization techniques to improve software development, modeling [3] [4] , and code quality [5] , cost estimation [6] [7] and the process we call it ***I**mmersive **S**oftware **E**ngineering **V**isualization **(ISEV)***. In our study, we work on creating the metaphors (real-world object) to visualize the factors related to code development, structures, models and quality factors.

In addition to the development of the 3D application, we also do a usability study to find the difference between user expectations and development. Recently, we work on creating metaphors related to software code quality. In that research, we visualize the code quality aspects (*Code smells: Large Class, Long Method, God Class, etc.*) showed in Figure 2.

In the future, we plan to extend this work more with code structure and model. Also, we will work on creating new metaphors for design smells. In summary, we will use software meta information to design a 3D immersive view to understand programs and code quality.

2. Background and Related Works

Some existing researches are described in this section. There are some studies that focused on software code and model visualization. Understanding a software code and model has always been somewhat challenging. With the increasing complexity of the software system, it increases the complexity of the code & its quality metrics and hence the task of understanding it. One way to comprehend the program code and model is by visualizing it in a 3D environment.

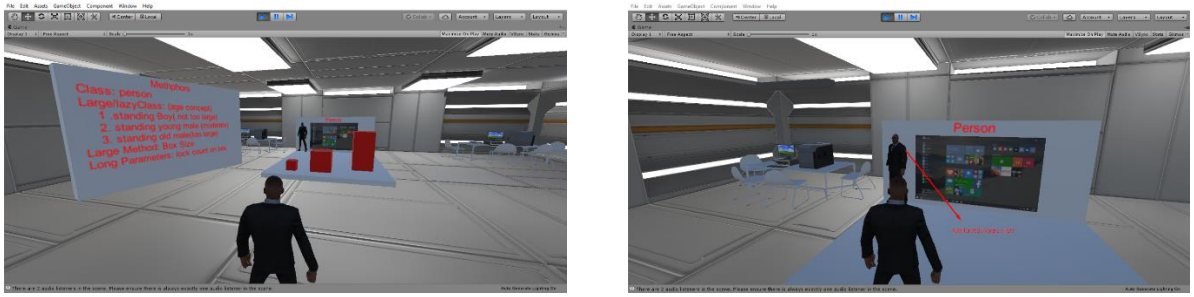


(a) (b)

Figure 1: (a) City VR application to visualize the data, god or brain class, (b) Snippet of the city metaphor model of a software package.

3. Progress to Date

Code quality metrics visualization is an immersive topic in the area of Software Engineering (SWE). Program testing, optimization, refactoring, documentation, and, most importantly, debugging and repair are the key factors for code quality. The important part of code quality is to visualize the results in a proper way so that any user can understand the impact of code quality of a project or repository.



(a) (b)

Figure 2: (a) Visualization of code smell (code quality metric) in virtual reality, (b) Engage in a 3D environment to see a large class (code smell) in virtual reality

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