Understanding Program Comprehension

Software Composition Seminar

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Outline

1. Introduction
2. Participants
3. Interview setup
4. Static vs Dynamic analysis
5. Results
6. Conclusion

Introduction

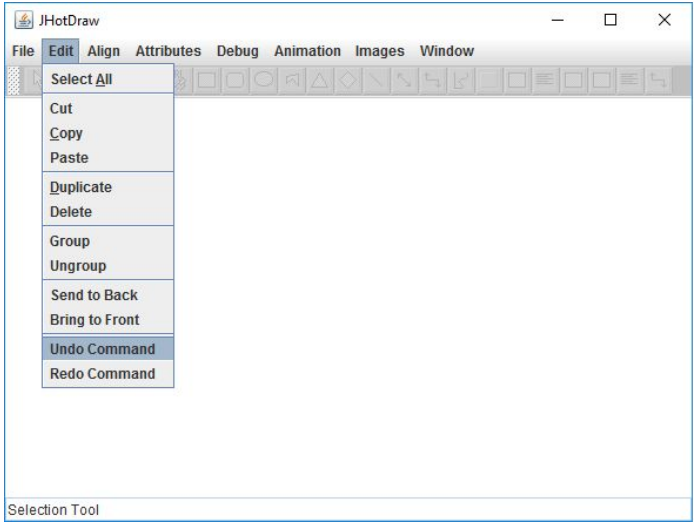
- How do developers think?
- Experiment
- Coping with unknown code

Participants

- 12 (6+6) participants
- Academic and professional background
- Different levels of experience in Java

Interview setup

- Unknown complex project
- 30 minutes
- Undo Command bug
- Static and dynamic environment



Interview setup

Static debugging:

- No debugger
- No printing of values during runtime

Dynamic debugging:

- No constraints

Static debugging

- Different approaches in bug-localization
- Undirected flow of thoughts (e.g. undo/redo)

```
79    public boolean undo() {
80        if (!super.undo()) {
81            return false;
82        }
83
84        FigureEnumeration fe = getAffectedFigures();
85        while (fe.hasNextFigure()) {
86            Figure f = fe.nextFigure();
87            if (getOriginalValue(f) != null) {
88                getAttribute();
89            }
90        }
91
92        return true;
93    }
```

Dynamic debugging

- Undirected flow of thoughts - up to a point
- Polymorphic code

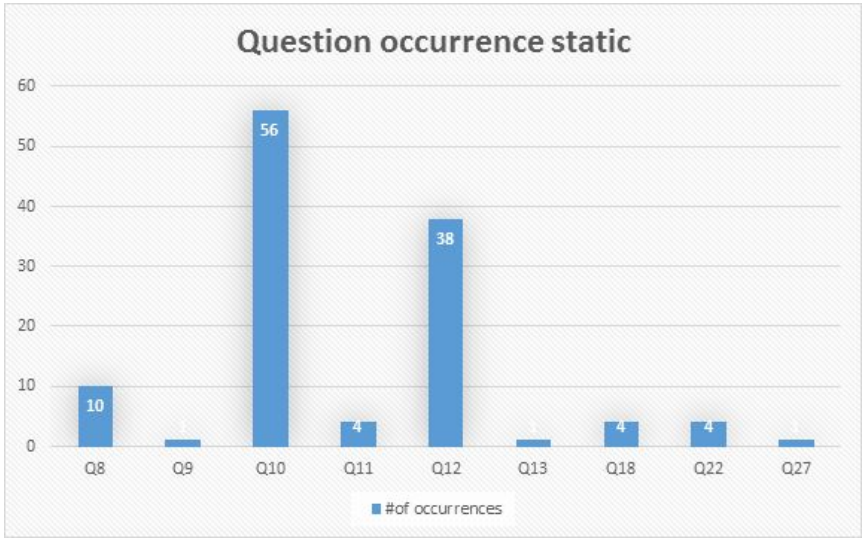
```
public void execute() {

  Undoable lastUndoable = um.popUndo();
  // Execute undo
  boolean hasBeenUndone = lastUndoable.undo();
  // Add to redo stack
  if (hasBeenUndone && lastUndoable.isRedoable()) {
      um.pushRedo(lastUndoable);}
}
```

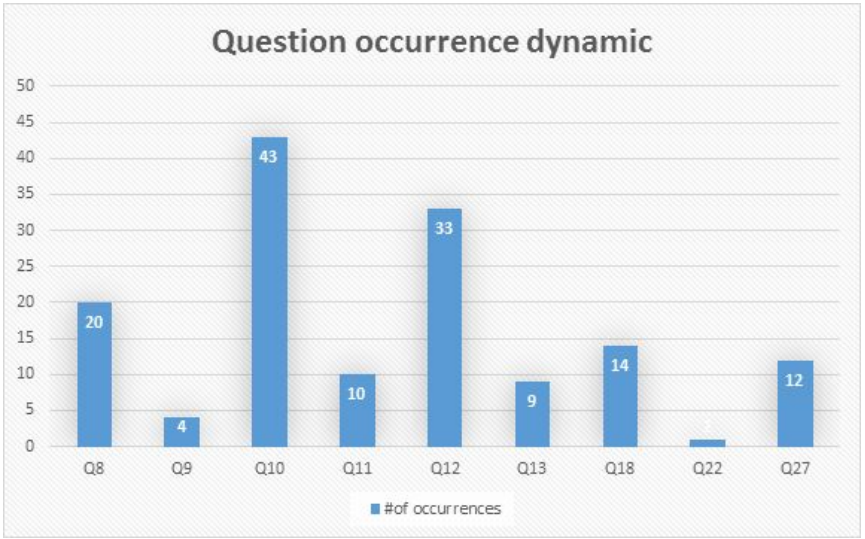
Sillito's paper

- *"Asking and Answering Questions during a Programming Change Task"* - Jonathan Sillito [2008]
- 44 different groups of questions
- Relation with our experiment

Results

- Q8: Where does this type fit in the type hierarchy?
- Q10: Where is this field declared in the type hierarchy?
- Q12: Where is this method called or type referenced?





Polymorphism

- Challenges of polymorphism
- Problems in static environment
- Different hierarchy types

Polymorphism

- Shallow but wide hierarchy
- 24 different types of UndoActivity
- Breaking point for debugging

```
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```

Discussion

- Debugger is not always utilized properly
- Coping with polymorphism
- Experience in industry means a lot
- Threats to validity

Conclusion

- Developers’ bottleneck
- Importance of this study
- Future work

Summary

- Static vs dynamic
- Polymorphism
- Industry experience is important