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Team Number: 4 Consultation Day/Hour: Tuesday, 1pm

Team Name: Team 4

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CS3202 Software Engineering Project

Final Report

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# Project Story

CS3202 has been an eventful project based module. In the continuation from CS3201, we have implemented the full scope of the Static Program Analyzer (SPA), alongside some extensions. We ensured that we improved on the weaknesses from our previous project and strengthened the base to build our SPA upon. We also had the addition of a new member with, alongside one member of our group opting to change groups. This switch of members actually improved the dynamics of our group, allowing us to work better with one another. The remainder of this report shall discuss in detail how we went about implementing the various components of the SPA. This discussion shall include a summary of our main achievements (Section 1), project plans (Section 2), UML diagrams (Section 3), design decisions (section 4), coding standards and experiences (Section 5), query processing (Section 6), testing (Section 7) and finally end off with a concluding discussion (Section 8).

# Summary of Main Achievements

## Basic SPA Functionality

For the purposes of the CS3202 development of the SPA, we have implemented the full SPA as described in the Project Handbook. This includes the implementation of the components:

* Parser
* Design Extractor
* Program Knowledge Base (PKB)
* Query Processor (QP).

The PKB stores the design abstractions implemented:

* Abstract Syntax Tree (AST)
* Follows/Follows\*
* Parent/Parent\*
* Modifies
* Uses
* Calls/Calls\*
* Next/Next\*
* Affects/Affects\*

The QP handles the processing of queries involving the aforementioned design abstractions alongside a combination of “with”, “such that” and “pattern” clauses. It has been implemented to also return tuple results. The QP also includes components that handle the optimization of query evaluation.

The description above just highlights the main functionality implemented. Overall, all of the required functions from iteration 1-3 have been implemented. The details of their implementation shall be discussed in the later sections of this report.

## Highlights of System

In the implementation of the functionality, defined by the handbook, we have ensured that aspects of our software standout from the norm. This is in the way that we have implemented some functions and also the addition of certain components. The main highlights of our project includes:

* Polymorphism of data structure for PKB (MapTable & ListTable)
* Next\* Implementation
* Addition of Query Representator (QR) and Query Optimizer (QO) in the QP
* Query Evaluator (QE) in the QP [really?]

These highlights will be further elaborated on in Section 4 and Section 6.

## Extension for Bonus Points

We have implemented the first extension for the extended code pattern. This includes the relationships Contains, Contains\* and Siblings. The test cases for this extension has been included alongside the other test cases for the SPA.

🡪 talk abt other mentionable parts of the project

# Project Plans

We implemented this project in an iterative manner

## Project Schedule

## Organization of Meetings

//talk abt

# UML Diagrams

\*SAME AS BEFORE\*

//reuse 2 diags as before

//make 2 more for testing if possible

//how did they add value to the project

//allow us to analyze and discuss the problems. Focus on what to implement, allowing us to emphasize on the what of the implementation (section 10.1)

# Design Decisions

////talk abt separation of concerns and virtues of simplicity and standardization

//system decomposition with information hiding {section 10.1}

//show software architecture (emphasis on the differences in the QP)

## PKB Data Structure Representation

- discuss the design problem

-identify goals to be met by relevant design solutions

-discuss alternatives, previous implementations

-analyze strengths and weaknesses [include big o notation analysis]

-discuss implemented design based on the weakness of the previous design decisions

-analyze using big o notation

-give example for insertion, searching and getting for one relationship

## PKB API

## SPA Relationships

### AST

### Modifies/Uses [for procedure calls]

### Parent/Follows

### Calls

### Next/Next Star

### Affects/Affects Star

### Contains/Contains Star

### Siblings

## Design Patterns

# Coding Standards & Experiences

\*SAME AS BEFORE\*

# Query Processing

## Query Validation

Table-driven approach to query validation??

## Query Evaluation

### Data Representation (QR)

### Basic Query Evaluation

#### Manage the temporary results

### Optimization

### Design Decisions

# Testing

## Testing Experience

## Examples of Test Cases

### Unit Testing

#### PKB

#### PQL

### Integration Testing

#### Parser, PKB & Design Extractor

### Validation Testing

# Discussion

## Possible Improvements to Project

## Project Experience

### Team Work

### Incremental Development

### SPA Complexity & Proj solution

### Things learnt

## Tools used

-usefulness of recommended tools

-other tools used

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