

BCPR301   
Advanced Programming

Assessment 2 Marking Sheet for Coder

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# Repository link:

Refactored code repository

<https://github.com/forestraindrip/PR301_Code_Refactoring.git>

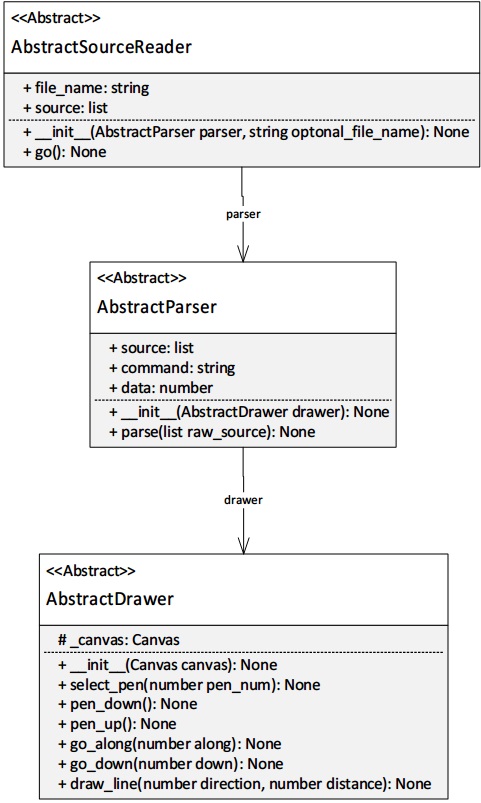
Source code repository

<https://github.com/forestraindrip/PR301_Assignment2.git>

# Feature list

* User can select pen
* User can put pen down
* User can move pen up
* User can move the pen horizontally (go along)
* User can move the pen vertically (go down)
* User can draw a line with input direction and distance
* The system can read commands from text file
* The system can parse the commands from text file

# Interface diagram



# Bad smells before refactoring

The order of the bad smells is listed from the worst bad smell to the lesser ones.

* Lazy Class in AbstractSourceReader

Location: tigr.py => AbstractSourceReader => line 51~64

* Inappropriate Intimacy between frontends and parsers

Location: front\_end\_kieran.py => TkinterInterface => draw() => line 71

front\_end\_jerry.py => GuiInterface => draw() => line 64

* Shotgun Surgery in the drawers and frontends

Location: drawer\_jack.py => line 7~13, 66

drawer\_kieran.py => line 11~17, 55

drawer\_turtle\_jack.py => line 8~14, 19

all frontend classes

* Alternative Classes with Different Interfaces in two frontends.

Location: front\_end\_kieran.py => TkinterInterface

front\_end\_jerry.py => GuiInterface

* Switch statement in the drawers and the parsers.
* Refused-bequest in MainTIGr.
* Long methods in frontends

# Refactoring 1

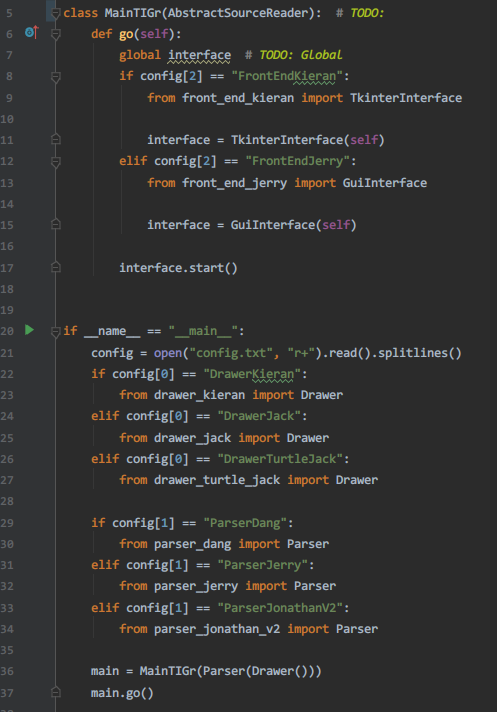
## Name

Lazy Class

## Location

* refactored\_code
  + source\_reader\_kieran.py
    - Whole MainTIGr class
* tigr.py
  + AbstractSourceReader line 48~62

## Reasons



The AbstractSourceReader is the lazy class. As shown in the screenshot, the MainTIGr inherits the AbstractSourceReader. However, there should not be a relationship between them. In assignment 1, the responsibilities of provided abstract class, AbstractSourceReader, is reading source file then passing the result to the parser for further processing; its implementation is compulsory. However, in this case, MainTIGr is used as the entry point of the program which distorts the role of AbstractSourceReader. As a matter of fact, AbstractSourceReader has no actual functionality in this program which essentially makes it a **Lazy Class**. Moreover, the bad implementation **creates other bad smells including** **inappropriate intimacy, shotgun surgery and refused-bequest**. Therefore, I think the Lazy Class of AbstractSourceReader is the most critical bad smell at this stage.

## Strategies/ approaches

* Break the relationship between MainTIGr and AbstractSourceReader.
* Implement a proper SourceReader for source reading.
* Rename the drawers. Three drawers with different implementation sharing the same name before refactoring.
* Rename the parsers. Three parsers with different implementation sharing the same name before refactoring.
* Redirect the functions using source reading back to the created SourceReader.

## Result Evaluation

### Function and PEP8 Validation

Passed

### Has the bad smell been removed?

Yes

### Did you bring new bad smells into the program?

No, only a new SourceReader is created. It is a well-behaved source reader absented from the original system.

### How well is your program now in terms of software quality?

* Low coupling: The classes, including drawers, source reader and GUI, have lower coupling now.
* No global variable: The refactoring removes the global variable “interface” in the MainTigr class.
* Separated responsibilities of classes: The frontend classes don’t have the responsibility of SourceReader now. The SourceReader is not used as entry point as well.

## Worst bad smells after refactoring1

* Alternative Classes with Different Interfaces in two frontends
* Duplicate code in frontends, drawers
* Long methods in frontends
* Switch statement in the drawers and the parsers

# Refactoring 2

## Name

Alternative Classes with Different Interfaces

## Location

* refactored\_code
  + front\_end\_jerry.py
    - GuiInterface whole class
  + front\_end\_kieran.py
    - TkinterInterface whole class

## Reasons

These two frontend classes have similar functions with different implementations and names. Parts of them have duplicate codes which decreases code readability. The bad smell affects multiple classes. On the contrary, other bad smells only affect individual classes. Therefore, I think Alternative Classes with Different Interfaces is the worst bad smell at this stage.

## Strategies/ approaches

1. Extract Superclass: Create a superclass AbstractFrontEnd which is inherited by two frontend classes
2. Extract methods: Migrate the methods from the original classes to the new superclass.

## Result Evaluation

### Function and PEP8 Validation

Passed

### Has the bad smell been removed?

Yes

### Did you bring new bad smells into the program?

No.

### How well is your program now in terms of software quality?

* Code consistency is increased. The function names in GuiInterface and TkinterInterface are the same now.
* Code duplication is greatly reduced. Duplicate codes are move to the parent class now.
* Code readability is increased. Because inconsistent and duplicate codes are reduced, the code readability in these two classes is improved.

## Worst bad smells after refactoring2

* Long methods in frontend init\_widgets()
* Switch statements in parsers and drawers

# Refactoring 3

## Name

Long methods

## Location

* refactored\_code
  + front\_end\_jerry.py
    - GuiInterface
      * init\_widgets() line 19~79

## Reasons

The init\_widgets() has 60 lines. This make the code hard to read and maintain. On the contrary, the switch statements in the classes has less impact in terms of readability and maintainability. Therefore, I think the long method is the worst bad smell at this stage.

## Strategies/ approaches

* Extract Method: Migrate codes in the init\_widgets() into multiple methods and give these methods meaningful names.
* Extract Method: Merge identical method to reduce code duplication after the previous step.

## Result Evaluation

### Function and PEP8 Validation

Passed

### Has the bad smell been removed?

Yes

### Did you bring new bad smells into the program?

No

### How well is your program now in terms of software quality?

* Code readability is increased. The lengthy statements are encapsulated in functions with meaningful names.
* Code duplication is greatly reduced. The duplicated codes of creating labels are merged into \_\_setup\_label() function(front\_end\_jerry.py line 51~53).

# Expected marks

1. Smell detection

* Identification of bad smells: 3\*1 marks
* Location of bad smells: 3\*1 marks
* The reasons: 3\*1 marks
* Descriptions of strategies: 3\*1 marks

Total: 12 marks

1. Refactoring
   * Identification of the worst smell: 3\*1 marks
   * Version control: 3\*1 marks
   * Modification and validation: 3\*2 marks
   * Testing and evaluations: 3\*1 marks

Total: 15 marks

Overall: **27 Marks**