Assignment 8 - G03P02

Group information

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Dataflow Testing

Dataflow testing is a white-box testing technique based on finding the test paths of a program according to the locations of definitions and uses of variables in the program.

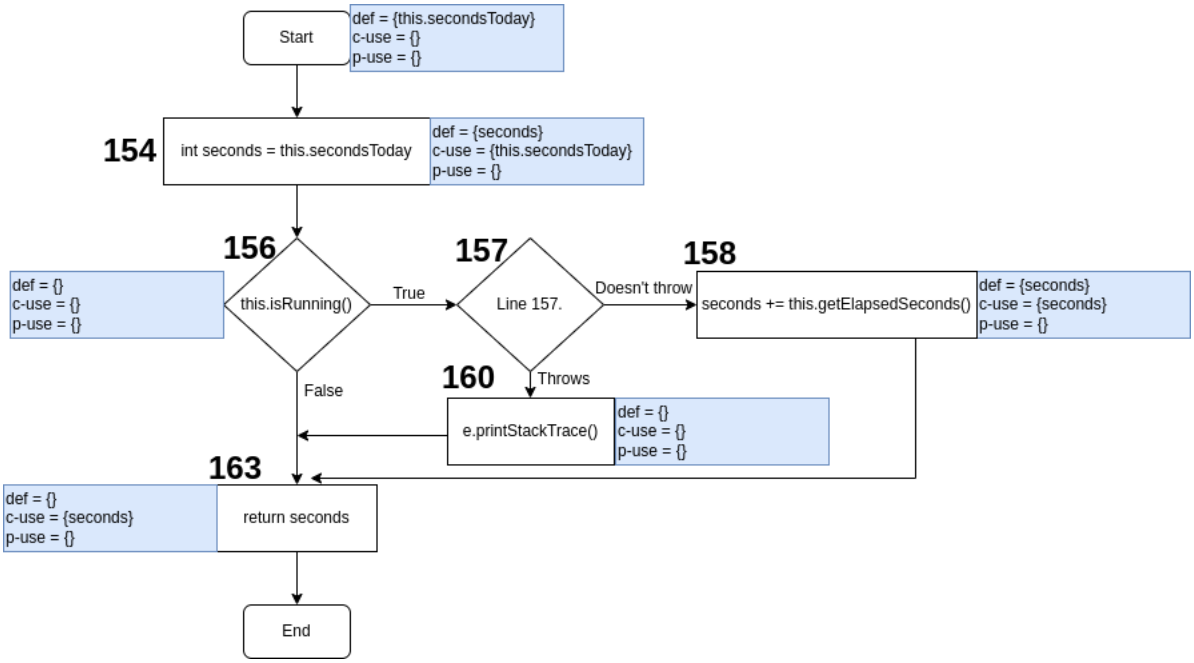
Dataflow Test #1

Function: `public int getSecondsToday()` in `Project.Java`

Purpose: This function returns the number of seconds that a project has been active for the current day.

Reason for selection: It is crucial that this function works as intended since other important functions rely on it.

Dataflow Graph



Def-use pairs

Variable this.secondsToday

Pair ID	Def	Use	Path
1	Start	154	`<Start, 154>`

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable seconds

Pair ID	Def	Use	Path
1	154	158	`<154, 156, 157, 158>`
2	154	163	`<154, 156, 163>`
3	154	163	`<154, 156, 157, 160, 163>`
4	158	158	`<158, 158>`
5	158	163	`<158, 163>`

Coverage criteria:

- **all-defs**: {2,4}
- **all-c-uses**: {1,2,4,5}
- **all-p-uses**: {}
- **all-uses**: {1,2,4,5}

Unit Tests

The created test checks if the function returns the correct value of seconds. This value depends on whether the project is running or not. We ran the test for a running project and a stopped project to cover all paths according to the criteria.

All tests pass **successfully**.

`getSecondsTodayTest` in `ProjectTest.java`

```
    @ParameterizedTest
    @MethodSource("getSecondsTodayInputs")
    public void getSecondsTodayTest(Boolean running) {
        // when
        this.project.setRunning(running);

        //then
        assertEquals(this.project.getSecondsToday(), ProjectTest.secondsToday);
    }

    public static Stream<Arguments> getSecondsTodayInputs() {
        return Stream.of(
                Arguments.arguments(false),
                Arguments.arguments(true)
        );
    }
```

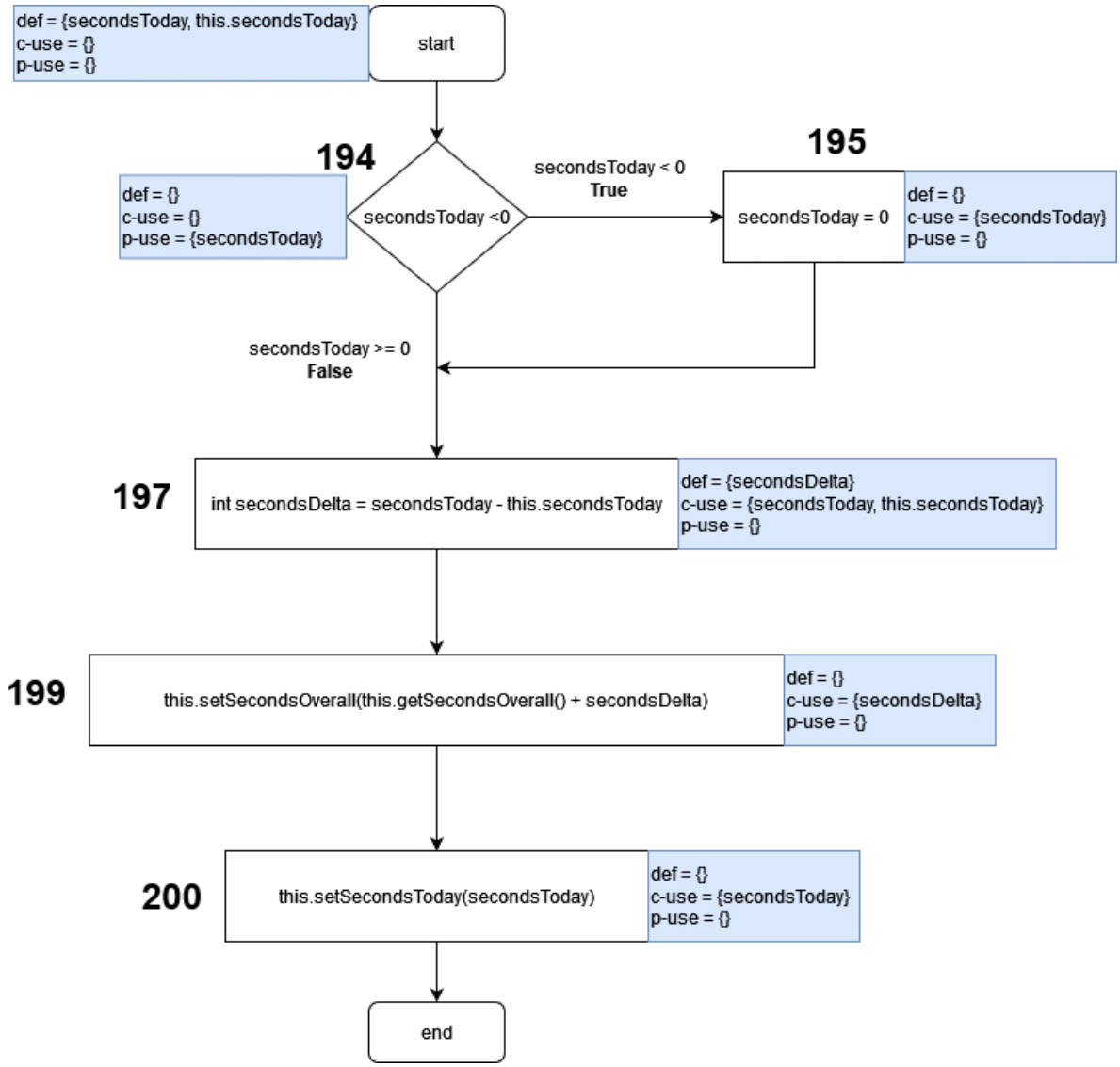
Dataflow Test #2

Function: `public void adjustSecondsToday(int secondsToday)` in `Project.Java`

Purpose: This function receives an integer representing the number of seconds that it took to complete a task. Then, the function updates the number of seconds spent on the task today, as well as the overall time spent on it.

Reason for selection: Throughout the usage of the application, the user is able to set the time spent on a task. As such, this is a method that deals with user input, so it needs to be reliable.

Dataflow Graph



Def-use pairs

Variable secondsToday

Pair ID	Def	Use	Path
1	start	(194,T)	<start,194,195>
2	start	(194,F)	<start,194,197>

Pair ID	Def	Use	Path
3	start	195	<start,194,195>
4	start	197	<start,194,197>
5	start	200	<start,194,195,197,199,200>
6	start	200	<start,194,197,199,200>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {3,4,6}
- **all-p-uses**: {1,2}
- **all-uses**: {1,2,3,4,6}

Variable this.secondsToday

Pair ID	Def	Use	Path
1	start	197	<start,197>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable secondsDelta

Pair ID	Def	Use	Path
1	197	199	<start,199>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Unit Tests

The created test checks if the function adjusts the number of seconds of a project correctly. We ran the test for a negative and a positive input to cover all paths according to the criteria.

All tests pass **successfully**.

`adjustSecondsValidTest` in `ProjectTest.java`

```
    @ParameterizedTest()
    @MethodSource("adjustSecondsValidInputs")
```

```
    public void adjustSecondsValidTest(int secondsToday) {
        // given
        secondsToday = Math.max(secondsToday,0);
        int expectedSecondsToday = secondsToday;
        int expectedSecondsOverall = ProjectTest.secondsOverall -
ProjectTest.secondsToday + secondsToday;

        // when
        this.project.adjustSecondsToday(secondsToday);

        // then
        assertEquals(expectedSecondsToday, this.project.getSecondsToday());
        assertEquals(expectedSecondsOverall, this.project.getSecondsOverall());
    }

    public static Stream<Arguments> adjustSecondsValidInputs() {
        return Stream.of(
                // ...
                // dataflow testing
                Arguments.arguments(-1),
                Arguments.arguments(1)
        );
    }
```

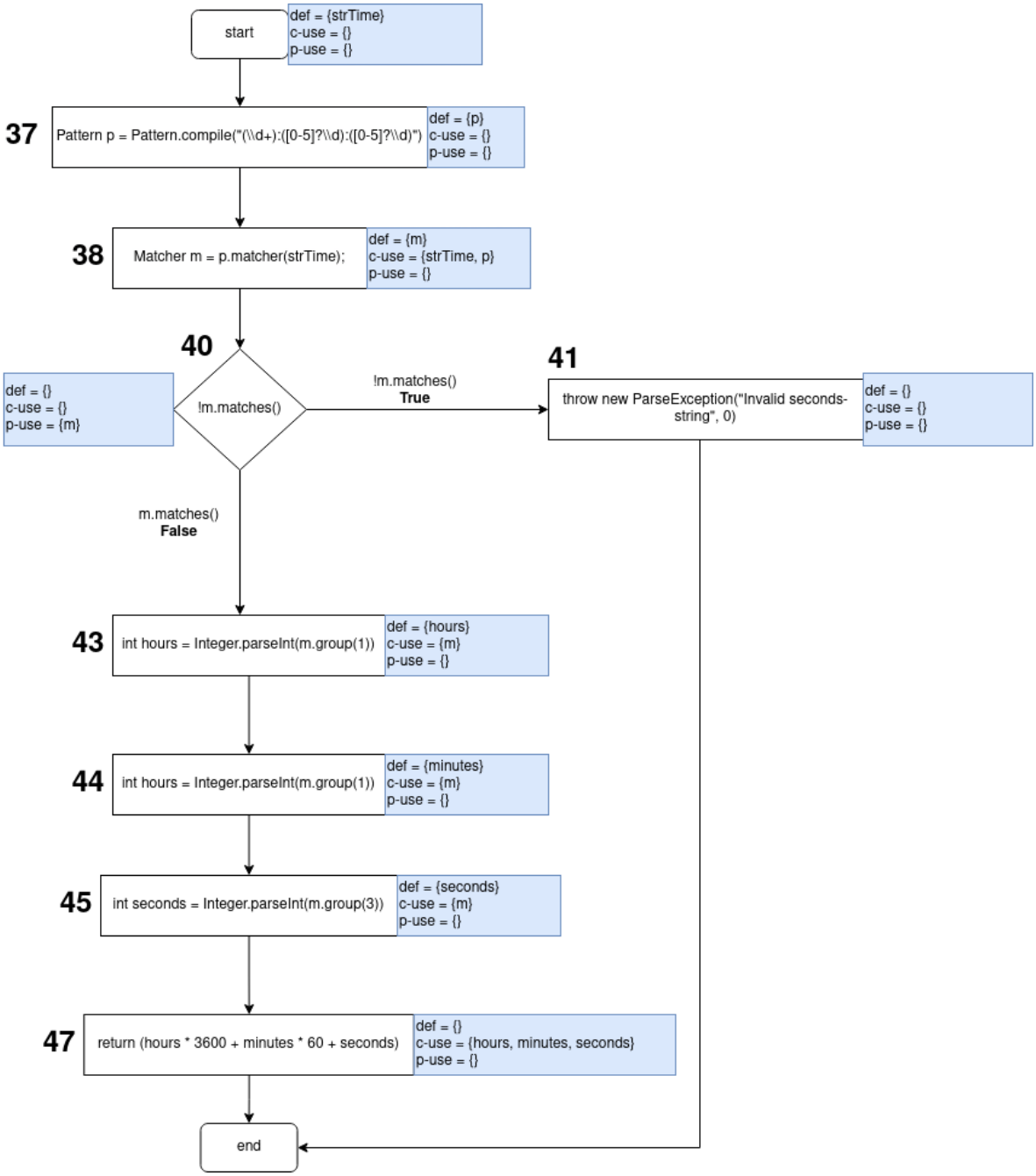
Dataflow Test #3

Function: `public static int parseSeconds(String strTime)` in `ProjectTime.Java`

Purpose: This function receives a string representing time, in `hh:mm:ss` format, and returns the total number of seconds it represents.

Reason for selection: This method deals with parsing of user input, which needs to be robust.

Dataflow Graph



Def-use pairs

Variable strTime

Pair ID	Def	Use	Path
1	start	38	<start,37,38>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable p

Pair ID	Def	Use	Path
1	37	38	<37,38>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable m

Pair ID	Def	Use	Path
1	38	(40,T)	<38,40,41>
2	38	(40,F)	<38,40,43>
3	38	43	<38,40,43>
4	38	44	<38,40,43,44>
5	38	45	<38,40,43,44,45>

Coverage criteria:

- **all-defs**: {3}
- **all-c-uses**: {3,4,5}
- **all-p-uses**: {1,2}
- **all-uses**: {1,2,3,4,5}

Variable hours

Pair ID	Def	Use	Path
1	43	47	<43,44,45,47>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable minutes

Pair ID	Def	Use	Path
1	44	47	<44,45,47>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Variable seconds

Pair ID	Def	Use	Path
1	45	47	<45,47>

Coverage criteria:

- **all-defs**: {1}
- **all-c-uses**: {1}
- **all-p-uses**: {}
- **all-uses**: {1}

Unit Tests

The created test checks if the function parsed the string representing a timestamp correctly. We ran the test for one valid and another invalid input to cover all paths according to the criteria.

All tests pass **successfully**.

`parseSecondsValidTest` in `ProjectTimeTest.java`

```
    @ParameterizedTest(name = "Hours: {0} | Minutes: {1} | Seconds: {2}")
    @MethodSource("parseSecondsValidInputs")
    public void parseSecondsValidTest(String hours, String minutes, String
seconds) throws ParseException {
        // given
        int expectedSeconds = timeComponentsToSecs(hours, minutes, seconds);
        String timeStr = timeComponentsToTimeStr(hours, minutes, seconds);

        // when
        int result = ProjectTime.parseSeconds(timeStr);

        // then
        assertEquals(expectedSeconds, result);
    }

    private static Stream<Arguments> parseSecondsValidInputs() {
        return Stream.of(
                //...
                // Dataflow testing
                Arguments.arguments("00", "00", "59")
        );
    }
```

`parseSecondsInvalidTest` in `ProjectTimeTest.java`

```
    @ParameterizedTest(name = "Hours: {0} | Minutes: {1} | Seconds: {2}")
```

```
    @MethodSource("parseSecondsInvalidInputs")
    public void parseSecondsInvalidTest(String timeStr) {
        // when + then
        assertThrows(ParseException.class, () ->
ProjectTime.parseSeconds(timeStr));
    }

    private static Stream<Arguments> parseSecondsInvalidInputs() {
        return Stream.of(
                // ...
                // Dataflow testing
                Arguments.arguments("00")
        );
    }
```