國立臺北科技大學

資訊工程系

軟體測試與驗證

Test Design Specification

And

Test Case Specification

Turbo Editor

Team#6

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民國 109 年 5 月 20 日

Table of Contents

Change History

Version	Primary Author(s)	Description of Version	Date Completed
1.0.0	古兆瑋、陳冠穎、劉孝忠	樣式及內容初稿。	2020/04/20
1.1.0	古兆瑋、陳冠穎、劉孝忠	依教授於期中報告提出之建議，於 Phase 3 修正 1.5 Item Pass/Fail Criteria；以及新增 Graph Coverage Test Approach 與新增使用案例之特殊情形測試。	2020/05/20

1. Test Design Specification

1.1 Test Design Specification Identifier

NTUT-108-STV-TurboEditor_TDS。

1.2 Features to be Tested

Feature ID	Description	Use Case
F-T-01	Create New File	Create File
F-T-02	Open File	Read File
F-T-03	Read File’s Info	
F-T-04	Rename File	Update File
F-T-05	Edit File	
F-T-06	Undo Editing	
F-T-07	Redo Editing	
F-T-08	Search File with REGEX	Search File
F-T-09	Search File with MATCH CASE	
F-T-10	Search File with REPLACE	
F-T-11	Set Line Numbers	Set Configuration
F-T-12	Set Syntax Highlight	
F-T-13	Set Wrap Content	
F-T-14	Set Use Monospace	
F-T-15	Set Read Only	
F-T-16	Set Font Size	
F-T-17	Set Theme	
F-T-18	Set Accessory View	
F-T-19	Set Use the storage Access Framework	
F-T-20	Set Keyboard Suggestion and Swipe	
F-T-21	Set Auto Save	
F-T-22	Set Encoding	
F-T-23	Set Ignore Back Button	
F-T-24	Set Split The Text If Too Long	
F-T-25	Set Fullscreen Mode	
F-T-26	Set Open Last Viewed File At Startup	

1.3 Approach Refinements

本次計畫使用 User Scenarios 測試技巧，將使用者操作案例之步驟逐步以 APP UI 測試自動化框架之腳本撰寫之，進行自動化測試。

1.4 Test Identification

Test ID	Description	Related Use Case
TD-01	Create New File	Create File
TD-02	Open File	Read File
TD-03	Read File's Info	
TD-04	Rename File	Update File
TD-05	Edit File	
TD-06	Undo Editing	
TD-07	Redo Editing	
TD-08	Search File with REGEX	Search File
TD-09	Search File with MATCH CASE	
TD-10	Search File with REPLACE	
TD-11	Set Line Numbers	Set Configuration
TD-12	Set Syntax Highlight	
TD-13	Set Wrap Content	
TD-14	Set Use Monospace	
TD-15	Set Read Only	
TD-16	Set Font Size	
TD-17	Set Theme	
TD-18	Set Accessory View	
TD-19	Set Use the storage Access Framework	
TD-20	Set Keyboard Suggestion and Swipe	
TD-21	Set Auto Save	
TD-22	Set Encoding	
TD-23	Set Ignore Back Button	
TD-24	Set Split The Text If Too Long	
TD-25	Set Fullscreen Mode	
TD-26	Set Open Last Viewed File At Startup	

1.5 Item Pass/Fail Criteria

Test Item 的 Pass/Fail 判斷標準，分為下列兩種方式：

一、以 User Scenario Technique 設計之測試案例：以一功能之敘述句，在測試執行後是否成立為 Pass/Fail 標準，假使功能測試執行後，使敘述句成立則 Pass；反之則 Fail，而本次測試之目標為使所有與 1.2 Features to be Tested 及 1.4 Test Identification 有關之 Test Case 通過測試(Pass)，證明軟體有達成使用案例的需求。

二、以 Control-Flow Graph Coverage Technique 設計之測試案例：以 Basis Path Approach，須覆蓋所有分支，意即 Statement Coverage 及 Branch Coverage 是 100%，證明測試案例是有實際將該段程式碼執行過的。

不論判斷標準為何，最終希望本次測試能夠達成 80%的 Code Coverage，證明因為測試涵蓋這麼高的覆蓋率，所以測試的結果是可以信任的。

2. Test Case Specification

2.1 Test Case Specification Identifier

NTUT-108-STV-TurboEditor_TCS。

2.2 Test Cases

Test Case ID	TC-01
Test Case Name	Create File
Related Use Case	UC-01
Related Test Item	TD-01
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button 3. Click "New file" on menu. 4. Input file name. 5. Save the file.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up for choosing directory and entering name. 3. Empty new file shows up on the screen for entering content.

Test Case ID	TC-02
Test Case Name	Read File
Related Use Case	UC-02
Related Test Item	TD-02、TD-03
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button. 3. Click "Open a file" on menu. 4. Select a file to open.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up. 3. The selected file opens after clicking on it. 4. File content displays on the editor.

Test Case ID	TC-03
Test Case Name	Update File
Related Use Case	UC-03
Related Test Item	TD-04、TD-05、TD-06、TD-07
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button. 3. Click "Open a file" on menu. 4. Select an existing file to open. 5. Edit content of the opened file. 6. Click undo button. 7. Click redo button. 8. Click save button. 9. Click “Save”. 10. Click menu of processing file. 11. Click rename button. 12. Enter new file name. 13. Click “OK”. 14. Click menu button. 15. Click “Open a file” button. 16. Select the file just renamed. 17. Edit content. 18. Click save button. 19. Click “Save as” 20. Enter new file name. 21. Choose directory. 22. Click “SAVE”. 23. Click menu button. 24. Click “Open a file” 25. Select the file just saved.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up. 3. The selected file opens after clicking on it. 4. Original content displays on the editor. 5. Change of content displays on the editor. 6. The change is undone after clicking undo button. 7. The change is redone after clicking redo button.

	8. The menu of processing file shows up at the top-right corner of the screen. 9. Rename dialogue pops up for new file name. 10. Message of file cannot be renamed at the bottom of editor. 11. “Save as” dialogue pops up for file “Name” and “Folder”. 12. File explorer shows up for choosing directory and entering name.

Test Case ID	TC-04
Test Case Name	Search File
Related Use Case	UC-04
Related Test Item	TD-08、TD-09、TD-10
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button 3. Click "Open a file" on menu. 4. Click search icon. 5. Enter text for searching. 6. Select the wanted file in searching results.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up. 3. Search field shows up for input 4. Search results displays on screen. 5. The selected file opens after clicking on it.

Test Case ID	TC-05
Test Case Name	Set Configuration
Related Use Case	UC-05
Related Test Item	TD-11、TD-12、TD-13、TD-14、TD-15、TD-16、TD-17、TD-18、TD-19、TD-20、TD-21、TD-22、TD-23、TD-24、TD-25、TD-26
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button 3. Click "Preferences" on menu. 4. Enable the features.

	5. Disable the features.
Output Specification	1. Menu displays on the left side of screen. 2. Preferences menu displays on the right side of screen. 3. The selected feature toggle button is on. 4. The selected feature toggle button is off.

Test Case ID	TC-06
Test Case Name	Back When Create File
Related Use Case	UC-01
Related Test Item	TD-01
Scope	Turbo Editor
Input Specification	1. Launch Application. 2. Click menu button. 3. Click "New file" on menu. 4. Input file name. 5. Click “Back” button. 6. Click menu button. 7. Click "New file" on menu. 8. Input file name. 9. Save the file. 10. Type in some text. 11. Click “Back” button. 12. Click “No”.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up for choosing directory and entering name. 3. Empty new file shows up on the screen for entering content. 4. Change of content displays on the editor. 5. “Save” dialogue pops up for save the file. 6. APP goes back to main menu.

Test Case ID	TC-07
Test Case Name	Close APP When Create File
Related Use Case	UC-01
Related Test Item	TD-01
Scope	Turbo Editor

Input Specification	1. Launch Application. 2. Click menu button. 3. Click "New file" on menu. 4. Input file name. 5. Close the app. 6. Launch Application. 7. Click menu button. 8. Click “Open a file” on menu. 9. Search for the file name input at step 4. 10. Launch Application. 11. Click menu button. 12. Click "New file" on menu. 13. Input file name. 14. Save the file. 15. Type in new text. 16. Close the app. 17. Launch Application. 18. Click menu button. 19. Click “Open a file” on menu. 20. Select the file created at step 10.
Output Specification	1. Menu displays on the left side of screen. 2. File explorer shows up for choosing directory and entering name. 3. Empty new file shows up on the screen for entering content. 4. Change of content displays on the editor. 5. File explorer shows up for selecting existing files. 6. Search field shows up for input. 7. Search results displays on screen. 8. The selected file opens after clicking on it. 9. APP closes. 10. Editor shows the file content before type in new text.

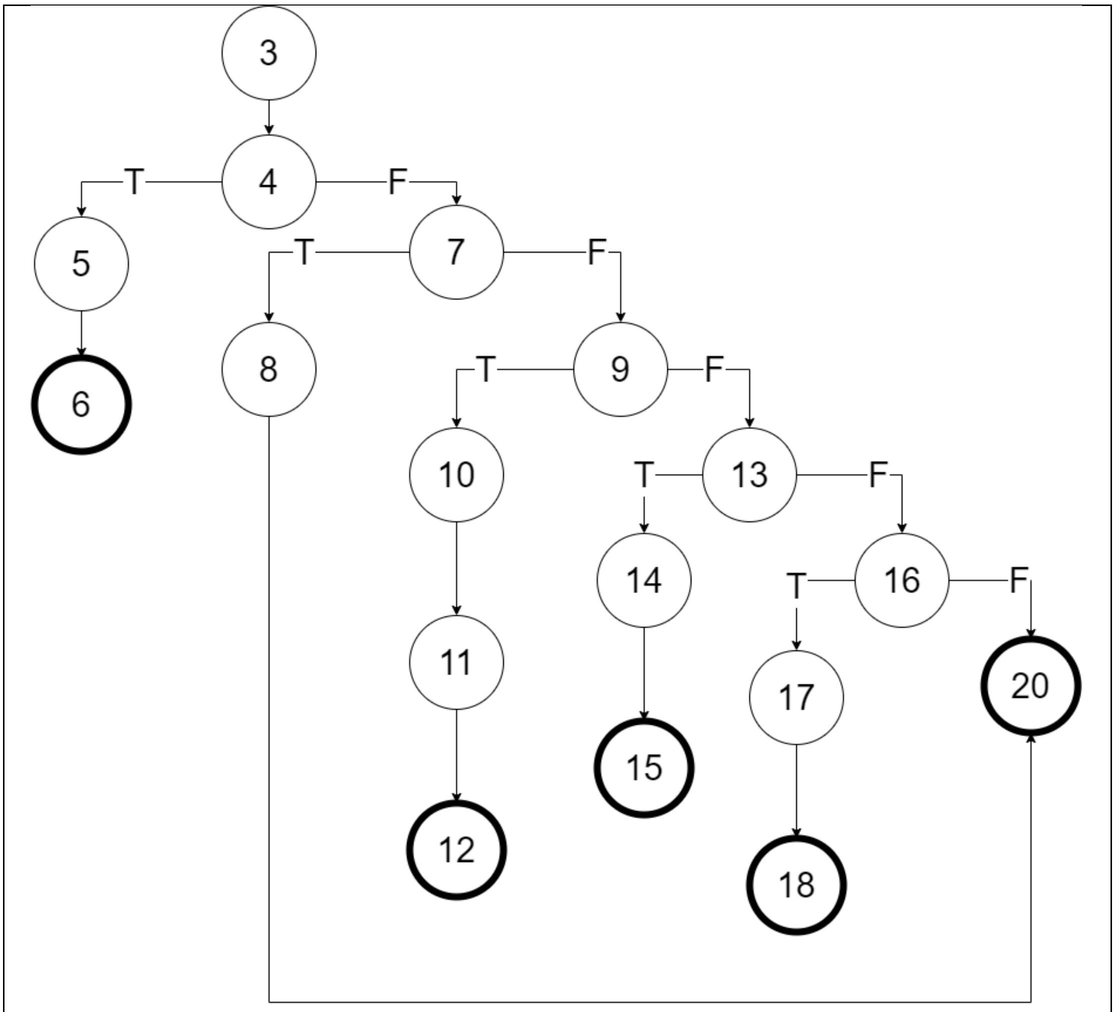
Test Case ID	TC-08
Test Case Name	onOptionsItemSelected
Scope	Turbo Editor

Source Code File Name	SelectFileActivity.java

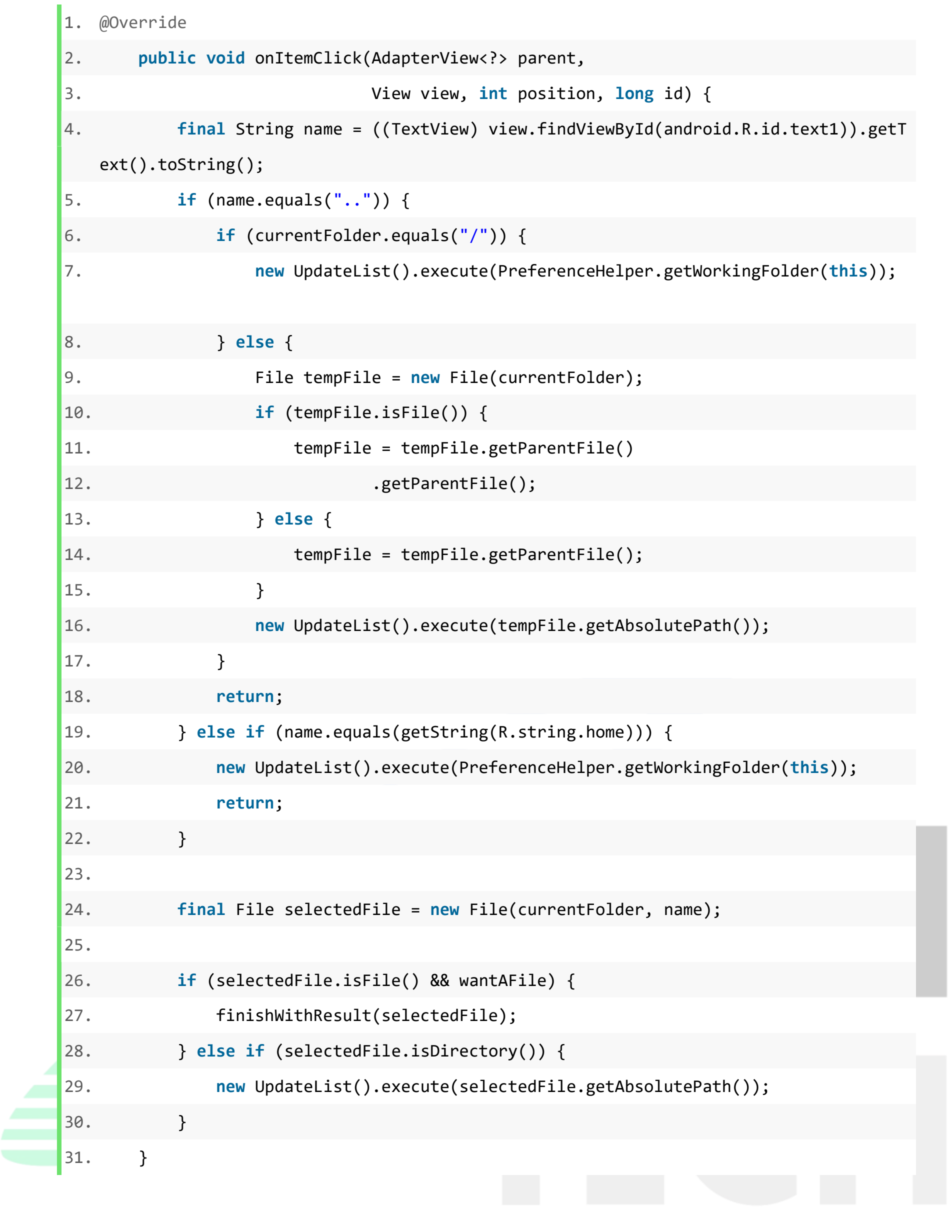
Source Code

```java
@Override
    public boolean onOptionsItemSelected(MenuItem item) {
        int i = item.getItemId();
        if (i == android.R.id.home) {
            finish();
            return true;
        } else if (i == R.id.im_add_file_or_folder) {
            ShowAddFileOrFolderPopup(findViewById(R.id.im_add_file_or_folder));
        } else if (i == R.id.im_set_as_working_folder) {
            PreferenceHelper.setWorkingFolder(SelectFileActivity.this, currentFolder);
            invalidateOptionsMenu();
            return true;
        } else if (i == R.id.im_is_working_folder) {
            Toast.makeText(getBaseContext(), R.string.is_the_working_folder, Toast.LENGTH_SHORT).show();
            return true;
        } else if (i == R.id.im_select_folder) {
            finishWithResult(new File(currentFolder));
            return true;
        }
        return super.onOptionsItemSelected(item);
    }
```

Control-Flow Graph

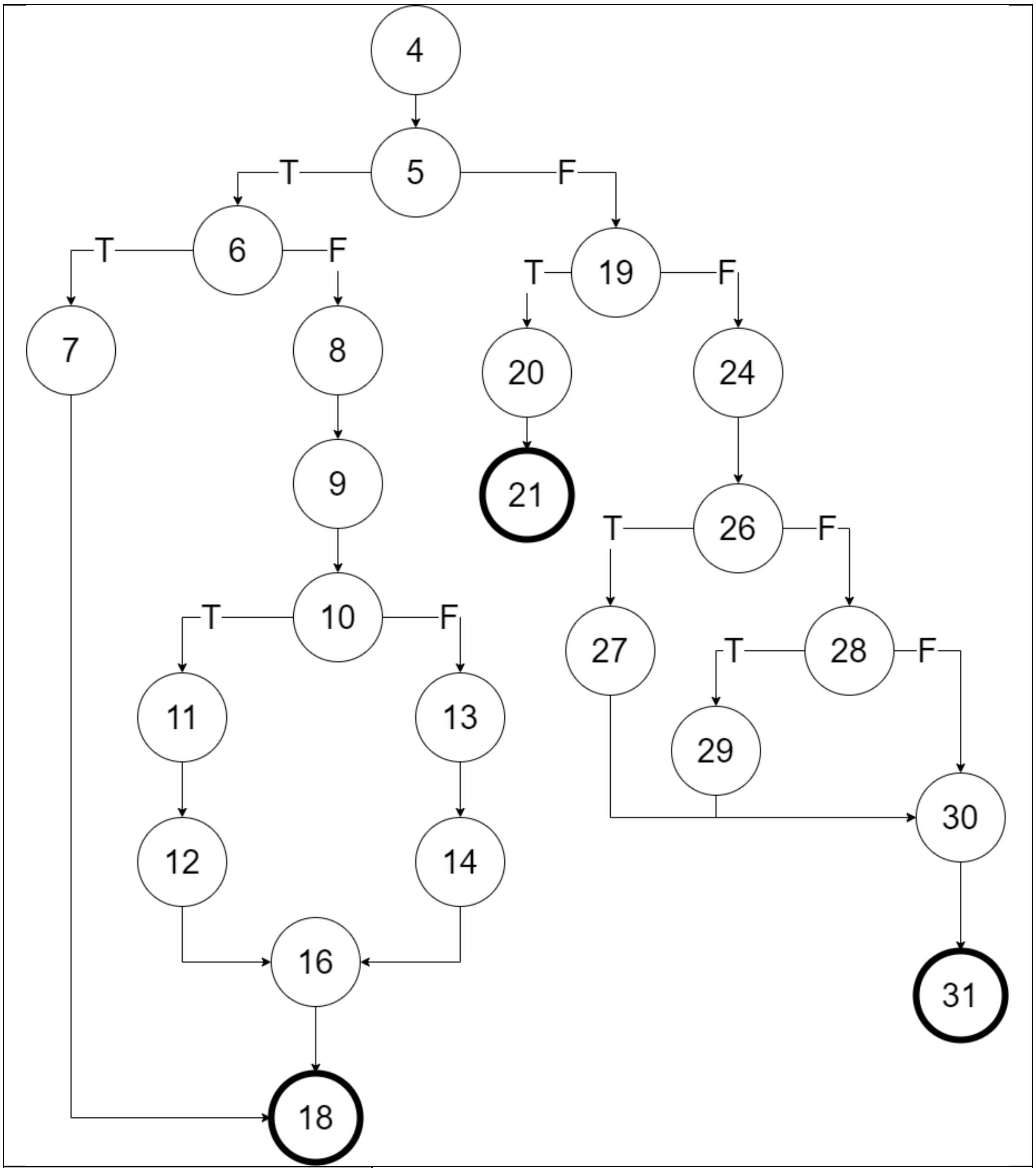
<table>
<tr><td colspan="2">
</td></tr>
<tr><td><b>Basis Path</b></td><td>[3, 4, 5, 6]
[3, 4, 7, 8, 20]
[3, 4, 7, 9, 10, 11, 12]
[3, 4, 7, 9, 13, 14, 15]
[3, 4, 7, 9, 13, 16, 17, 18]
[3, 4, 7, 9, 13, 16, 20]</td></tr>
</table>

<table>
<tr><td><b>Test Case ID</b></td><td>TC-09</td></tr>
<tr><td><b>Test Case Name</b></td><td>onItemClick</td></tr>
<tr><td><b>Scope</b></td><td>Turbo Editor</td></tr>
<tr><td><b>Source Code File Name</b></td><td>SelectFileActivity.java</td></tr>
<tr><td colspan="2">Source Code</td></tr>
</table>



```java
@Override
    public void onItemClick(AdapterView<?> parent,
                            View view, int position, long id) {
        final String name = ((TextView) view.findViewById(android.R.id.text1)).getText().toString();
        if (name.equals("..")) {
            if (currentFolder.equals("/")) {
                new UpdateList().execute(PreferenceHelper.getWorkingFolder(this));

            } else {
                File tempFile = new File(currentFolder);
                if (tempFile.isFile()) {
                    tempFile = tempFile.getParentFile()
                            .getParentFile();
                } else {
                    tempFile = tempFile.getParentFile();
                }
                new UpdateList().execute(tempFile.getAbsolutePath());
            }
            return;
        } else if (name.equals(getString(R.string.home))) {
            new UpdateList().execute(PreferenceHelper.getWorkingFolder(this));
            return;
        }

        final File selectedFile = new File(currentFolder, name);

        if (selectedFile.isFile() && wantAFile) {
            finishWithResult(selectedFile);
        } else if (selectedFile.isDirectory()) {
            new UpdateList().execute(selectedFile.getAbsolutePath());
        }
    }
```

Control-Flow Graph



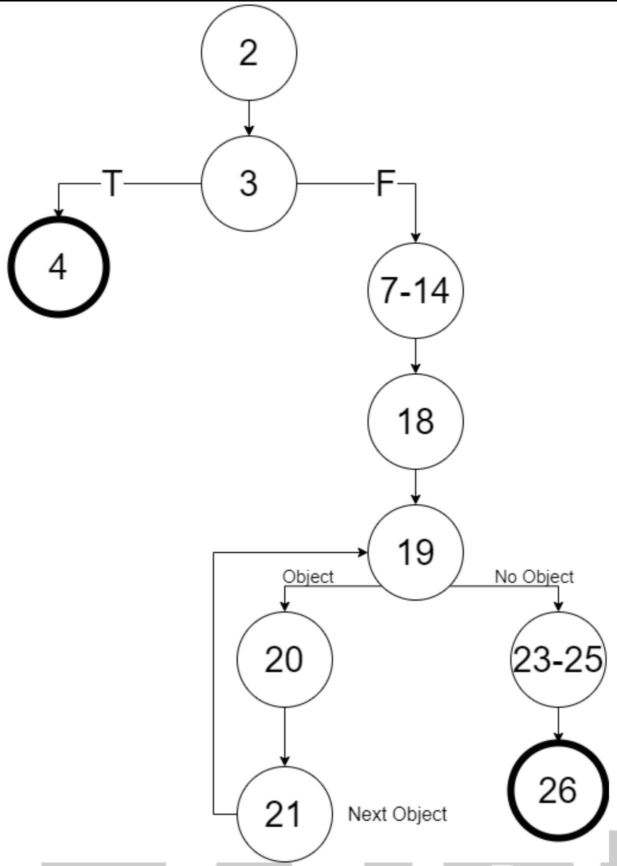
Basis Path	[4, 5, 6, 7, 18] [4, 5, 6, 8, 9, 10, 11, 12, 16, 18] [4, 5, 6, 8, 9, 10, 13, 14, 16, 18] [4, 5, 19, 20, 21] [4, 5, 19, 24, 26, 27, 30, 31] [4, 5, 19, 24, 26, 28, 29, 30, 31] [4, 5, 19, 24, 26, 28, 30, 31]

Test Case ID	TC-10
Test Case Name	undo
Scope	Turbo Editor
Source Code File Name	Editor.java

Source Code

```java
public void undo() {
        EditItem edit = mEditHistory.getPrevious();
        if (edit == null) {
            return;
        }

        Editable text = getEditableText();
        int start = edit.mmStart;
        int end = start + (edit.mmAfter != null
                ? edit.mmAfter.length() : 0);

        mIsUndoOrRedo = true;
        text.replace(start, end, edit.mmBefore);
        mIsUndoOrRedo = false;

        // This will get rid of underlines inserted when editor tries to come
        // up with a suggestion.
        for (Object o : text.getSpans(0,
                text.length(), UnderlineSpan.class)) {
            text.removeSpan(o);
        }

        Selection.setSelection(text,
                edit.mmBefore == null ? start
                        : (start + edit.mmBefore.length()));
    }
```

Control-Flow Graph

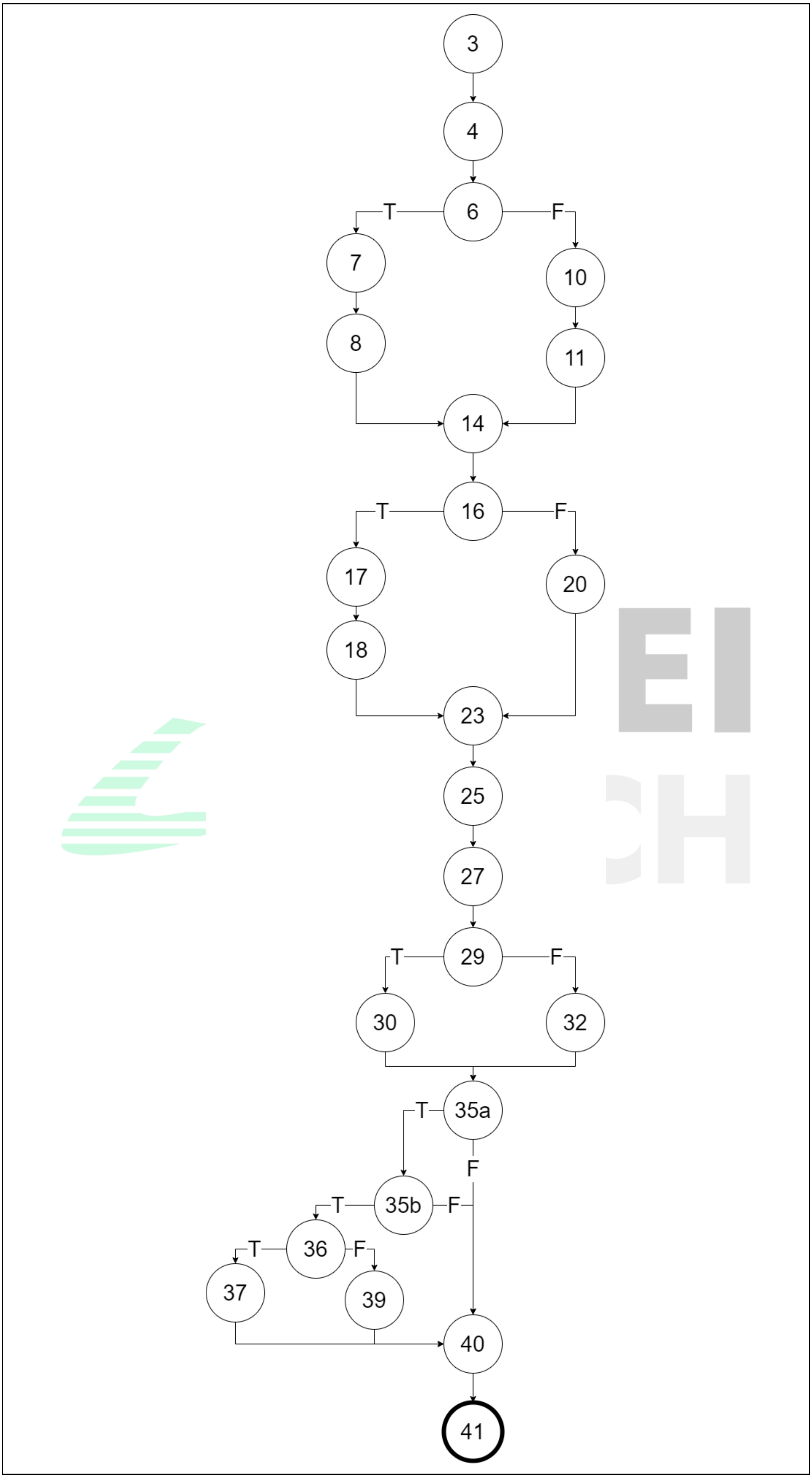


Basis Path	[2, 3, 4] [2, 3, 7-14, 18, 19, 20, 21, 19, 23-25, 26]

Test Case ID	TC-11
Test Case Name	replaceTextKeepCursor
Scope	Turbo Editor
Source Code File Name	Editor.java
Source Code	

```java
public void replaceTextKeepCursor(String textToUpdate) {

        int cursorPos;
        int cursorPosEnd;

        if (textToUpdate != null) {
            cursorPos = 0;
            cursorPosEnd = 0;
        } else {
            cursorPos = getSelectionStart();
            cursorPosEnd = getSelectionEnd();
        }

        disableTextChangedListener();

        if (PreferenceHelper.getSyntaxHighlight(getContext())) {
            setText(highlight(textToUpdate == null ? getEditableText() : Editable.Factory
                    .getInstance().newEditable(textToUpdate), textToUpdate != null));
        } else {
            setText(textToUpdate == null ? getEditableText() : textToUpdate);
        }

        enableTextChangedListener();

        int newCursorPos;

        boolean cursorOnScreen = cursorPos >= firstVisibleIndex && cursorPos <= lastVisibleIndex;


        if (cursorOnScreen) { // if the cursor is on screen
            newCursorPos = cursorPos; // we dont change its position
        } else {
            newCursorPos = firstVisibleIndex; // else we set it to the first visible pos
        }

        if (newCursorPos > -1 && newCursorPos <= length()) {
            if (cursorPosEnd != cursorPos)
                setSelection(cursorPos, cursorPosEnd);
            else
                setSelection(newCursorPos);
        }
    }
```

Control-Flow Graph


3
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27
29
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F
30
32
35a
T
F
35b
T
F
36
T
F
37
39
40
41

Basis Path	[3, 4, 6, 7, 8, 14, 16, 17, 18, 23, 25, 27, 29, 30, 35a, 35b, 36, 37, 40, 41] [3, 4, 6, 7, 8, 14, 16, 17, 18, 23, 25, 27, 29, 30, 35a, 35b, 36, 39, 40, 41] [3, 4, 6, 10, 11, 14, 16, 20, 23, 25, 27, 29, 32, 35a, 40, 41]

2.3 Environmental Needs

本測試考量測試中觀測及紀錄(文字、圖像及影像)的方便性，將計畫於個人電腦(PC)上之 Android 模擬器，透過框架進行 APP UI 自動化測試，其硬體規格及軟體規格如下。

Hardware Specification and Configuration		
種類	**描述**	**備註**
中央處理器	Intel® Core™ i7-4770	
圖形處理器	Intel® HD Graphics 4600	位於中央處理器內
硬碟	INTEL SSDSC2CT240A4	Intel® SSD 335 Series
記憶體	DDR3-1333	16 GB
顯示器	VW247N、VN289N	

Software Specification and Configuration		
名稱	**版本**	**備註**
Microsoft Windows 10 專業版	1903	
Android Studio	3.6.2	SDK Platform Required
Appium	1.15.1	Appium Doctor Required

2.4 Environmental Setups

- ✓ Android Studio
- ✓ Android Virtual Device
- ✓ SDK Platforms:
  - ✧ Android 10.0(Q)
- ✓ SDK Tools:
  - ✧ Android SDK Build-Tools
  - ✧ Android SDK Command-line Tools
  - ✧ Android Emulator
  - ✧ Android SDK Platform-Tools
  - ✧ Android SDK Tools
  - ✧ HAXM
- ✓ Appium
  - ✧ Node.js
  - ✧ npm install -g appium

    - ✧ npm install -g appium-doctor
    - ✧ set ANDROID_HOME
    - ✧ set JAVA_HOME
    - ✧ set path %ANDROID_HOME%/platform-tools
    - ✧ set path %ANDROID_HOME%/tools
    - ✧ set path %JAVA_HOME%/bin
    - ✧ install ffmpeg
- ✓ Appium Desktop

2.5 Special Procedural Requirements

無。

2.6 Intercase Dependencies

無。

Glossary

SUT

軟體系統測試則通常是以被測系統（System Under Test，SUT）表示正在被測試的系統，目的是測試系統是否能正確操作。這一詞語常用於軟體測試中。[1]

Android

Android（讀音：英：['ændrɔɪd]，美：['ænˌdrɔɪd]），中文常譯作安卓或安致，是一個基於Linux核心的開放原始碼行動作業系統，由Google（Google）成立的開放手機聯盟持續領導與開發，主要設計用於觸控螢幕行動裝置如智慧型手機和平板電腦與其他可攜式裝置。[2]

APP

A short of “Application”

Turbo Editor

Simple, Powerful and Open Source Text Editor for Android. Built following the latest Android Guidelines to make the experience the most intuitive on the Store, also on Tablets![3][4]

Appium

Appium is an open source test automation framework for use with native, hybrid and mobile web apps.

It drives iOS, Android, and Windows apps using the WebDriver protocol.[5]

Reference

[1] 被測系統(Wikipedia) https://zh.wikipedia.org/wiki/%E8%A2%AB%E6%B5%8B%E7%B3%BB%E7%BB%9F

[2] Android(Wikipedia) https://zh.wikipedia.org/wiki/Android

[3] Turbo Editor(Google Play) https://play.google.com/store/apps/details?id=com.maskyn.fileeditor

[4] Turbo Editor(Github) https://github.com/vmihalachi/turbo-editor

[5] Appium http://appium.io/

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