

Literate Functional Testing

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Literate...



- Literate Programming
 - *Donald Knuth*
- Linguistics
 - ideas from natural language in code



... Functional ...

- XP: incremental delivery
- Small functional units: “stories” prioritised by customer



...Testing

- XP: emphasis on automated testing
- Unit testing
 - JUnit [Beck and Gamma]
 - jMock [Freeman, Mackinnon, Pryce, Walnes]
- Functional testing
 - HttpUnit [Gold]
 - HtmlUnit [Bowler]



Influences

Literate Style + HtmlUnit + jMock

=

Literate Functional Testing



Using Code to Communicate

- Among developers
- Among developers, business analysts, and customers



Principles

- High-level
- Readable
- Writable
- Composable
- Extensible



```
WebResponse formPage = getIndexPage();
WebForm form = formPage.getForms()[0];
form.setParameter(FROM, UNAMBIGUOUS_STATION_TEXT);
form.setParameter(TIME, "17:00");
form.setParameter(MODE, RAIL);
WebResponse resultsPage = form.submit();
checkTitle(resultsPage, DEPARTURES_AND_ARRIVALS_SEARCH);
checkContains(resultsPage, "(" + STATION_CODE + ")");
WebTable[] tables = resultsPage.getTables();
WebTable resultsTable = tables[0];
String time = resultsTable.getCellAsText(1,1);
String realTime = resultsTable.getCellAsText(1,2);
checkRealTime(time, realTime);
WebLink link = resultsPage.getLinkWith(time);
assertNotNull("calling pattern link not found", link);
```



Starting from Scratch



Home menu

Departures & arrivals

Travel news

Departures & arrivals in Welsh

skyactive 

online info goes here

Travel news

For area...

All UK (excl N. Ireland)

South West

South East

London

East Anglia

East Midlands

West Midlands

Yorkshire & Humber

North West

North East

Scotland

Wales


Transport type

All Public


Delays

All Major

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Please choose an area
from the list

Travel news: all UK (ex. N. Ireland), all transport types, major delays

Incident summary

A4054 Cardiff: Closure both ways at Radyr

M25 Surrey: Restriction anticlockwise at J13

M40 Warwickshire: Restriction Southbound at J15

A3216 London: Closure both ways at Battersea

M8 Glasgow City: Accident Westbound at J13

M40 Warwickshire: Hazard Southbound at J16

A38 Derbyshire: Closure Southbound at Ripley

Southern services at Battersea Park disrupted

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online info goes here

Assert that the current page has three select boxes named region, transport type and delays.

Assert that the regions select box has between 9 and 12 elements, including London and the South East.

assert that the current page has three
select boxes named region, transport
type and delays

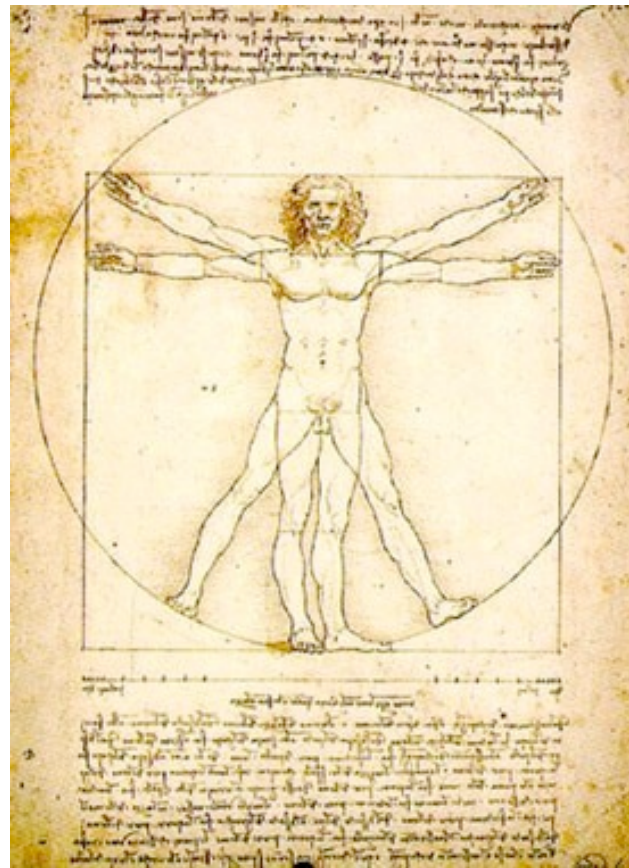

```
assert that ( the current page ,  
has ( three , select boxes ) . named(  
region, transport type , delays ) )
```

```
assertThat(theCurrentPage,  
has(exactly(3), selectBoxes().named(  
"region", "transport type" , "delays" )));
```

```
assertThat(theCurrentPage,  
has(selectBox("region")  
.with(between (9,12), options()  
.including ("London", "South East" ))));
```



A Little Anatomy



```
assertThat(theCurrentPage,  
    has(selectBox().labelled("Region")));
```

```
assertThat(theCurrentPage,  
    has(selectBox().labelled("Region")));
```

```
assertThat(theCurrentPage,  
    has(selectBox().labelled("Region")));
```

```
assertThat(theCurrentPage,  
    has(selectBox().labelled("Region")));
```



```
assertThat(theCurrentPage,  
    has(selectBox().labelled("Region")));
```

between(9,12)

between(9).and(12)





Demo

- Go to the index page
(www.google.co.uk)
- Assert that page has title "Google"
- Click on link "Images"
- Enter "kizoom" into text field
- Click on button "Search Images"
- Assert that page has text "Kizoom
summer party"



Features

- Actions
- Implicit variables
- Matchers
- Refinements
- Constraints
- Consequences
- Considerations



Features: Actions

- Examples:

```
goToTheIndexPage()
```

```
clickOn(link("Images"));
```



Features: Implicit Variables

- Example:

```
assertThat(page, has(title("Google")));
```

- Anaphoric it:

```
assertThat(box.getFruit(), isNotNull());
```

```
assertThat(it,  
    has(property("colour", eq("yellow"))));
```




Features: Matchers

- Examples:

```
clickOn(link("Images"));
```

```
assertThat(page, has(title("Google")));
```



Features: Refinements

- Example:

```
assertThat(it, has(image().
```

```
    withUrlThat(endsWith("summer04.jpg"))));
```



Features: Constraints

- Example:

```
assertThat(page, has(title("Google")));
```

- Synonyms:

```
assertThatAll(cells(), has(link()));
```

```
assertThatAll(cells(), have(link()));
```



Features: Consequences

- Example:

```
boolean a = true;
```

```
boolean b = false;
```

```
assertThat(a, eq(true),  
           otherwise("a should be true"));
```

```
assertThat(b, eq(true),  
           otherwise("b should be true"));
```

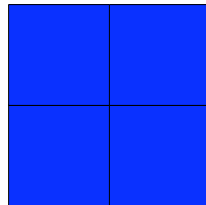


Features: Considerations

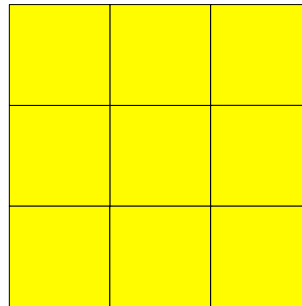
- Example:

```
considering(table().withId("2x2"));  
assertThat(it, has(2, rows()));  
assertThatAll(rows(), have(2, cells()));
```

2x2



3x3





Adoption Experiences



```
public void testNavigatingToPurchaseSingleTicket()
    throws Exception {

    goToTheIndexPage();
    planDefaultSingleJourney();
    getFaresForNumberOfAdultsAndChildren(1, 0);

    considering(row().with(cell().with(link(
        "Saver Single"))).from(outwardFaresTable()));
    selectAny radioButton();
    considering(theWholePage());

    assertThat(page, doesntHave(returnFaresTable()));
    clickOn(imageButton().withId("purchasetickets"));

    checkPurchaseTicketsPage();
    assertThat(page, doesntHave(returnTable()));
    assertThat(outwardTable(), has(text(
        "London Euston to Manchester Piccadilly")));
}
```




Language Barriers





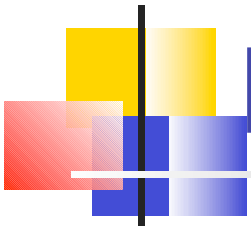
Conclusions

- Java API for writing literate tests
- Adapt coding style to natural language
- Show intention clearly
- Cross team discussion point
- Adoption hard work but benefits shown



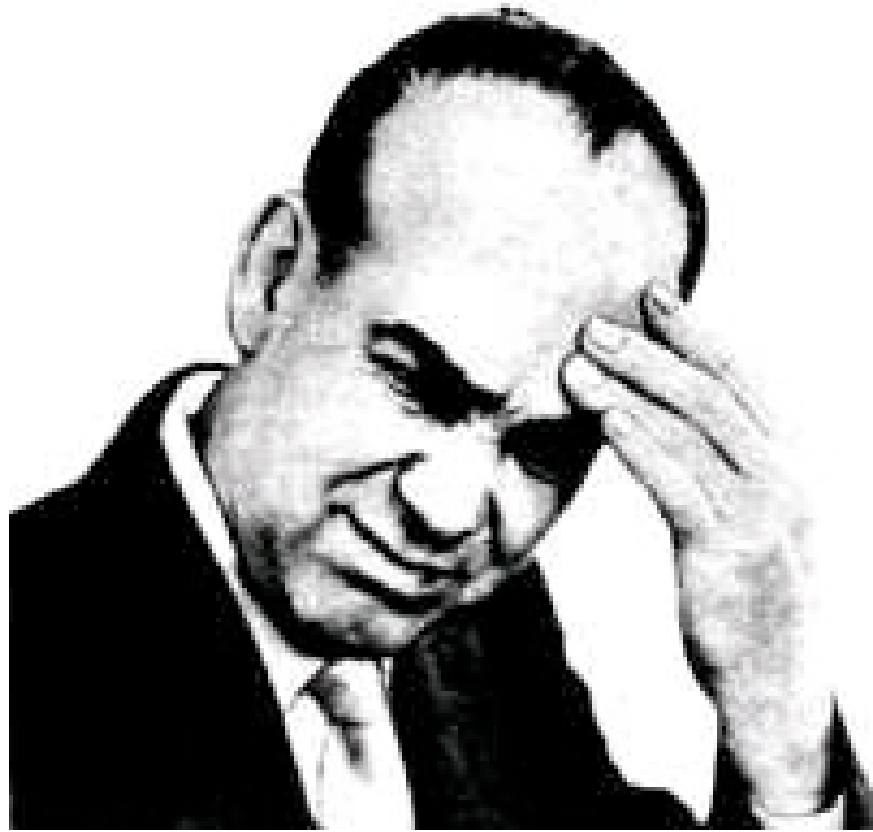
What next?

- Open Source release
- HamCrest
- Other languages?
- Other domains?
- Make application code more literate?



Further Information

- Project page:
<http://code.google.com/p/literate/>
- robert@chatley.com
- tom@tiling.org







Source Code

```
public class GoogleTest extends
    NavigatingLiterateFunctionalTestBase {
    public void testImageSearch() throws Exception {
        goToTheIndexPage();
        assertThat(page, has(title("Google")));
        clickOn(link("Images"));
        enter("kizoom", into(textField()));
        clickOn(button("Search Images"));
        assertThat(page, has(text("Kizoom summer party")));
        assertThat(it,
            has(image().withUrlThat(endsWith("summer04.jpg"))));
    }
}
```