Interactive Television Applications

1 Abstract

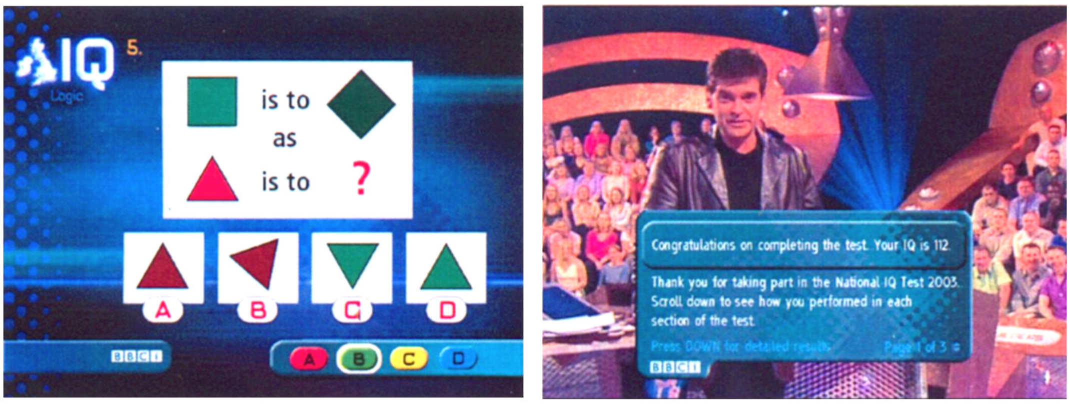
Digital television allows interactive content to accompany standard broadcasts. The development of bespoke interactive content is expensive. You are to design a system that will allow the non-technical producers of television programmes to build interactive content from a set of high-level building blocks.

In effect, you will create a modelling language (metamodel, rules and symbols), a tool supporting it, and a generator.

2 Background

Digital television is becoming increasingly popular in the UK. In addition to providing higher quality video and increased channel capacity, it allows interactive content to accompany standard broadcasts. Interactive applications have been used to enhance traditional broadcasts in many ways:

- Viewers can play along with quizzes (Figure 1).
- Viewers can choose different camera angles during sporting events.
- Viewers can take part in discussions and comment on events though message boards.
- Viewers can remind themselves of the important developments in a drama's plot (Figure 2).

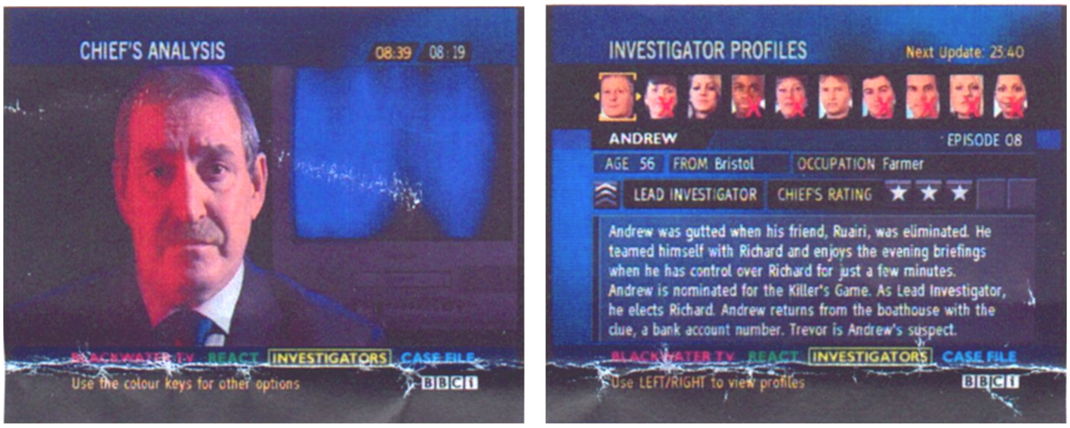


Congratulations on completing the test. Your IQ is 112.

Thank you for taking part in the National IQ Test 2003. Scroll down to see how you performed in each section of the test.

Press DOWN for detailed results. Page 1 of 3

Figure 1. Playing along with *Test the Nation*



Andrew was gutted when his friend, Ruairi, was eliminated. He teamed himself with Richard and enjoys the evening briefings when he has control over Richard for just a few minutes. Andrew is nominated for the Killer's Game. As Lead Investigator, he elects Richard. Andrew returns from the boathouse with the clue, a bank account number. Trevor is Andrew's suspect.

Figure 2. Viewing developments in *The Murder Game*

3 Problem

Currently, each interactive application is bespoke. This greatly limits the number of programmes that can be accompanied by interactive content, as the applications are expensive to develop. The resulting UI is also different for different programmes, which is confusing to users. You are to design a system that will allow non-technical producers to build applications to accompany their programmes.

The application will sit on the right hand side of the screen (Figure 3), and display one of the following pieces of content:

- A page of text, to be used for news stories, background information etc.
- A multiple choice vote, for example "Man of the match" in a football match.
- A menu that allows the user to view items of content, including sub-menus.

The basic on-screen layout and navigational structure of the application has been defined by the user experience department, and producers aren't able to change it.

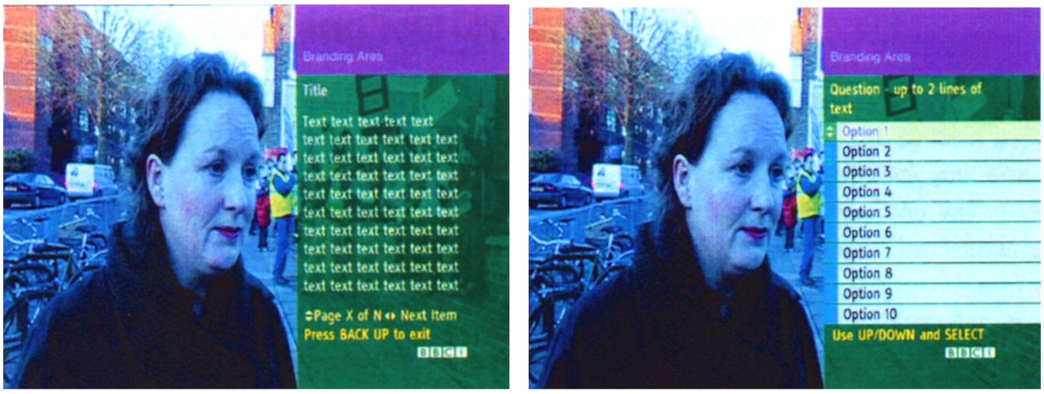

Branding Area
Title
Text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
text text text text text text
⇕Page X of N ↔ Next Item
Press BACK UP to exit
BBCi
Branding Area
Question - up to 2 lines of text
Option 1
Option 2
Option 3
Option 4
Option 5
Option 6
Option 7
Option 8
Option 9
Option 10
Use UP/DOWN and SELECT
BBCi

Figure 3. Different types of content

4 Use cases

The following set of use cases emerged during discussions with the producers. They are ordered by their value to the producers, with the use case giving the most value first.

4.1 Case 1

A producer would like to build an application for the soccer world cup finals, listing the teams and information about each, and allowing viewers to vote for the most likely winner.

4.2 Case 2

As Case 1, but the teams should be listed by group (e.g. four teams in three groups). As the teams are known before their division into groups by lots, it should be possible to define the content for the teams first, and quickly add the structure of the groups, so that the application can be running for users as soon as possible during the program that broadcasts the division by lots.

4.3 Case 3

A producer would like to use a page of text to provide analysis of the recent events in a rugby match. A journalist with a laptop will need to change the text on the page throughout the match. The user interface used by the journalist should not allow him to change the structure of the whole application, only edit the text.

4.4 Case 4

A producer has decided that the wording of a particular text page was better before the last set of changes, and would like to revert it.

5 Interactive application architecture

Designing interactive applications requires relatively detailed knowledge of the standards for each platform. For this reason, you should concentrate on the system used by producers to define the application content, and its interfaces to black box components that build the actual application. To define these interfaces, you will need some knowledge of the basic architecture of interactive applications. The following crash-course should suffice.

Digital televisions contain a basic operating system, and a set of libraries providing functions to display text and graphics, change the currently displayed video stream, etc. Applications are designed and specified with a domain-specific modelling language (that you develop) and delivered to digital televisions by inserting it as XML into the same broadcast stream that contains the video and audio content. Once running, an application can be updated by changing the XML in the broadcast stream. Applications can send reply messages to your system, usually via a standard modem built into the television. Sending these reply messages is very slow, and involves the viewer paying call charges. For these reasons, reply messages can only be used for viewer initiated actions, such as responding to a vote.

6 Code generation

You should generate code like the following as plain text, rather than using any special method for saving models as XML. This puts the various tools on an even footing, and demonstrates the code generation facilities better for all kinds of code and other output files. Handling white space and encodings is not vital, but the results should be machine and human-readable.

```
<TVApp name=”World Cup 2010”>
    <Menu name=”World Cup”>
        <Vote name=”Who will win?”>
            <Choice name=”Estonia”/>
            <Choice name=”Lithuania”/>
        </Vote>
        <Text name=”World Cup trivia”>Trinidad &amp; Tobago were the first …</Text>
        <Menu name=”Teams”>
            …
        </Menu>
    </Menu>
</TVApp>
```