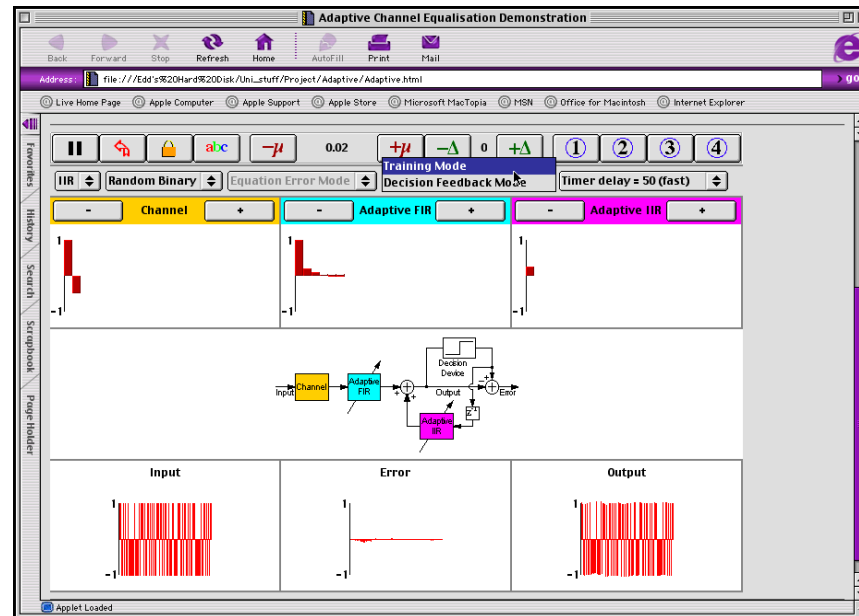


Adaptive Channel Equalisation Demonstration Tool

User manual

1. Introduction

This Java applet is designed as a demonstration tool that will aid learning about adaptive channel equalisation. It features an easy to use graphical interface, that allows access to all of the features of the tool. The applet is widely customisable, allowing a large variety of systems to be loaded and demonstrated.



The tool represents the channel that is being equalised as finite impulse response (FIR) filter, which distorts data being transmitted. The equaliser is implemented as an FIR filter or an infinite impulse response (IIR) filter. The different equalisation filters are available so that their relative benefits and costs can be observed. The filter coefficients are represented as red bars that change as the filters adapt. The input, error and output are also plotted to show how their values change over time.

Current, uncustomised versions of Netscape Navigator use their own internal Java implementation that does not support Swing. Navigator is therefore not currently compatible with this applet, although there are several 'plug-ins' that allow Navigator to be customised to use the host computer's virtual machine. Recent versions of Microsoft Internet Explorer support Swing and will run the applet. An alternative to running the applet in a web browser is to use Java's appletviewer.

From experience the applet requires a minimum of a Pentium II 233 or equivalent, for reasonable performance. This is however very dependant on the virtual machine installed on the particular machine. Ideally, the Java implementation should contain a 'Just-in-Time' compiler and use 'native threads', since these help to increase execution speed.

2.2 Running the Applet

In a web browser:

- Point the web browser at the appropriate URL.

Using the appletviewer:

- Windows and UNIX - at the command line type appletviewer and pass the URL or path of the HTML file as a parameter (where 'file.html' is the name given to the HTML file):

```
appletviewer http:// .... /file.html
```

- MacOS - run the 'Apple Applet Runner', that was installed with 'MacOS Runtime For Java' and select 'Open Location' from the File menu. Enter the URL into the resultant dialog box.

2.3 HTML File

2.3.1 Applet Tag

The HTML file must contain an <applet> tag, in order to run the tool. The class files and other required files are contained within the file Equalise.jar. The applet tag must include at least the following:

size. However, the cross-platform 'look and feel' generally has smaller buttons than the native look and feel under both MacOS and Windows, allowing smaller width values to be used.

2.3.2 Presets

The HTML file in which the applet is embedded, contains a list of 'presets' for the tool. These allow the user to alter the preset channel models that are loaded by the applet, without access to the source code.

These 'presets' are defined as parameters in HTML, which the applet reads in, when it is initialised. Below is a sample of how these parameters are defined:

```
<PARAM NAME = preset1_0 VALUE = 1.0>
<PARAM NAME = preset1_1 VALUE = -1.6>
<PARAM NAME = preset1_2 VALUE = 0.55>
<PARAM NAME = preset1_mu VALUE = 0.0075>
<PARAM NAME = preset1_fir VALUE = 8>
<PARAM NAME = preset1_iir VALUE = 4>
<PARAM NAME = preset1_delay VALUE = 8>
```

These parameters must be between <applet> and </applet>.

They are defined as:

```
<PARAM NAME = presetX_Y VALUE = Z>
```

Where:

- X = preset number (integer).
- Y = coefficient number (integer).
- Z = value (double).

Where the type of variable expected by the applet is shown in parentheses.

The coefficient value Y can also be a string; mu, fir, iir, delay, tooltip.

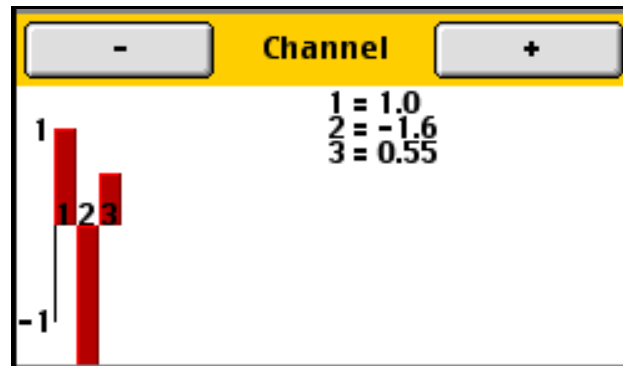
- 'mu' is the value of the coefficient mu (double)
- 'fir' is the length of the FIR adaptive filter (integer).
- 'iir' is the length of the iir part of the adaptive filter (integer).
- 'delay' is the length of the feed-forward delay in the system (integer).
- 'tooltip' is the text that appears when the cursor is over the preset button (String).

used. If the native 'look and feel' cannot be loaded, the applet defaults to using the cross-platform 'look and feel'.

3. Operation Instructions

3.1 Filters

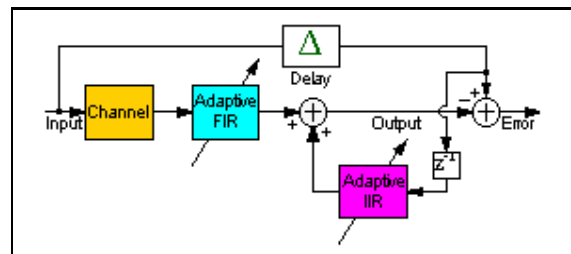
The channel and the adaptive filters are represented by bar graphs, these show the filter coefficients as dark red bars. The coefficients of the channel being equalised can be adjusted by clicking on the appropriate bar to move it to the required value.



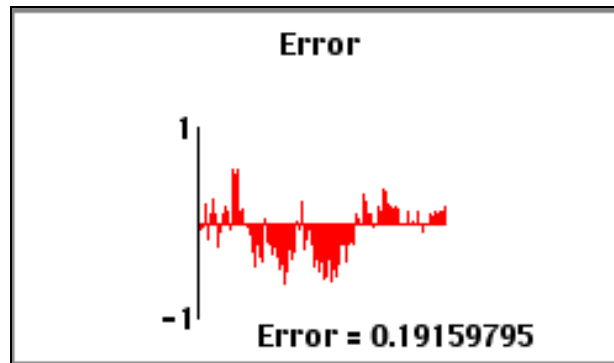
The colour of the top of each filter graph corresponds to the filter of that colour in the diagram, described below. The number of coefficients within a filter can be altered using the '+' and '-' buttons at the top of the bar graph.

3.2 Diagram of System Configuration

The centre panel of the applet displays a diagram of the current system arrangement. The panel responds to user changes to the configuration of the equaliser.



The colour of each filter in the diagram is the same as to the colour of the title bar of the



These graphs allow the effect of the equalisation filter to be observed in real time giving a visual representation of the past and present signal values.

3.4 Toolbar

The applet is operated in a normal 'point and click' manner.

Along the top of the applet is a toolbar allowing quick access to many of the features.



The function of each button is given below:



Pause - pauses the system



Reset - resets the adaptive filters



Hold - hold adaptive filters at current values



Text Toggle - turns text drawing on/off (shows filter coefficient values and current values of input, output and error).



-u - decreases the value of the coefficient mu

3.5 Menus

The applet contains 5 pull down menus.



These provide the ability to alter various aspects of the system:

- Select FIR or IIR equaliser.
- Select the input type, whitenoise or random binary.
- Select equation error or output error (greyed out if FIR is selected).
- Select training mode or decision feedback (greyed out if FIR is selected).
- Alter the speed at which the applet runs.