MEME Tutorial

Generating similar charts from different datasources

Draft paper

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1 Introduction

This paper describes how it is possible to create several basically similar charts with MEME, using a *template* chart already created and a basic script.

Beginner programming skills are required, since this feature involves automatic XML file generation, and reveals some of the internal tricks of MEME.

1.1 Requirements

Requirements needed to finish this tutorial:

- Basic MEME user experience.
- Beginner knowledge in an arbitrary (scripting) programming language (we use Perl[1] in this document). This tutorial does not cover the usage of Perl, but the example code is very small and straightforward to follow even with beginner programming skills.
- The understanding of XML handling (reading and creating).

[1] For further information, visit http://www.perl.org

2 The Reference Model

The model evaluated in this tutorial is the model presented in the *MEME Tutorial*: the *Prisoner's Dilemma*. The model and its evaluation is discussed in details in the tutorial available on-line at http://mass.aitia.ai/documentation/manuals/meme-documentation.

The model (both in source and binary format) is included in each MEME build, available under the `MEME\documents\prisoners_demo\` directory. The simulation output `IPD.out` is also available, and it may be imported directly into a fresh install of MEME with the *Import...* function. This way the *MEME Tutorial* is not prerequisite of this one.

2.1 The Used MEME View

We used a slightly modified version of the basic view. The only modification is that we left `Strategies` custom script. The exact settings can be seen at Figure 1. The result should have exactly 25 rows (the exact values can be seen at Figure 2).

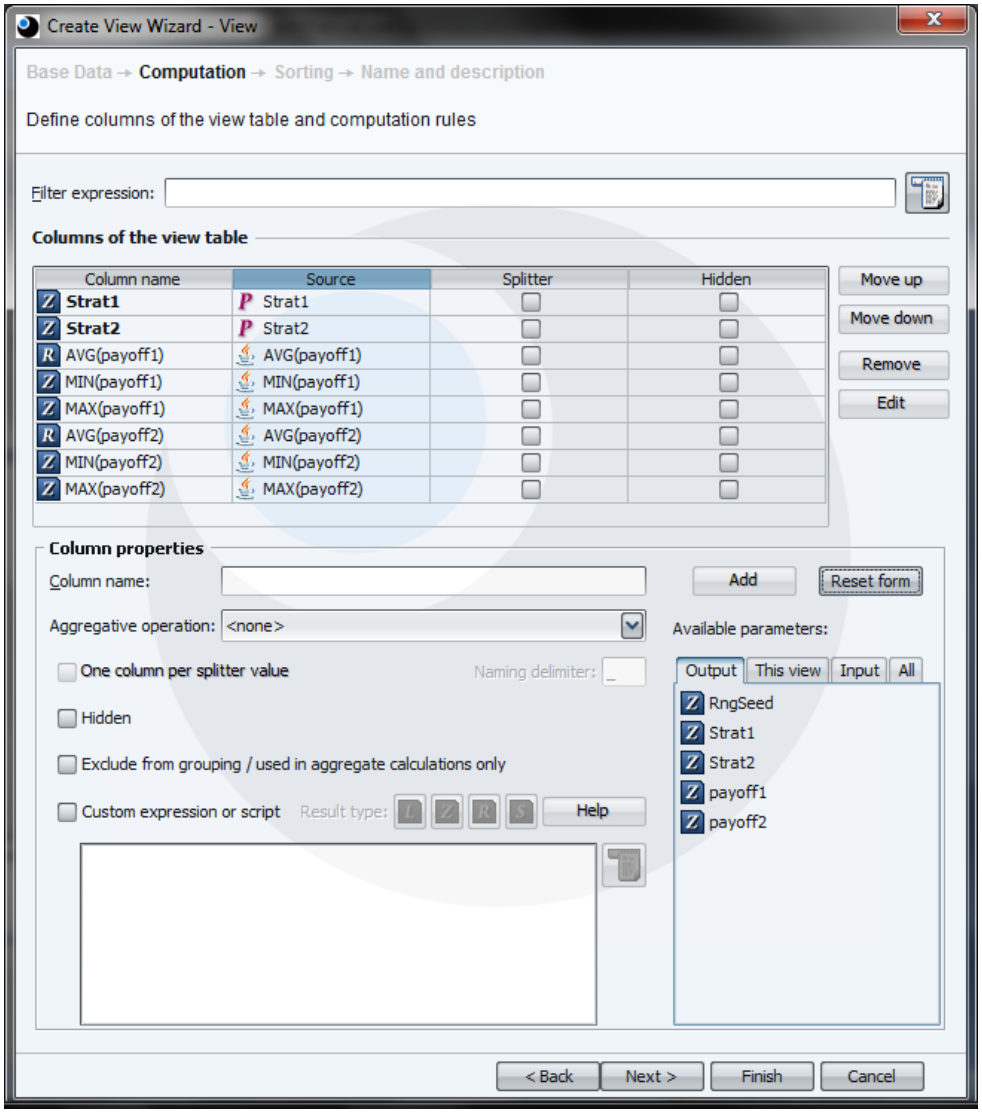
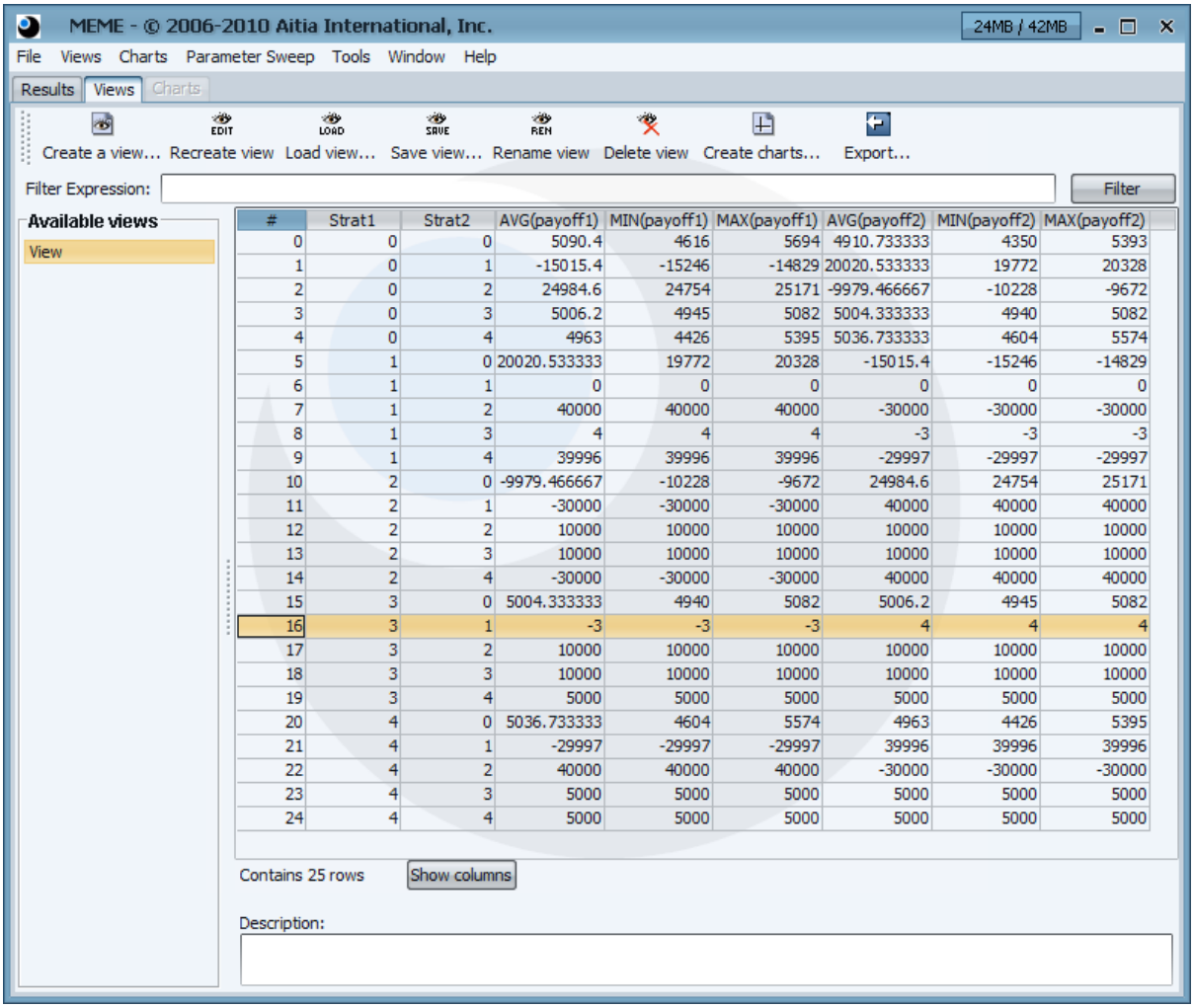


Figure 1 – View settings



#	Strat1	Strat2	AVG(payoff1)	MIN(payoff1)	MAX(payoff1)	AVG(payoff2)	MIN(payoff2)	MAX(payoff2)
0	0	0	5090.4	4616	5694	4910.733333	4350	5393
1	0	1	-15015.4	-15246	-14829	20020.533333	19772	20328
2	0	2	24984.6	24754	25171	-9979.466667	-10228	-9672
3	0	3	5006.2	4945	5082	5004.333333	4940	5082
4	0	4	4963	4426	5395	5036.733333	4604	5574
5	1	0	20020.533333	19772	20328	-15015.4	-15246	-14829
6	1	1	0	0	0	0	0	0
7	1	2	40000	40000	40000	-30000	-30000	-30000
8	1	3	4	4	4	-3	-3	-3
9	1	4	39996	39996	39996	-29997	-29997	-29997
10	2	0	-9979.466667	-10228	-9672	24984.6	24754	25171
11	2	1	-30000	-30000	-30000	40000	40000	40000
12	2	2	10000	10000	10000	10000	10000	10000
13	2	3	10000	10000	10000	10000	10000	10000
14	2	4	-30000	-30000	-30000	40000	40000	40000
15	3	0	5004.333333	4940	5082	5006.2	4945	5082
16	3	1	-3	-3	-3	4	4	4
17	3	2	10000	10000	10000	10000	10000	10000
18	3	3	10000	10000	10000	10000	10000	10000
19	3	4	5000	5000	5000	5000	5000	5000
20	4	0	5036.733333	4604	5574	4963	4426	5395
21	4	1	-29997	-29997	-29997	39996	39996	39996
22	4	2	40000	40000	40000	-30000	-30000	-30000
23	4	3	5000	5000	5000	5000	5000	5000
24	4	4	5000	5000	5000	5000	5000	5000

Figure 2 – View data used in this tutorial

3 Creating a Template XML Chart

3.1 The Created Charts

In the next section we will create basically similar, but different charts. Our goal is to create various bar charts for each strategy combination: we will split the chart shown at Figure 25 in the MEME Tutorial into 6 separate bar charts displaying the average, minimal and maximal payoff values of agents for each payoff and statistic combination.

3.2 Creating the First Chart XML

Charts of MEME may be exported and reimported. This task is done in XML format. In order to achieve our goal, first we have to create a *template* chart XML, what we will use as an input for our script.

First we create the following chart:

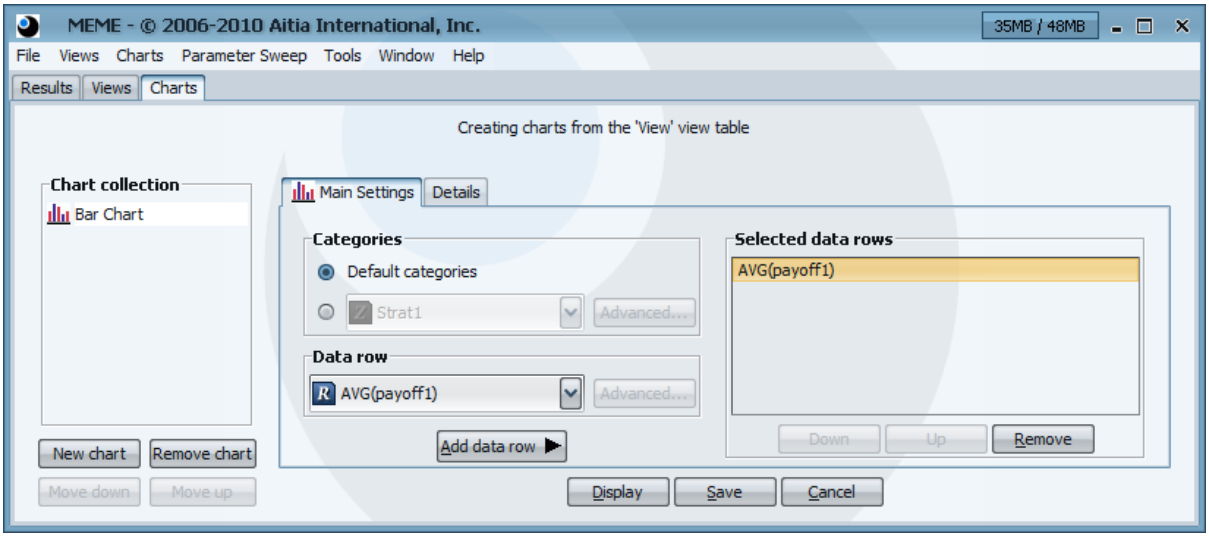


Figure 3 – Creating the First MEME Chart

Which contains the average `payoff1` values for different strategy combinations. It should display something similar to Figure 4.

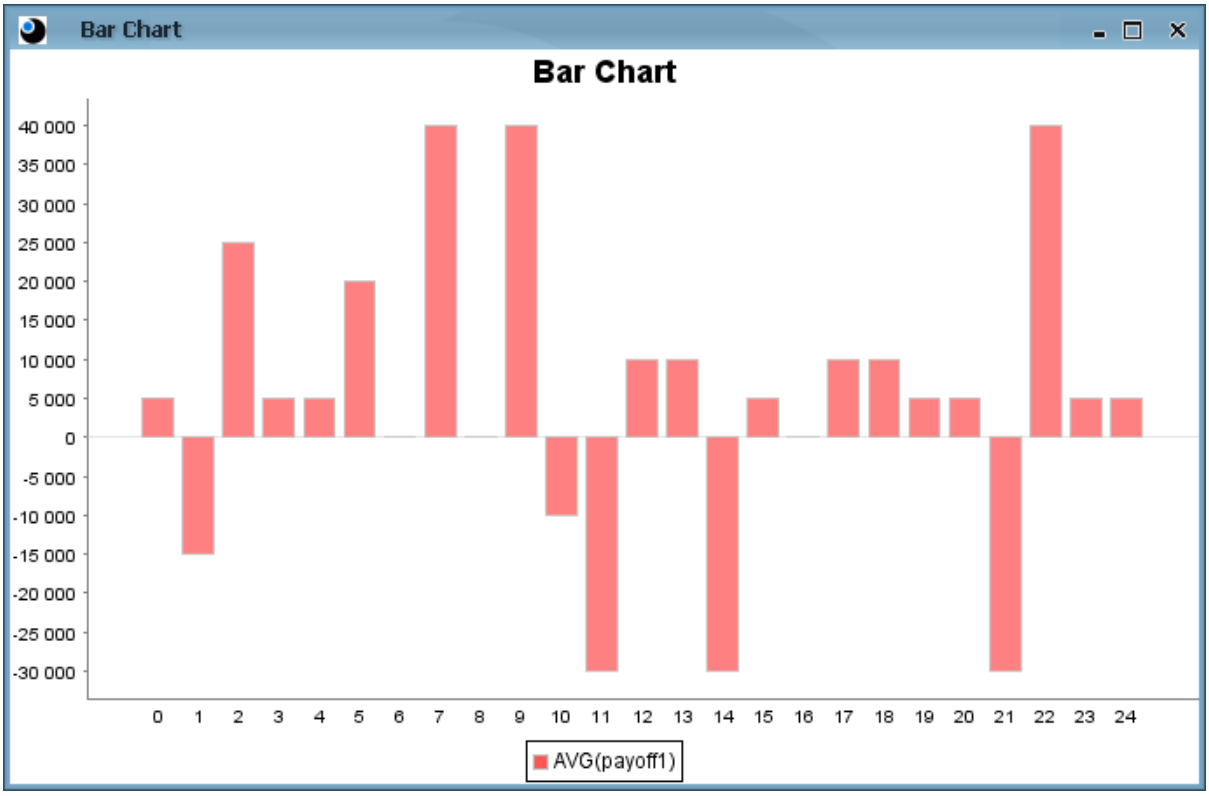


Figure 4 – Average payoff1 values

The chart settings are now set, so it may be saved as an XML with the save button. Save it as `avg.xml`. The saved file should have the following content:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<chart singleFlag="false">
    <datasources>
        <datasource id="1" type="ai.aitia.visu.ds.ISeriesProducer">
            <property key="version">2.1.00713</property>
            <property key="locale_specific">false</property>
            <property key="ascending">true</property>
            <property key="case_sensitive">true</property>
            <property key="id">1.View;AVG(payoff1)</property>
        </datasource>
    </datasources>
    <chartconfig fireInitialEvent="true" type="BarChart">
        <property key="datasource">-10,1</property>
        <property key="environment appearance">basic</property>
        <property key="color appearance">colored</property>
        <property key="label angle">0</property>
        <property key="custom appearance"/>
        <property key="show legend">true</property>
        <property key="title">Bar Chart</property>
        <property key="subtitle"/>
        <property key="bar renderer">one bar per datarow</property>
    </chartconfig>
</chart>
```

Listing 1 – A generated template XML

This XML document describes the properties of a chart (like the title, datasources, etc.), which we will manipulate in the following. In the next section, we describe a simple script that creates XML documents for all combination of `payoff1`, `payoff2` and the `AVG`, `MIN`, `MAX` statistics.

Please note that this task may be easily performed from MEME via the point-and-click Charting Wizard. However, when mass charts have to be made, this little trick may remove the burden of creating charts by hand.

4 Generating Chart XMLs

To create several similar XML descriptors, we need the help of a programming language. In this document, we have chosen Perl, since its major advantage is text processing.

The following script creates 6 different XML documents that MEME can interpret and export as PNG images.

```
#!/usr/bin/perl -w

use strict;
use warnings;

sub generateXMLContent {
my ($stat, $payoff) = @_;
return <<CONTENT;
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<chart singleFlag="false">
    <datasources>
        <datasource id="1" type="ai.aitia.visu.ds.ISeriesProducer">
            <property key="version">2.1.00713</property>
            <property key="locale_specific">false</property>
            <property key="ascending">true</property>
            <property key="case_sensitive">true</property>
            <property key="id">1.View;$stat($payoff)</property>
        </datasource>
    </datasources>
    <chartconfig fireInitialEvent="true" type="BarChart">
        <property key="datasource">-10,1</property>
        <property key="environment appearance">basic</property>
        <property key="color appearance">colored</property>
        <property key="label angle">0</property>
        <property key="custom appearance"/>
        <property key="show legend">true</property>
        <property key="title">Bar Chart ($stat payoff values)</property>
        <property key="subtitle"/>
        <property key="bar renderer">one bar per datarow</property>
    </chartconfig>
</chart>
CONTENT
}

for my $payoff ('payoff1', 'payoff2') {
   for ( 'AVG', 'MIN', 'MAX' ) {
          open FILE, ">", "chart_${_}_${payoff}.xml" or die $!;
          print FILE generateXMLContent($_, $payoff);
          close FILE or die $!;
   }
}

0;

__END__
```

Listing 2 – Chart XML generator script

The script above creates 6 files with the following names:

```
chart_(current statistic name)_(current payoff value).xml
```

It also changes the title of the charts to make it clearer what sort of data do they represent.

5 Generating Charts with MEME

The charts are generated directly from the created XML files with MEME. It is the final and the simplest task: just click on the *Charts → Export charts as PNG*, and select the generated XML files.

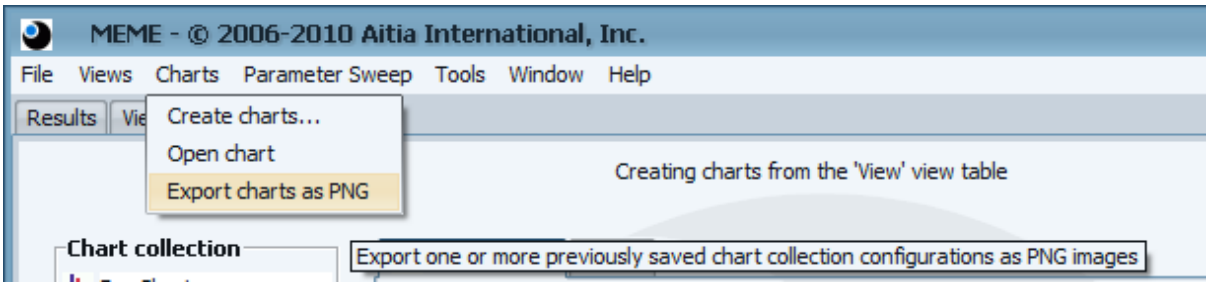


Figure 5 – Exporting a chart as a PNG file

MEME can process multiple XML files at once: use either the *Shift* or *Ctrl* buttons for multiple selection.

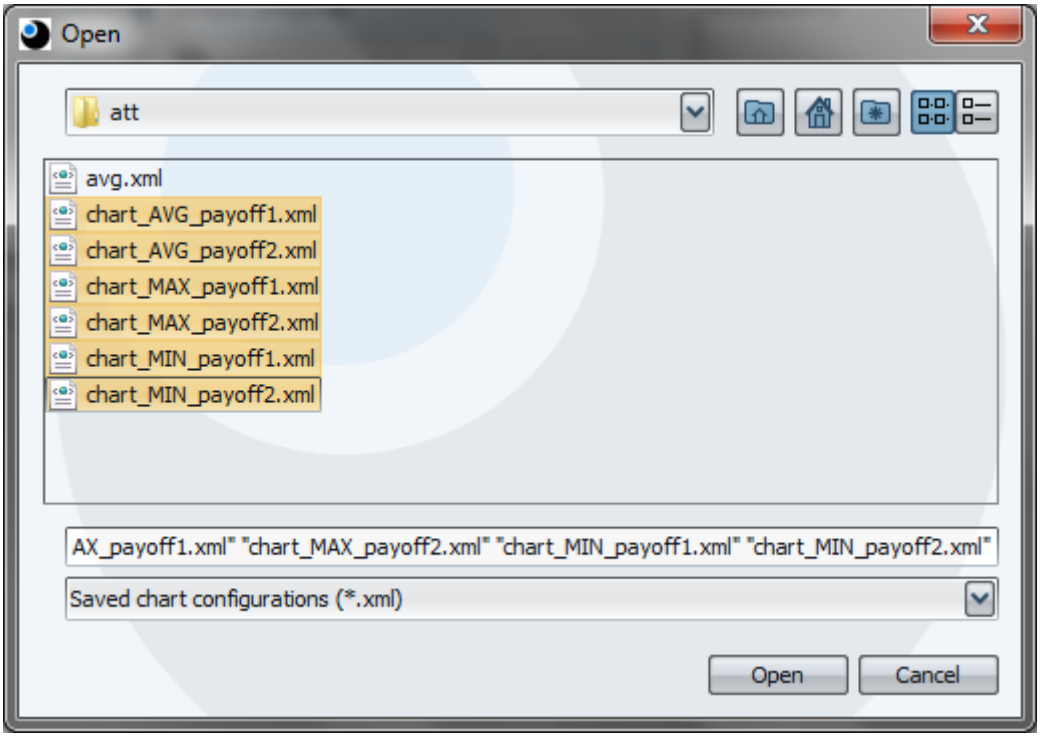


Figure 6 – Multiple selection of chart XML descriptors

Clicking on *Open* MEME starts working on the selected XML documents and starts generating the PNG images of the represented charts. The images are generated, and placed next to the XML files.

6 Generated Charts

The generated charts may be found below.

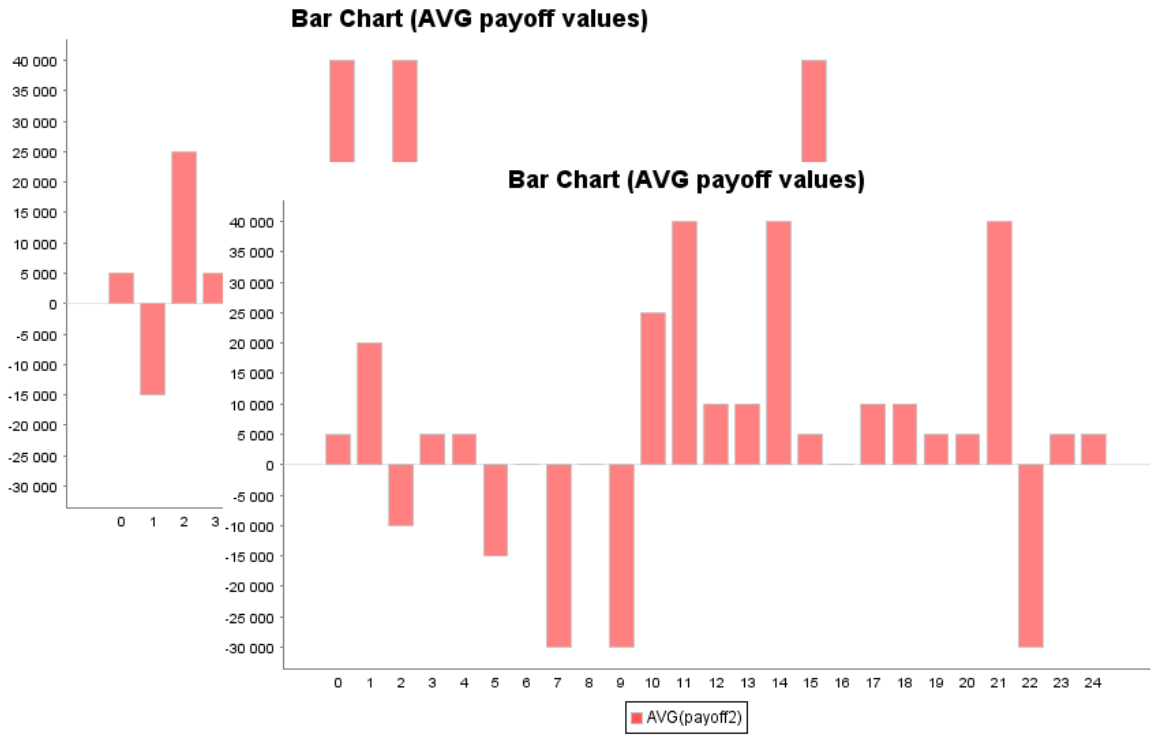


Figure 7 – Average payoff values

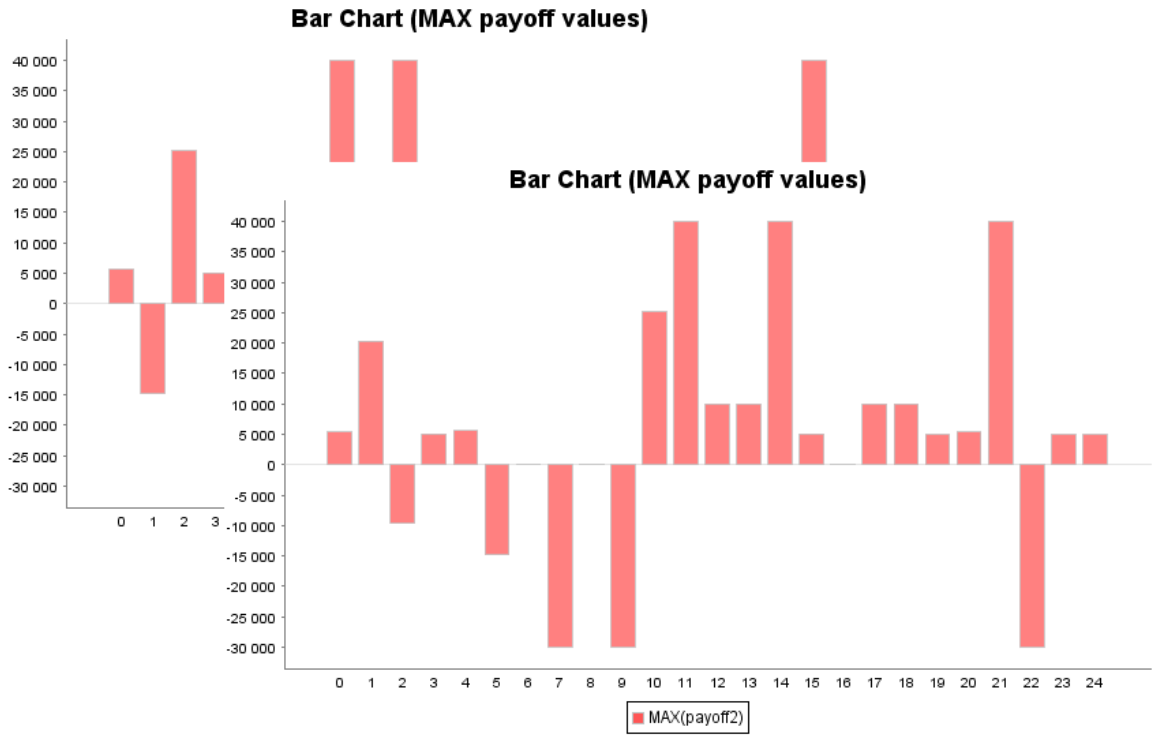


Figure 8 – Maximal payoff values

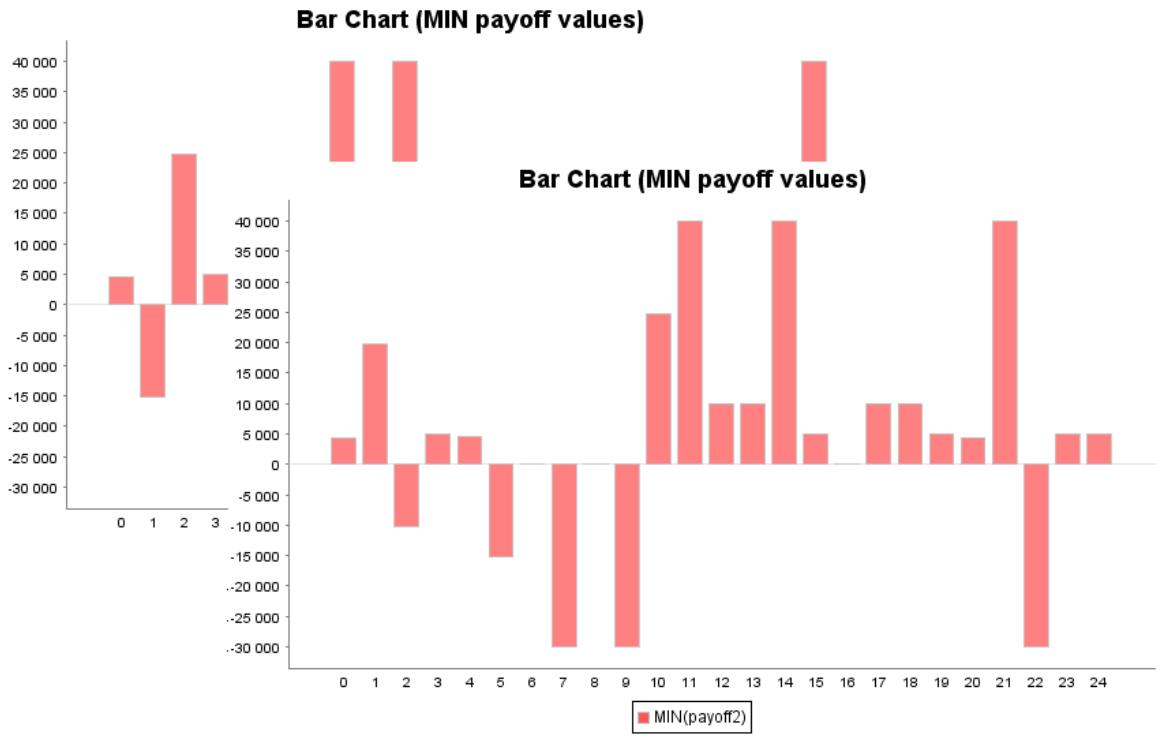


Figure 9 – Minimal payoff values

7 Conclusion

In this tutorial you became familiar with creating several different chart descriptors from an XML document saved from MEME. These descriptors were then directly used within MEME to create several chart images to create get different impressions on the evaluated simulation data.

The feature described herein may come extremely helpful when dealing with complex models to get an extensive overview of emergent processes and trends present in a simulation with the help of mass chart creation by eliminating time-consuming manual labour of setting chart properties.

However this technique requires minimal programming skills (to create custom XML documents), it is not fixed: any preferred programming language may be used for this task. We hope you will find this feature helpful for your work.

