

“Consumer price obfuscation and fuzzy global optimisation”

by

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Overview



- Background
- Techniques
- Case History: mobile phone tariffs
- Conclusions and references

Background



- The web accelerates barter
- The web accelerates services disproportionately
- All human systems naturally become more complex unless constrained (for example by the laws of Physics or Parliamentary Select Committees)
- Examples
 - Most financial products, share trading, loans ...
 - Utilities, (water, gas and electricity pricing)
 - Telecommunications, for example mobile phones

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Techniques



- Data mining
- Data analysis
- Implementation



Techniques – data mining

- Extracting the data is a major problem
 - Most suppliers advertise data in unstructured ways
 - Choice is mainly manual but XML would help an awful lot
- No incentive for suppliers to make data mining easier – (because it helps the customer)

Techniques – data analysis



- There are extraordinary levels of complexity
- The data have varying levels of uncertainty
- The data are sometimes inconsistent
- The data can be rapidly time-varying

Techniques – implementation



- Web-based service is essential
 - Sufficiently fast interactive response (< 2 seconds)
 - DoS and tamper proof (instrumentation vital)
 - Easy to change to respond to rapid and unpredictable time variations
 - Text descriptions of tariffs

Example parametrisation

```
#
# 02.
#
# Version:      $Revision: 1.1 $
# Date: $Date: 2004/04/24 08:56:49 $
#
<DVERS>      #BDMDRLN
<CURCY>      GBP
<CMPNY>      "02"
<SCHEM>      "25"
<INSPM>      0.0
<FRMCY>      0
<FR1CN>      25
<FR1CT>      SNO
<FR1PK>      OP
<FR2CN>      0
<FR2CT>      " "
<FR2PK>      " "
<FRTXM>      25
<NMSHR>      1
<LRFST>      16.00
<LRNSI>      " "
<CLNOP>      0.05
<CLNPK>      0.15
<CSNOP>      0.05
<CSNPK>      0.15
<CONOP>      0.30
<CONPK>      0.45
<VCEOP>      0.05
<VCEPK>      0.15
<TMSGGS>     0.12
<TDBND>
"12,50,3.00,100,5.00,150,8.00,200,9.00,250,12.00,300,14.0,400,16.00,4
50,19.0,500,21.00,600,25.00,800,32.00,1000,30.00"
<MMSGGS>     0.35
<CSWAP>      0.10
```

.....

Techniques – choice of analysis method



- Two forms of global optimisation
 - Exhaustive
 - Selective
 - Simulated annealing
 - Steepest descent
 - ...

Techniques – choice of analysis method



- Exhaustive

- Finding the cheapest mobile phone tariff currently requires about 200 million comparisons in the UK
- This is just about possible for an interactive architecture but may not be in future

- Depends on

$$\left(\frac{\textit{Complexity}}{\textit{Server - speed}} \right) (t)$$

Techniques – choice of analysis method



- First implementation
 - Interpreted, too slow for exhaustive treatment, so
 - Simulated annealing
 - Probability of jumping out of a local minimum

$$\propto e^{-\phi(T)}, \phi(T) \uparrow \text{ as } T \downarrow$$

Demonstration ...

Techniques – choice of analysis method



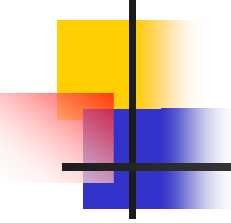
- Second implementation
 - PHP client driving server written in C
 - 1471 lines of PHP
 - 1958 lines of C
 - Exhaustive search possible in about half a second

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Case History – mobile phone tariffs

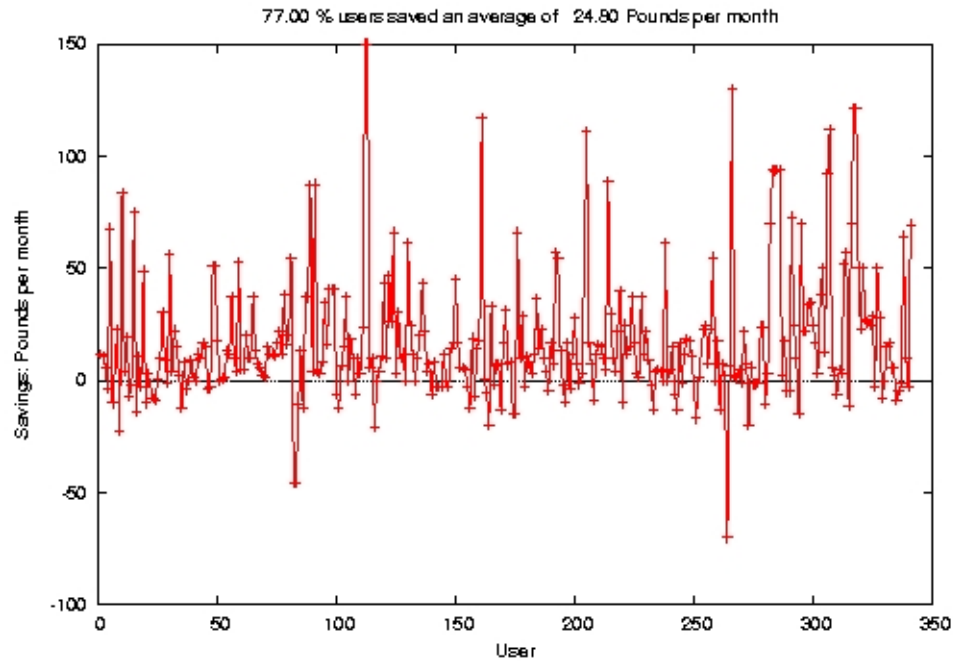
- 
-
- Already staggering complexity
 - In the UK, 7 tariff suppliers with around 100 plans and many sub-options
 - Time-dependent
 - Different charging methods and periods
 - Different definitions of peak time
 - Different text message deals, bundles, expired and non-expired
 - Different roll-over policies
 - Incomplete descriptions of how discounts apply, (for example order across networks).

Case History – mobile phone tariffs



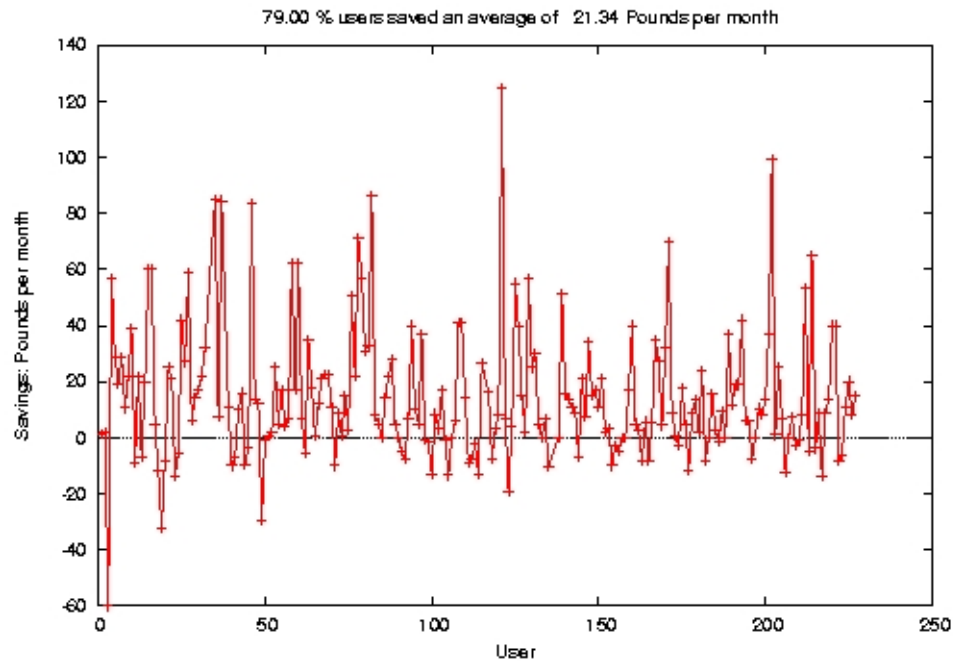
- Information solicited by PHP web client
 - New or existing user
 - Approximate minutes of call time per month
 - Approximate text messages per month
 - Percentage of calls at peak times
 - Percentage of calls to landlines
 - Percentage of calls to same network supplier
 - Percentage of calls made whilst roaming
 - *An estimate of confidence in the above questions*

UK Results 4Q03



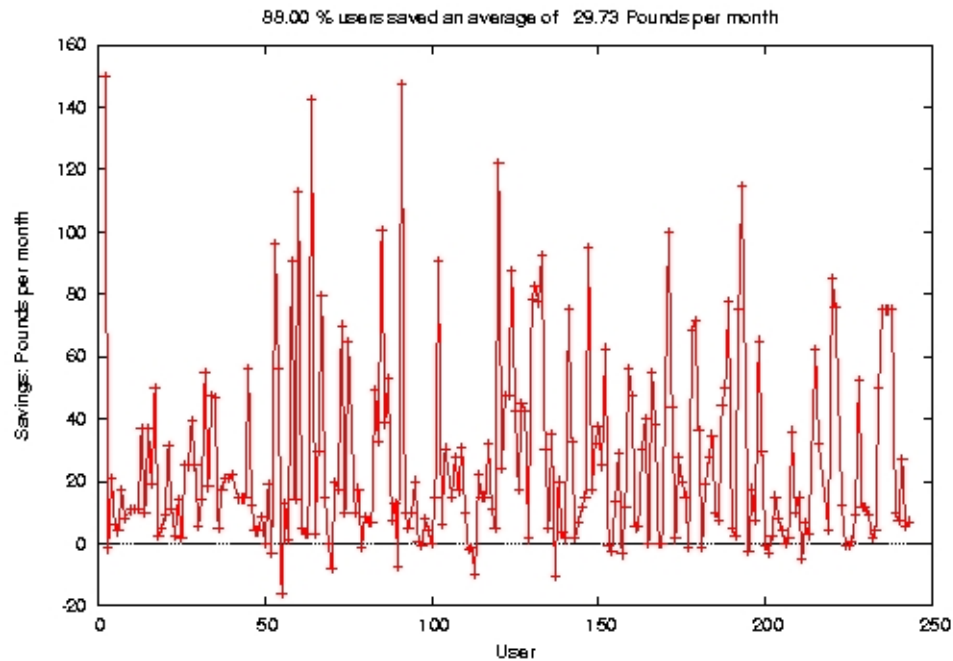
Average saving £24.80 per month

UK Results 1Q04



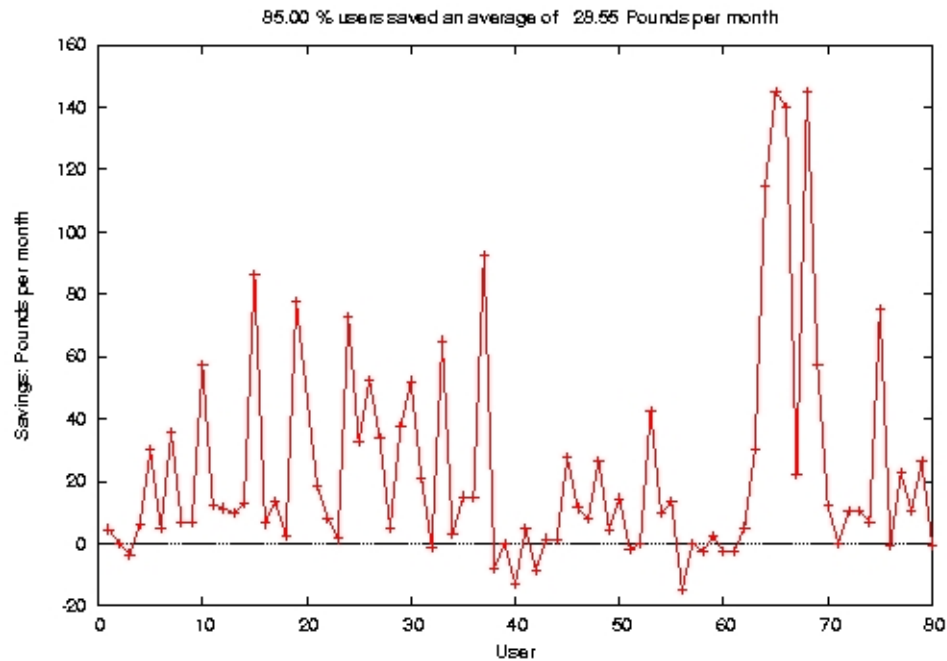
Average saving £21.34 per month

UK Results 2Q04



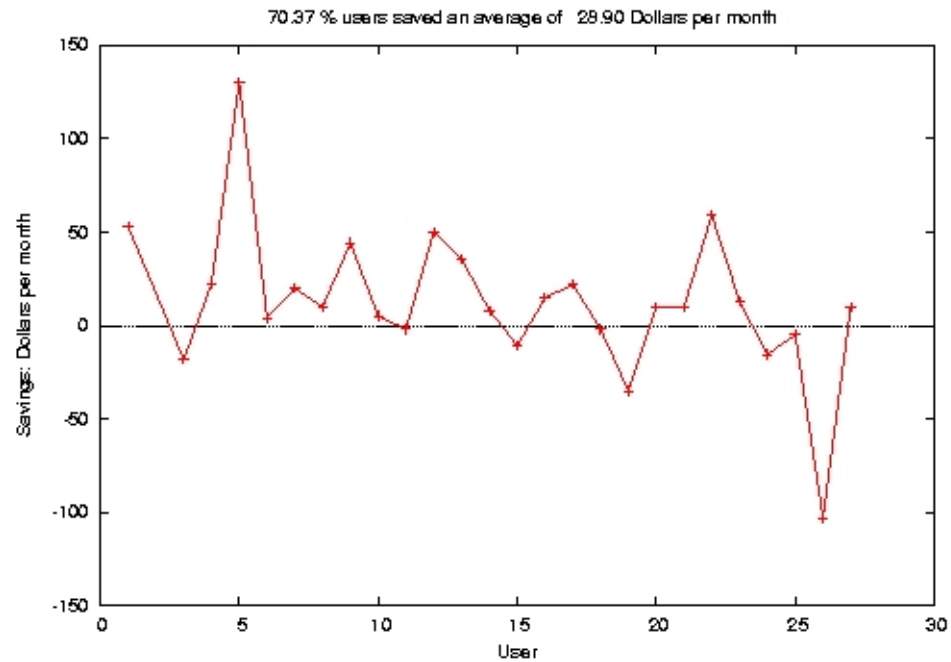
Average saving £29.73 per month

UK Results 3Q04



Average saving £28.55 per month

US Results 4Q03



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Conclusions



- Consumer price obfuscation is growing very rapidly
- The consumer is getting ripped off badly
- It is getting worse
- It is possible to ameliorate it significantly using conventional optimisation techniques.

Reference



Preprint:

Hatton, Les (2004) “The rise of consumer price obfuscation in social networks: mobile/cell phone charging”, submitted to IEEE Internet Computing, Dec 2004

downloadable from:-

http://www.leshatton.org/global_Dec2004.html

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