Optimising Television Commercial Air-time by means of a Genetic Algorithm

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Abstract

This paper provides an outline of a project that used genetic algorithms to solve a problem in scheduling commercial air-time. The resultant software has been in commercial use for a number of years.

1 BACKGROUND

Channel Four Television, one of the major broadcasters in the UK, needed to find a way to automatically schedule the bulk of its commercial air-time each month. The scheduler not only had to satisfy the requirements of Channel Four's customers and stringent regulatory constraints but also optimise usage of the air-time. Previous attempts, by other broadcasters and their suppliers, had produced only moderate success in solving this problem.

Sophisticated and detailed audience measurement (the UK viewing panel is larger than its equivalent in the US) supports one of the most elaborate trading regimes in the world, where air-time is mainly traded by viewing levels for specific audiences.

2 SOME ASPECTS OF THE PROBLEM

The main dimensions of the scheduling task are:-

- 600 to 800 campaigns
- 6 regional splits (sold in 11 combinations)
- 25 target audiences
- 1 month's schedule (around 14,000 commercials)

The nature of the optimisation problem is highly non-linear. This is due to the fact that every commercial scheduled affects the remaining supply of every audience. The impact upon the supply of other audiences varies for every break (different audience profiles) and by length of the spot (ratings are weighted by length but in a non-linear manner).

3 SOLUTION

Before committing significant resources to, what was considered within the commercial world, the use of novel technology, a proof of concept was undertaken. A subset of the problem, sequencing commercials within a break, was tackled. The proof of concept not only proved the technology but also resulted in a deployable application.

An initial, PC based, solution was developed and deployed. Due to the long run-time of the heuristic scheduler (45 minutes) and the limited run-time available (one weekend) only 10 genes were available and resultant schedules no better than those achieved manually.

Over the seven years of the authors involvement with the project the software evolved considerably. Increasingly more powerful PCs, enhancements to the scheduler (including focus on highest value air-time) and (most significantly) development of the GA engine to run in parallel across many PCs, enabled greater number of genes to be used. This, in turn, enabled improvements to the strategies in gene usage and the fitness function. The resulting schedules are acknowledged as being better than could have been achieved manually.

4 RESULTS

Channel Four Television has the most effective automated scheduler of commercial air-time in the UK. It is the only one that truly optimises the air-time. When the complex UK trading practices are taken into account, it is probably the most sophisticated air-time scheduler in the world.

The project outlined here has proved the viability of using genetic algorithms in a commercial environment. Millions of people daily see the results of genetic algorithms in action. Something in the order of 150,000 commercial breaks have been sequenced, and one million commercials scheduled, using genetic algorithms.

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