Bar Chart Ball, a Data Game

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ABSTRACT

We describe Bar Chart Ball, a game where players indirectly control a ball by modifying a bar chart that the ball rests on. The bar chart displays real-world demographic data about the UK, and the player modifies the chart by selecting which aspect of the data to focus on. By making data selection a core game mechanic, in fact the only game mechanic, we advance a novel and simple way of building game content from data, and of making data visualisation playable.

1. DATA GAMES

Data games[1] are games where gameplay and/or game content is based on real-world data external to the game, and where gameplay supports the exploration of and learning from this data [2]. Unlike most games, where real-world data is at most source material for human designers, data games build on the automatic or semi-automatic processing of publicly available data for automatically transforming this data into game content. Unlike most serious games, data games are not intended to teach a particular curriculum or instil a particular opinion, instead they aim to empower players by allowing them to freely explore the data through play, and to playfully create their own understanding. The idea of data games draws heavily on the increasing amount of *open data* and in particular *linked data* available due to the efforts of governments, NGOs and other organisations [3], and also on recent developments in *procedural content generation* [4].

As yet, there are few games that are unequivocally sit within this definition. We have previously described a content generator for the classic board game Monopoly, where players define their own concept of prosperity and a new board is automatically generated that reflects the expressed prosperity concept in the selection and valuation of streets [1]. The boards build on data collected online from various sources, including the UK government and DBPedia, and are generated using an evolutionary algorithm. In this short paper,

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[1] http://data-games.org/

we describe a new data game, *Bar Chart Ball*, that gamifies the same dataset in a very different way.
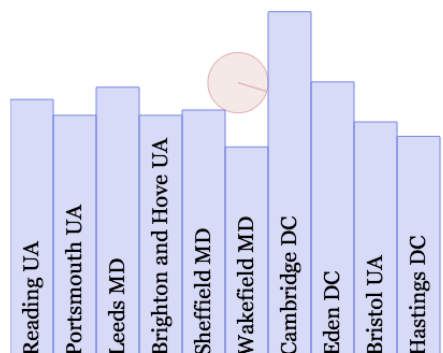
2. BAR CHART BALL

Bar Chart Ball takes the ubiquitous bar chart and turns it into a ball game. Bar charts are commonly used to visualise numeric data, allowing the viewer to easily compare the magnitudes of several numerical variables. The basic design idea of Bar Chart Ball is to make data selection a core game mechanic in such a way that the player needs to learn about the data set in order to play the game better. This can be contrasted to Open Data Monopoly, where data selection for game content generation was done previous to actually playing the game.

Our first implementation of Bar Chart Ball uses the same dataset as Open Data Monopoly, consisting of a number of locations in the UK (cities and areas) and a number of demographic indicators for these locations. The playing field is a simple bar chart, where each of the ten bars represents a different location and the height of the bar represents that location's score on a selected indicator. For example, if the selected indicator is general mortality, City of London will have a short bar and a community with a high proportion of retirees will have a long bar, but for an indicator related to perception of drug users as a social problem the relation is likely to be the opposite. At any time, the player can select a different indicator, thus reshaping the "landscape" formed by the bar chart; the bars move swiftly, but not instantly, into their new positions.

Onto this landscape, a ball is dropped (obeying simple Newtonian physics). The player's goal is to control this ball, and make it go where they want. However, the player's only tool for affecting the ball is changing the reshaping the bar chart through the judicious selection of indicators. If the player wants the ball to fall off the left end of the screen (a goal in the first version of the game), they might need to find an indicator that causes the bar immediately to the right of the ball to rise, pushing the ball left. Usually, getting the ball where you want requires a number of consecutive chart transformations. Playing Bar Chart Ball successfully requires being able to estimate the state of the chart after selecting a particular indicator, and thus the best way of getting better at the game is to learn to model the numerical relationships in the data underlying the game content. See Figure 1 for an example of the current version of Bar Chart Ball in action.
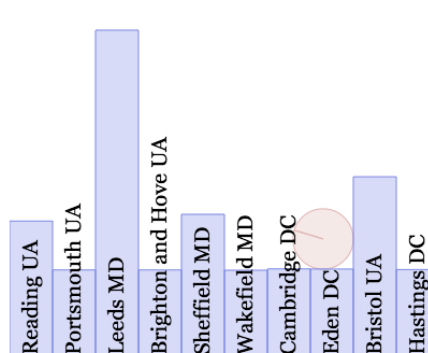
Figure 1: This figure shows two screenshots of the same game at different points in time. Different indicators are selected in the two screenshots, resulting in different lengths of the bars. In each game, which indicators and locations to use is chosen at random.

3. IMPLEMENTATION

Bar Chart Ball is currently a prototype implemented in HTML5, using the Box2D physics engine.

Through the UK open data initiative, we got access to national indicator data, which is available online as an Excel file. The file used for our prototype contains data made available in November 2010. The first step is to pre-process this data, mapping indicator values to geographical units and removing indicators with missing data. 72 indicators and about 325 geographical units were available for the creation of the game examples below. The indicators were normalised so that all values were between -1 and 1. The geographical units that were aggregations (for example, the South West or county councils) were also removed.

4. FUTURE WORK

We believe that Bar Chart Ball demonstrates a novel yet simple way of turning data into game mechanics, and from personal experience we know that the game is fun, challenging and occasionally illuminating. It turns looking at graphs into a playful and enjoyable activity. However, it remains to be seen to what extent the game will appeal to different kinds of players, and in particular how the game will affect its players. Which types of players enjoy playing data games? Do you learn anything about the underlying data by playing the game? For example, will you be able to better estimate mortality or education levels in London versus Lincoln after playing the game enough times? We plan to conduct user studies to find out. The methodology of these user studies is currently being developed, but might include comparing data games to traditional types of data visualisation and to games with similar game mechanics devoid of connection to real-world data.

We also plan to expand the game in various directions, including making an online two-player game (where players take turns to select indicators to push the ball into the desired location) and to include more core game mechanics, for example taken from platform games. In order to guarantee playability, it might also be necessary to perform optimisation or constraint solving on the selection of data instances or ordering of bars.

5. REFERENCES

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