DESIGN & ANALYSIS OF TABLE CARTOGRAMS

Simultaneous Multipurpose Tabular Area-Encoding Displays

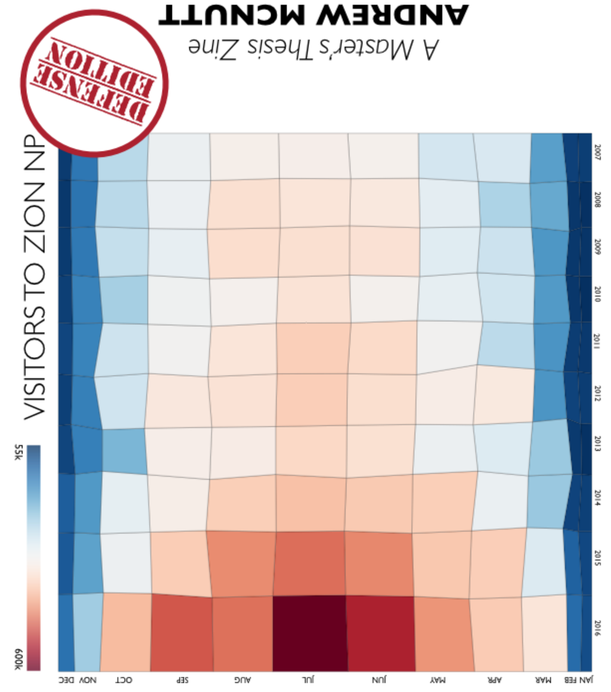


Table Formogram

Characteristic:
Matching an existing canonical table
Related to:
Shaded Matrix, the original table
Tasks it's good at:
Lookup, Detect Change, Observe Outlier

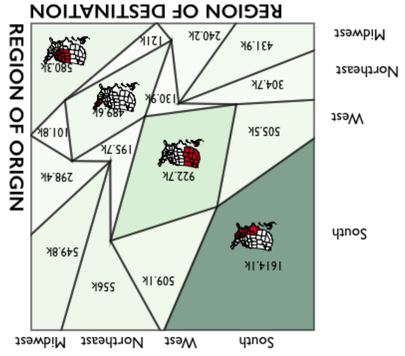
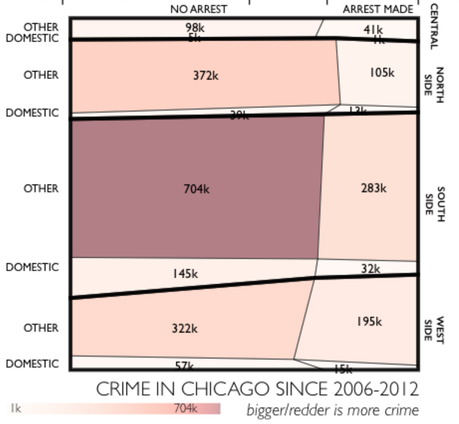


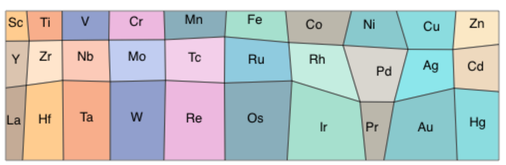
Table corrgram

Characteristic:
One categorical variable along rows and columns
Related to:
Confusion matrix, adjacency matrix, corrgrams
Tasks it's good at:
Summary, lookup, observe outlier

Table Mosaicgram

Characteristic:
multiple hierarchical categorical variables
Related to:
Mosaic, treemap, pivot table, sunburst
Tasks it's good at:
Hierarchical part-to-whole and part-to-part comparison

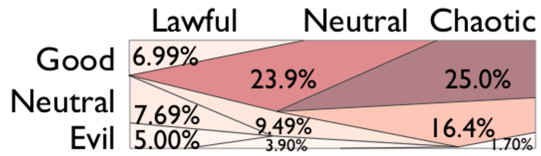




Groups 3-12 of the periodic table valued by elemental density

Table cartograms are great at showing **part-to-whole relationships**, especially when the input data has meaningfully ordered rows and columns.

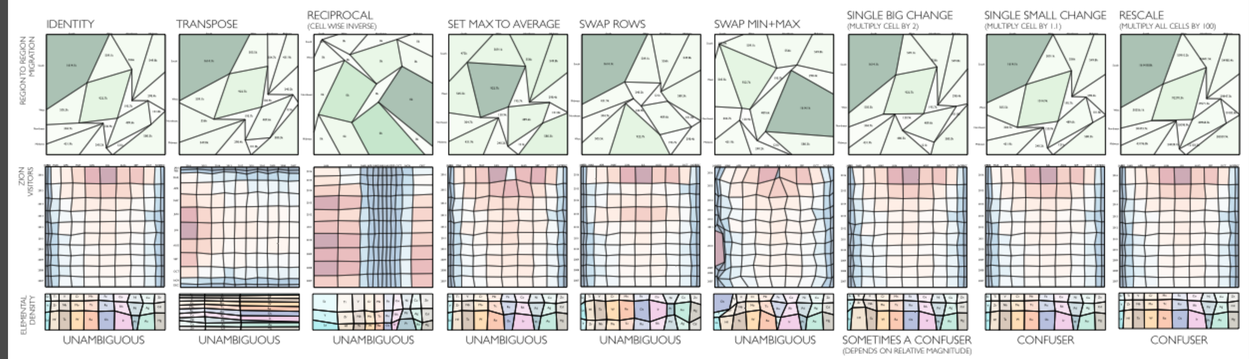
This makes them good for calendar displays and as enhancements to tables that already have a canonical ordering. In the year/month calendar to the left we are clearly able to make ordinal comparisons (the weekends have few tickets,and some particular weeks have very few). In the DnD alignment table below we can make easy part-to-whole comparisons without needing to tediously examine each individual pair of cells.



	Lawful	Neutral	Chaotic
Good	6.99%	23.9%	25.0%
Neutral	7.69%	9.49%	16.4%
Evil	5.00%	3.90%	1.70%

Popularity of DnD alignments, src informal online poll

What are they good for?



In the above chart we consider three tables of data from across this zine and apply a variety of data transforms (**αs**). Some of these transforms remain legible across transformation. While others do not! Here are the important takeaways from the analysis:

Changes to the scale are invisible. Table cartograms should not be used for presentations where scale matters

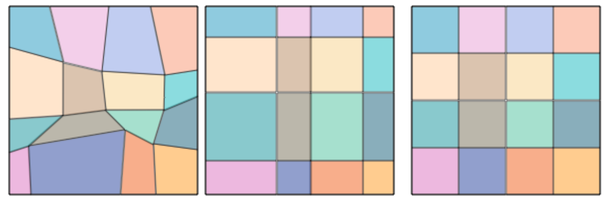
Reciprocal changes are visible. This shows that size order is visually maintained in table cartograms, which suggests that ordinal measurements (comparisons between discrete but ordered entities) are fair game. This confirms some of the part-to-whole analyses we've seen!

Small changes are invisible. This suggests that (when individual cells matter) data sets should be selected in such a way that they stay visible across transforms. A good rule of thumb is that tables should be selected that are no more than three orders of magnitude in range and contain no more than a few hundred cells.

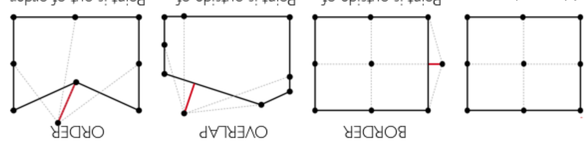
How do we know what we know?

What can be done with them? (part 2)

SETUP



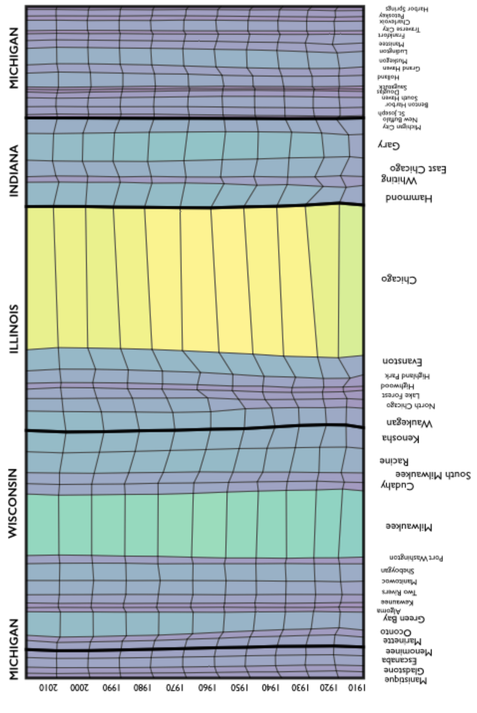
Our gradient descent minimizes **the relative error** between expected area as well as the penalties from the following constraints



What is a table cartogram?

They have two defining properties:

1. They possess an **Accurate Embedding** of Data as area.
2. They have a **Planar Grid-like Topology** that is constrained to a rectangle

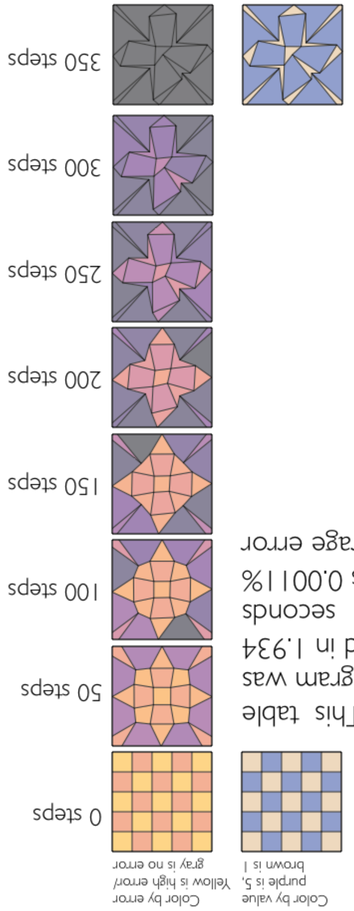


How do we know what we know?

Table cartograms are a type of data visualization that represent tables of numbers in a graphically intriguing and theoretically rich way.

They represent a table of numbers as a grid of quadrilateral cells, whose areas are changed to fit the data. **Like a heatmap that has been area-ed rather than colored**

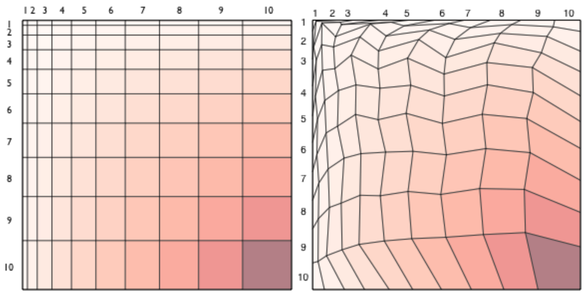
How do we actually make a these things?



This table cartogram was computed in 1.934 seconds it has 0.0011% average error

WATCH IT GO

In addition to enhancing previous visual encodings we can make new ones!



These two multiplication tables shown as table cartograms are equally right! A hallucinator!! This type of property makes it difficult to use table cartograms in visual analytics contexts where repeatable and consistent observations are important for gaining an understanding of the data.

Here we show a summary of the basic failure modes in Algebraic Vis Design A significant α might change something important about the data, while an insignificant α might change something about the representation (like changing the order of a data in a scatterplot).

Would you agree that a **good visualization will reflect changes to its data in a way that makes sense to a human**?

This is the basic principle behind Algebraic Vis Design (AVD). We use this lens as a mechanism to theoretically motivate our understanding of the table cartogram's properties. Taking this approach (rather than conducting user studies) allows us to economically scan the space of unknown unknowns about table cartograms, reducing them to known unknowns (which users studies are great at addressing).

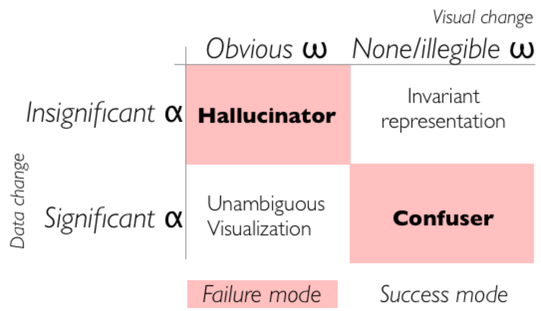
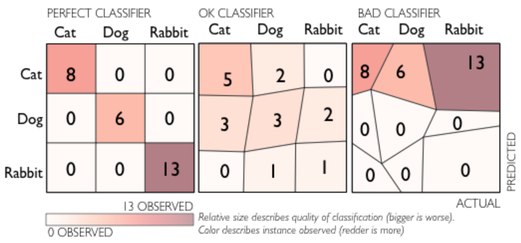


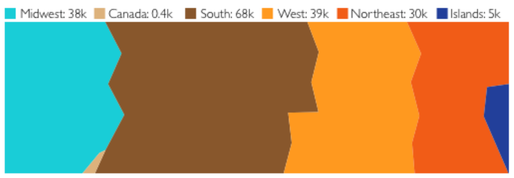
Table Confusiongram



Characteristic:
Re-encoding of confusion matrices
Related to:
Confusion matrices, corrgrams, table corrgrams
Tasks it's good at:
Identify outliers, both on a row-whole and cell to whole level

or at least evocatively name some unusual chart types

Table Polygrams



The number of times an airplane struck a bird since 1991 by origin. Data from the FAA bird strikes database.

Characteristic:
Tabular encoding and layout of non-tabular data
Related to:
Pie chart, stacked bar chart, waffle plot
Tasks it's good at:
Part-to-whole and part-to-part for non-tabular data

What can be done with them? (part 1)