Baltimore City vs County Dueling Populations

A sonification by Jenn Kotler

Download Sonification Here:
https://github.com/Jenneh/Dueling-Bmore/blob/main/Bmore%20City%20vs%20County%20Sonification%20Story.mp3

Creative Methodologies

PROJECT 2
Open Data Visualization

Jenn Kotler

Project Statement

"I want to study **My House** through the lens of **History** in the context of **the census**."

"I want to study **Hampden** through the lens of **Environment** in the context of **Environmental Citations**."

"I want to study **Hampden** through the lens of **Construction** in the context of **permits and citations**."

"I want to study **Hampden** through the lens of **population growth** in the context of **the census**."

Open Data Portal Sources

*List at least **three** data sources from Open Data Portals (e.g. Bike Lanes from Baltimore City Open Data, Vehicle Crash Data from Baltimore City Open Data, Zoning Districts from Baltimore City Open Data)*

- Zoning https://data.baltimorecity.gov/datasets/zoning/explore?location=39.290523%2C-76.638275%2C12.74
- Area Master Plan
- https://data.baltimorecity.gov/datasets/area-master-plan/explore?location=39.292950%2C-76.620500%2C12.62
- Permits
- https://data.baltimorecity.gov/datasets/housing-and-building-permits-2015-to-2018/explore?location=39.286100%2C-76.620500%2C12.51
- I haven't found a portal for this, but I would love to see a list of the number of houses built each year in the city or by neighborhood. Maybe this data exists and I just need to find it

Additional Research

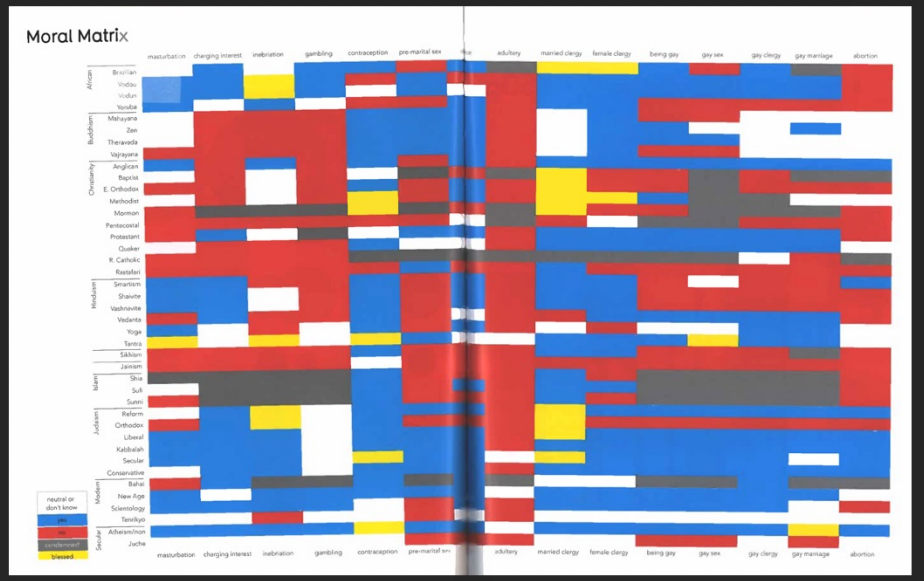
List any other potential sources of data and/or information that is publicly available and will help tell your story (e.g. community calendars, university demographic info, etc)

- MDLANDREC.NET (historic plat diagrams)
- Permits (they are public but ones before 2005 need to be requested because they aren't online)
- Historic archives (at library?)
- Old newspapers

Potential Ideas

List some potential ways you might answer your project statement using the data above. Hint, refer to the Data Viz Examples on Sakai.

- Timeline
- Show the map changing around the house
- I love this matrix… because it looks like it could act as a beautiful piece on non-objective art. I like the idea of making a mural based on the data visualization I make in the alley behind my house
  What is a positive message I can tell with data that I want to share with people walking though the neighborhood?



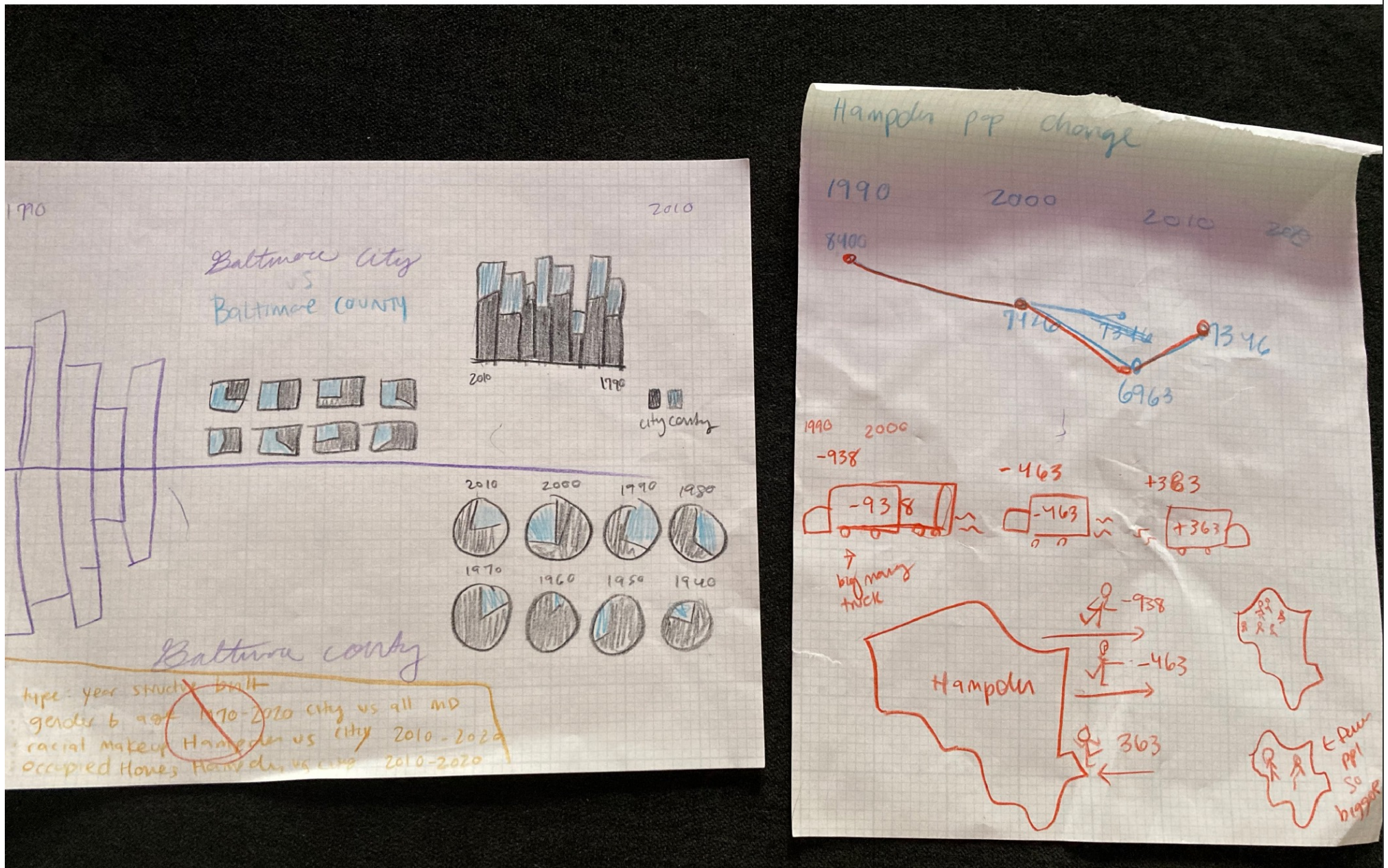
I explored data sets about

Baltimore City

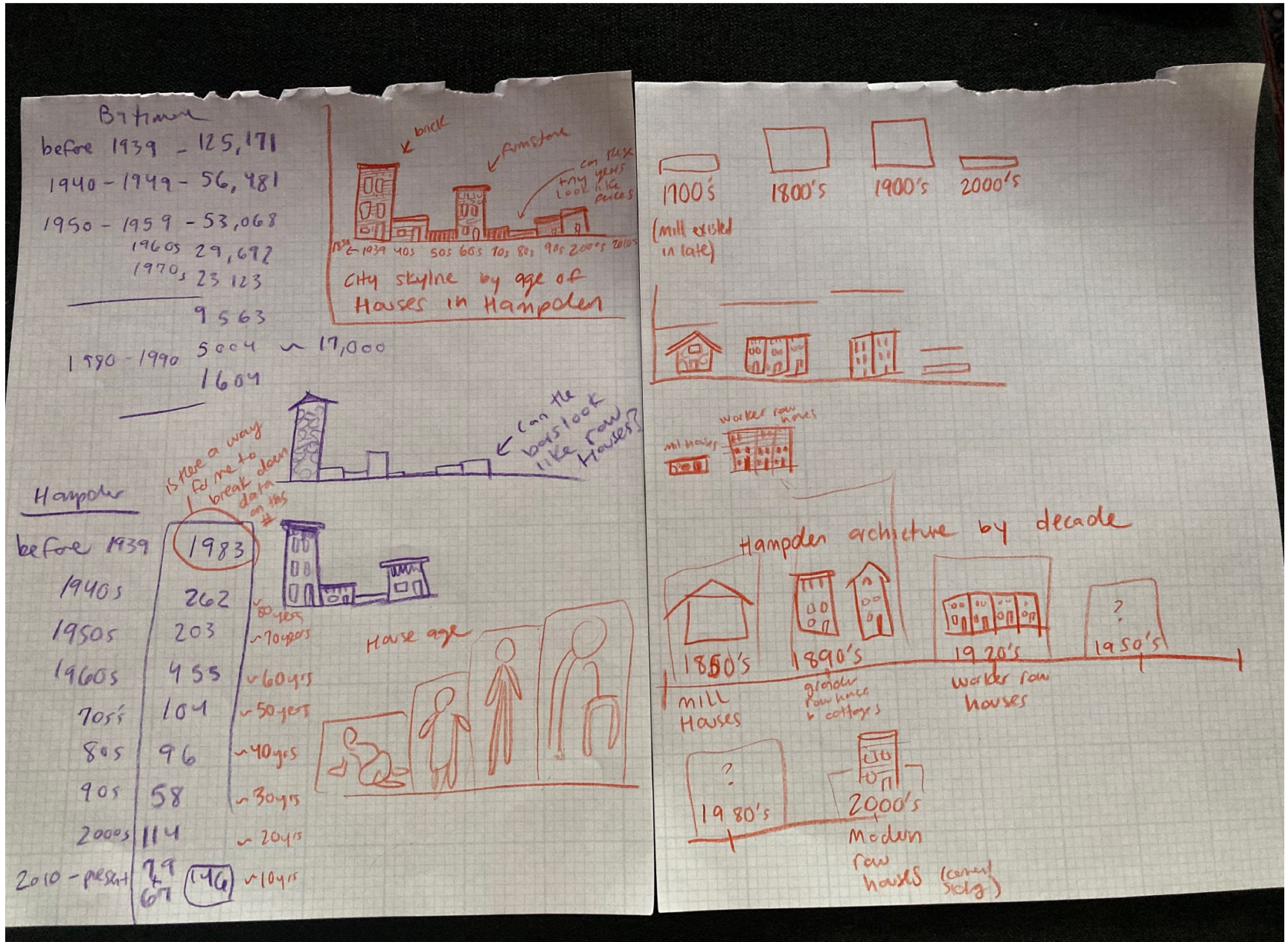
Housing and Population

Baltimore population City vs Suburbs/Rural
1790-present

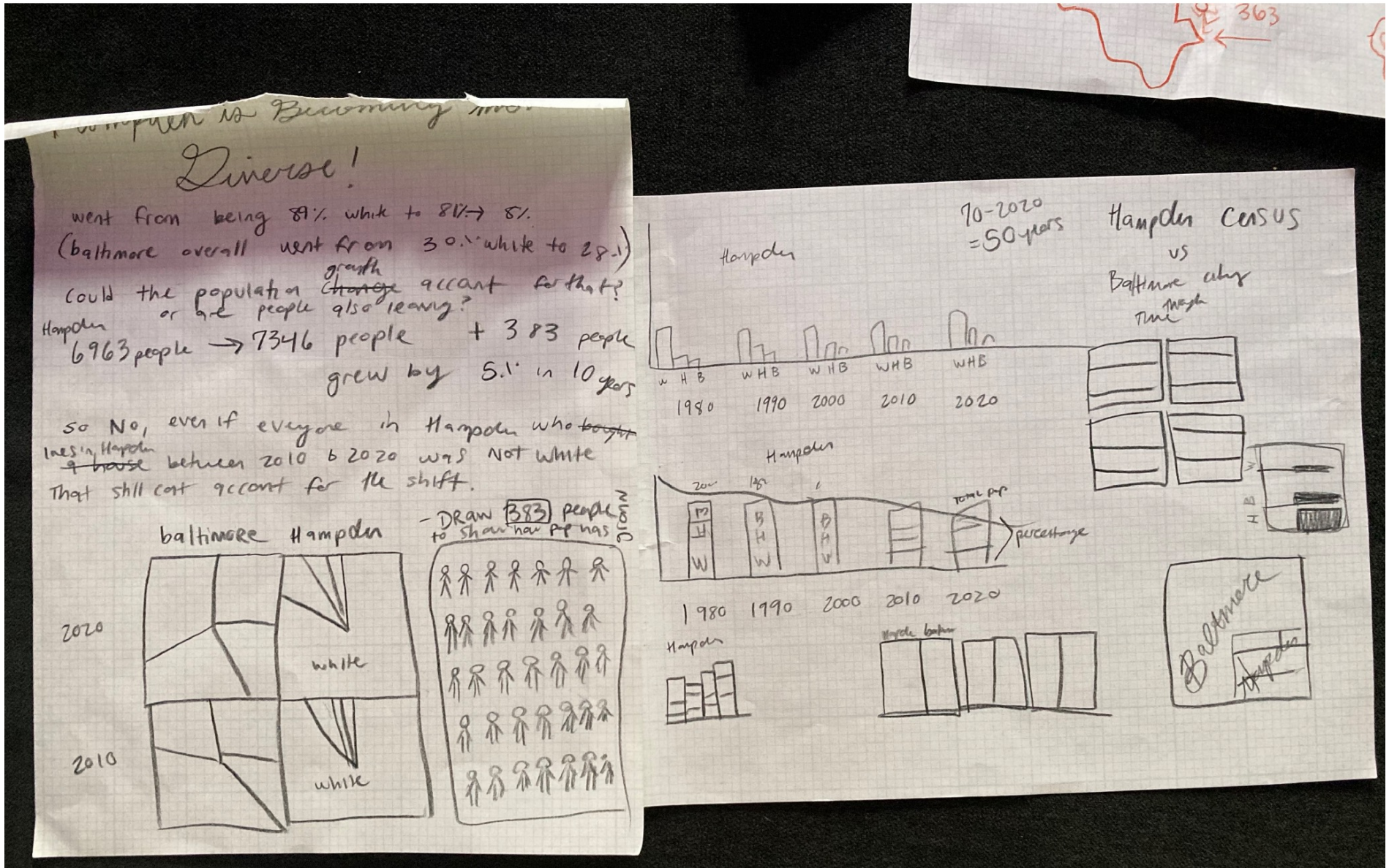
Hampden Population changes 1990-2020



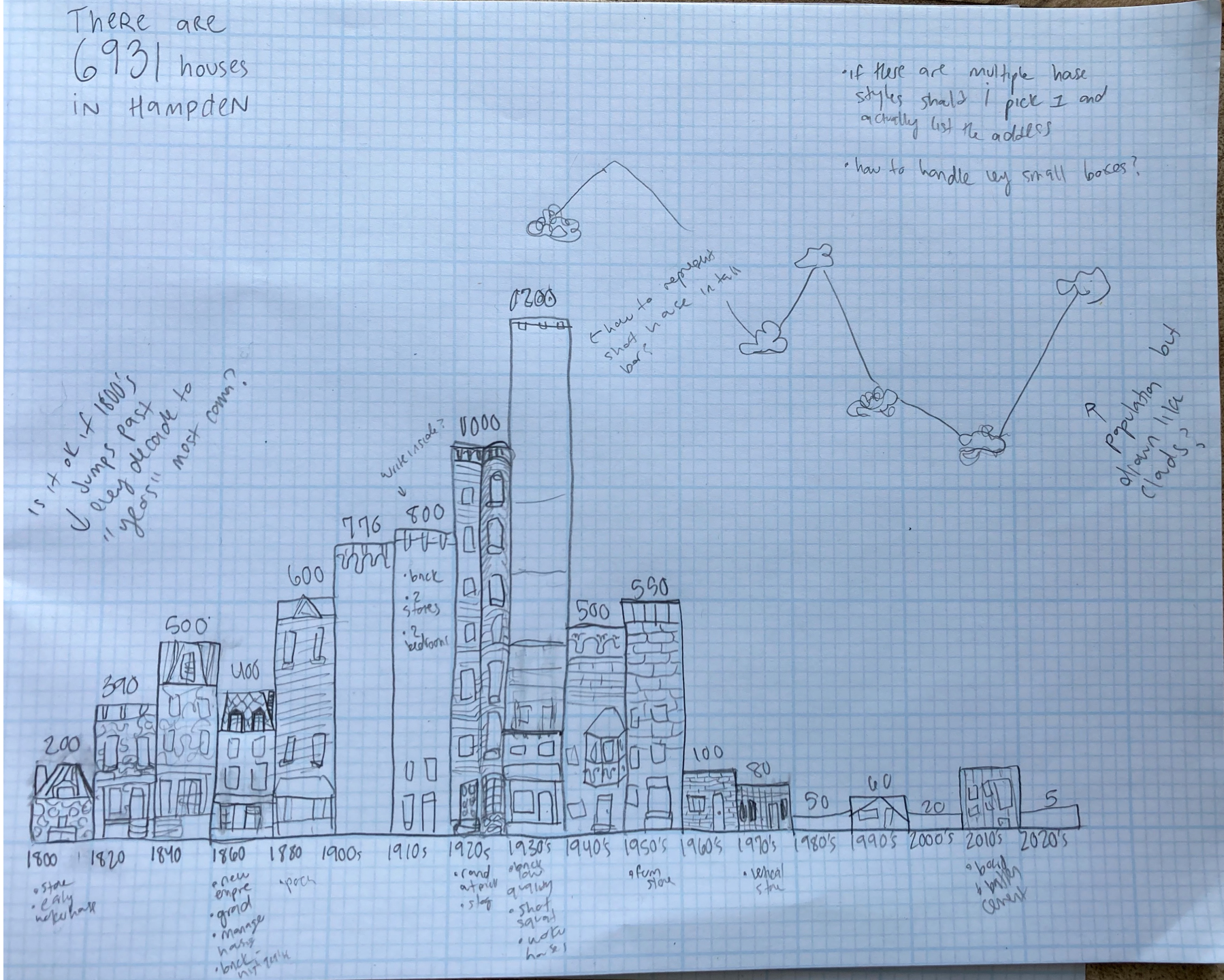
Housing age in Hampden by decade



Diversity of Hampden vs Baltimore City from 1980-2020



Initially I had a strong vision to work with data related to the age of houses in the Hampden neighborhood...



...but the data wasn't there in the open

https://www.city-data.com/neighborhood/Hampden-Baltimore-MD.html

User Defined Area:	BALTIMORE CITY
Total housing units	303,706
YEAR STRUCTURE BUILT	303,706
1989 to March 1990	1,604
1985 to 1988	5,004
1980 to 1984	9,563
1970 to 1979	23,123
1960 to 1969	29,692
1950 to 1959	53,068
1940 to 1949	56,481
1939 or earlier	125,171

Pre-1939 is the part of the data I find most interesting, but frustratingly it is all lumped into one datapoint.

ESTATED

Hampden House Year Built

We've compiled a preview of your data below.

Displaying: **25** of **6,931** total results.

Address	Location	Year Built	Size (sq. ft.)	Valuation (Es			
2709 HUNTINGDON AVE	BALTIMORE, MD, 21211	1920	1,044	$184,000			
2921 CRESMONT AVE	BALTIMORE, MD, 21211	1925	1,200	$354,000			
3101 HUNTINGDON AVE	BALTIMORE, MD, 21211	1920	1,164	$226,000			
2621 MILES AVE	BALTIMORE, MD, 21211	1912	864	$156,000			
505 W 27 ST	BALTIMORE, MD, 21211	1912	1,118	$254,000			
2713 HAMPDEN AVE	BALTIMORE, MD, 21211	1900	1,138	$247,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
2721 HAMPDEN AVE	BALTIMORE, MD, 21211	1900	1,098	$254,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
2723 HAMPDEN AVE	BALTIMORE, MD, 21211	1900	1,098	$207,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
441 W 24 ST	BALTIMORE, MD, 21211	1900	780	$193,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
808 W 37 ST	BALTIMORE, MD, 21211	1920	1,468	$337,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
824 W 37 ST	BALTIMORE, MD, 21211	1920	1,468	$326,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
608 W 38 ST	BALTIMORE, MD, 21211	1927	1,440	$325,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
3627 HICKORY AVE	BALTIMORE, MD, 21211	1880	1,204	$298,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
4037 FALLS RD	BALTIMORE, MD, 21211	1920	1,400	$238,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock
1430 MILL RACE RD	BALTIMORE, MD, 21211	1840	936	$262,000	Contact sales to unlock	Contact sales to unlock	Contact sales to unlock

I tried **really** hard to find this information. It's on all of the housing market websites like Zillow and Redfin, so I knew it existed somewhere.

I learned that those websites use APIs like Estated, which have this information behind a paywall, breaking the intention of this project

I felt very disinterested in building the visualization I initially imagined with only a portion of the data, so I decided to pivot and entirely change my project to rebuild my own excitement.
I didn't want to tell half a story.

I looked back at the open data sets I had collected and found another one that interested me because it went back **FAR** in history, all the way to **1790!** Plus, it was complete up until the 2010 census. I knew I would be able to find the final 2020 census information and complete the dataset.

https://planning.maryland.gov/MSDC/Documents/Census/historical_census/histcens_1790-2010.xls

POPULATION OF MARYLAND'S REGIONS AND JURISDICTIONS, 1790 - 2010

	2010	2000	1990	1980	1970	1960	1950	1940	1930	1920	1910	1900	1890	1880	1870	1860	1850	1840	1830	1820	1810	1800	1790
MARYLAND	**5,773,552**	**5,296,486**	**4,780,753**	**4,216,975**	**3,922,399**	**3,100,689**	**2,343,001**	**1,821,244**	**1,631,526**	**1,449,661**	**1,295,346**	**1,188,044**	**1,042,390**	**934,943**	**780,894**	**687,049**	**583,034**	**470,019**	**447,040**	**407,350**	**380,546**	**341,548**	**319,728**
BALTIMORE REGION	**2,662,691**	**2,512,431**	**2,348,219**	**2,174,023**	**2,070,670**	**1,803,745**	**1,457,181**	**1,174,589**	**1,068,356**	**931,413**	**798,392**	**718,176**	**619,080**	**519,349**	**420,572**	**351,739**	**283,011**	**198,272**	**165,484**	**139,290**	**123,736**	**99,279**	**76,511**
Baltimore County	805,029	754,292	692,134	655,615	621,077	492,428	270,273	155,825	124,565	74,817	122,349	90,755	72,909	83,336	63,387	54,135	41,592	32,066	40,250	33,463	29,255	32,516	25,434
Baltimore City	620,961	651,154	736,014	786,775	905,759	939,024	949,708	859,100	804,874	733,826	558,485	508,957	434,439	332,313	267,354	212,418	169,054	102,313	80,620	62,738	46,555	26,514	13,503

A common story I have heard since moving to Baltimore is the tension between the city vs the county.

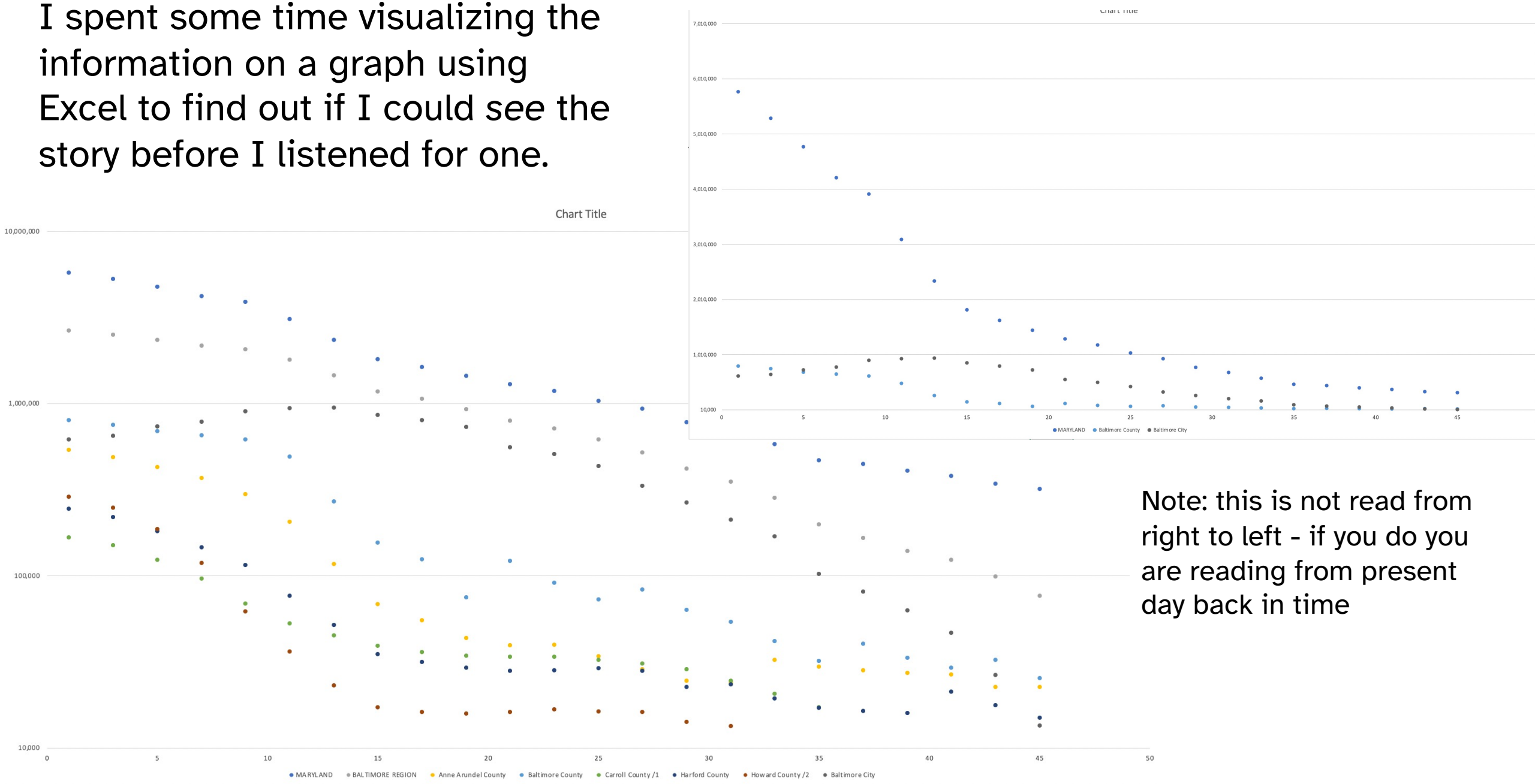
There is a lot of beef between the outlying suburbs and city. Even the name. Baltimore county refers to itself as *Baltimore* and to the city as *Baltimore city*. City people call the city *Baltimore* and Baltimore County is just *the county*. (With a air of distaste on both sides)

They fight over the name Baltimore itself.

I’ve been exploring sonification over the past couple of years, but have never used it for a personal project. The idea of exploring sound to tell a story for this project seemed fun.

Thinking about the city/county tension, I was quickly inspired by Dueling Pianos

I spent some time visualizing the information on a graph using Excel to find out if I could see the story before I listened for one.



Note: this is not read from right to left - if you do you are reading from present day back in time

I only had data until 2010, so I found the most recent census to complete set

It was more challenging to find that I expected. For a bit, I thought I would have to come up with the number by adding all the populations of different jurisdictions in the county, but luckily I found the data I was looking for: https://planning.maryland.gov/MSDC/Documents/pop_estimate/ARS/July-2020-Total.pdf

Total Population by Race for Maryland's Jurisdictions, July 1, 2020							
State/Region/Jurisdiction	Total	White Alone	Black or African American Alone	American Indian and Alaska Native Alone	Asian Alone	Native Hawaiian and Other Pacific Islander Alone	Two or More Races
Maryland	**6,055,802**	**3,515,375**	**1,894,597**	**38,429**	**415,516**	**7,446**	**184,439**
Baltimore Region	**2,749,022**	**1,635,659**	**846,087**	**12,206**	**171,631**	**2,734**	**80,705**
Anne Arundel	582,777	424,168	109,491	2,728	25,464	736	20,190
Baltimore County	826,017	489,836	255,602	3,930	53,170	756	22,723
Carroll	169,092	154,287	6,742	483	3,797	108	3,675
Harford	256,805	200,932	38,988	892	7,976	245	7,772
Howard	328,200	180,880	67,543	1,490	65,079	281	12,927
Baltimore City	586,131	185,556	367,721	2,683	16,145	608	13,418

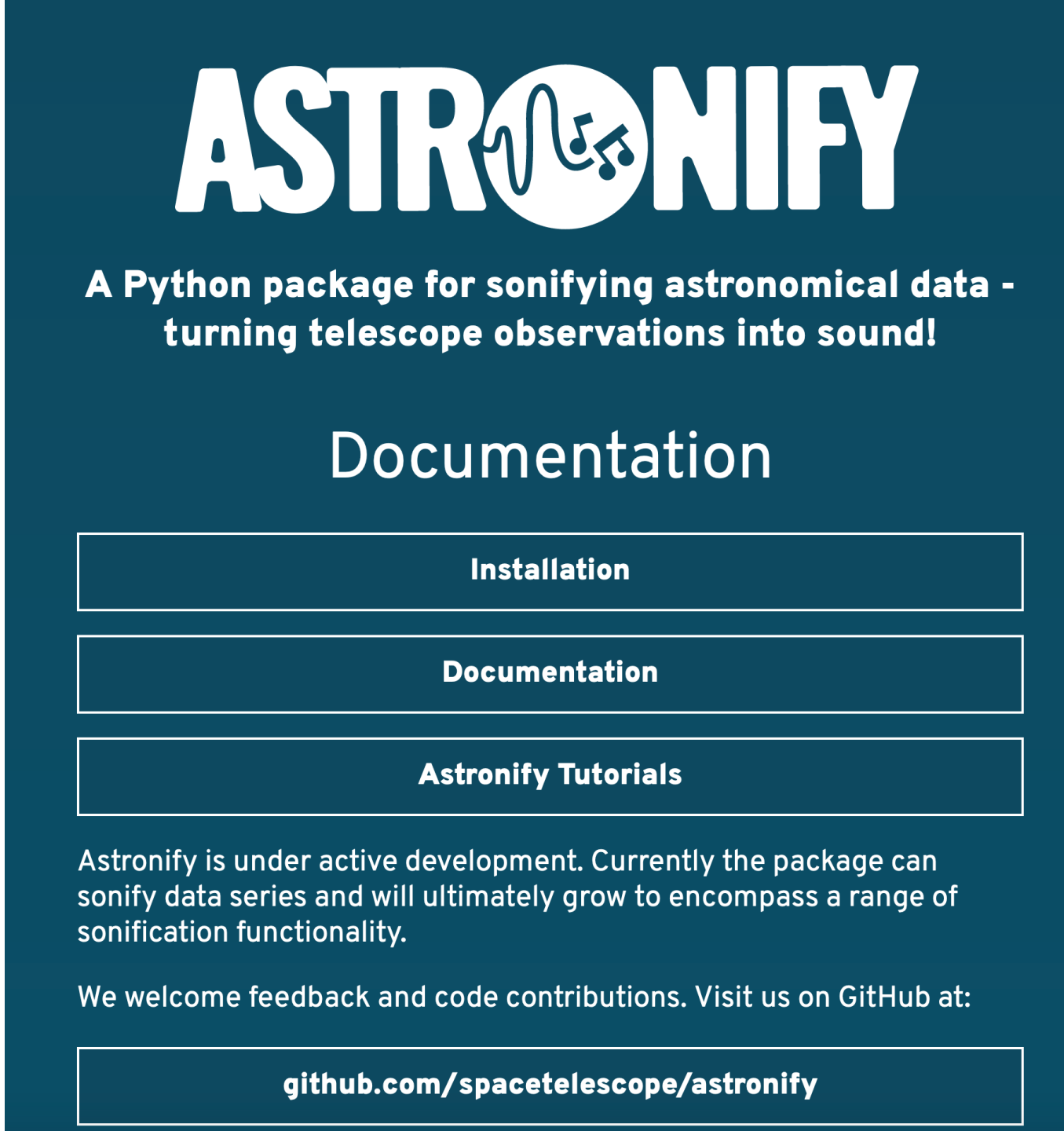
I knew I wanted to use the FOSS sonification library

Astronify

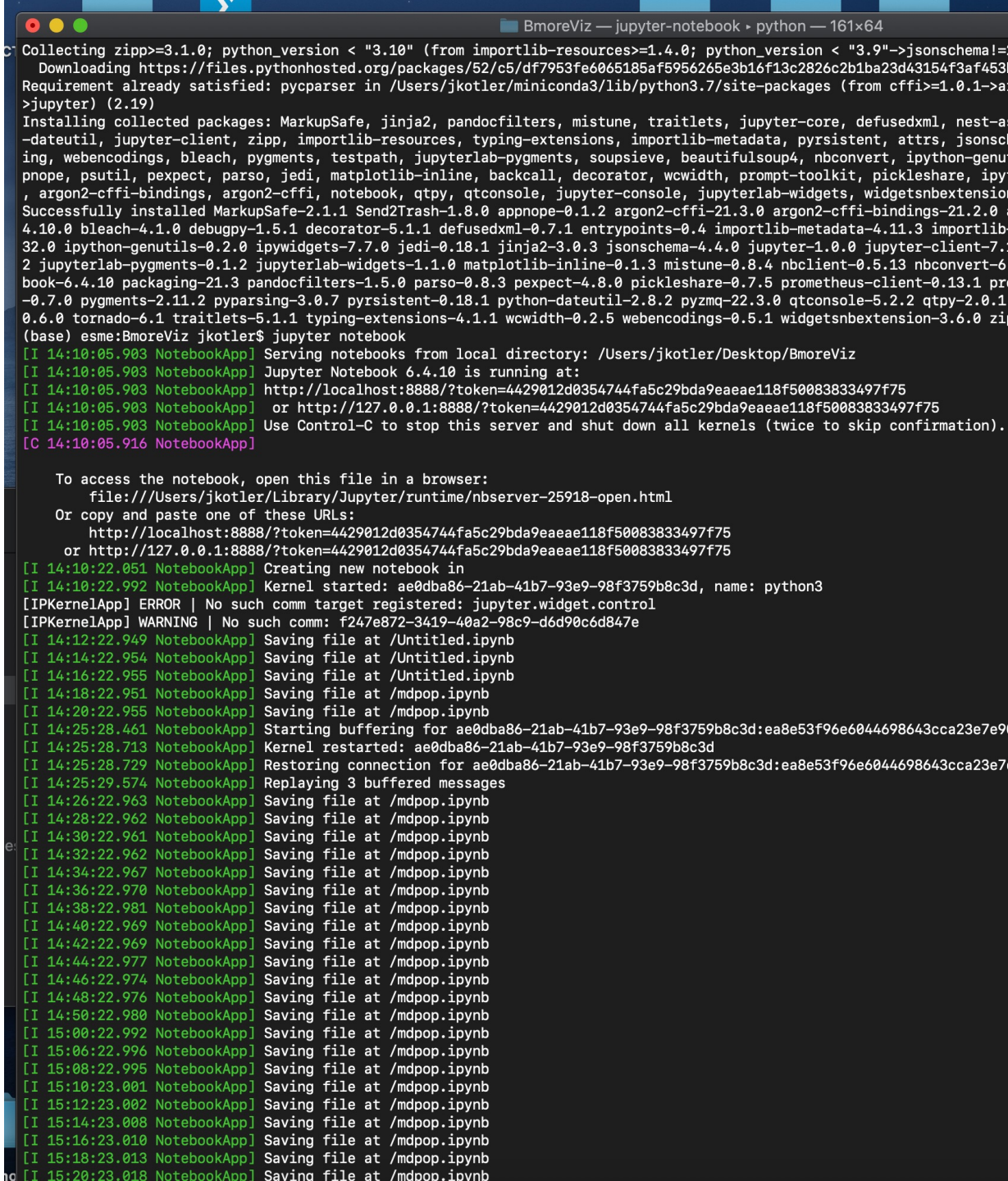
which I was involved in designing

https://astronify.readthedocs.io

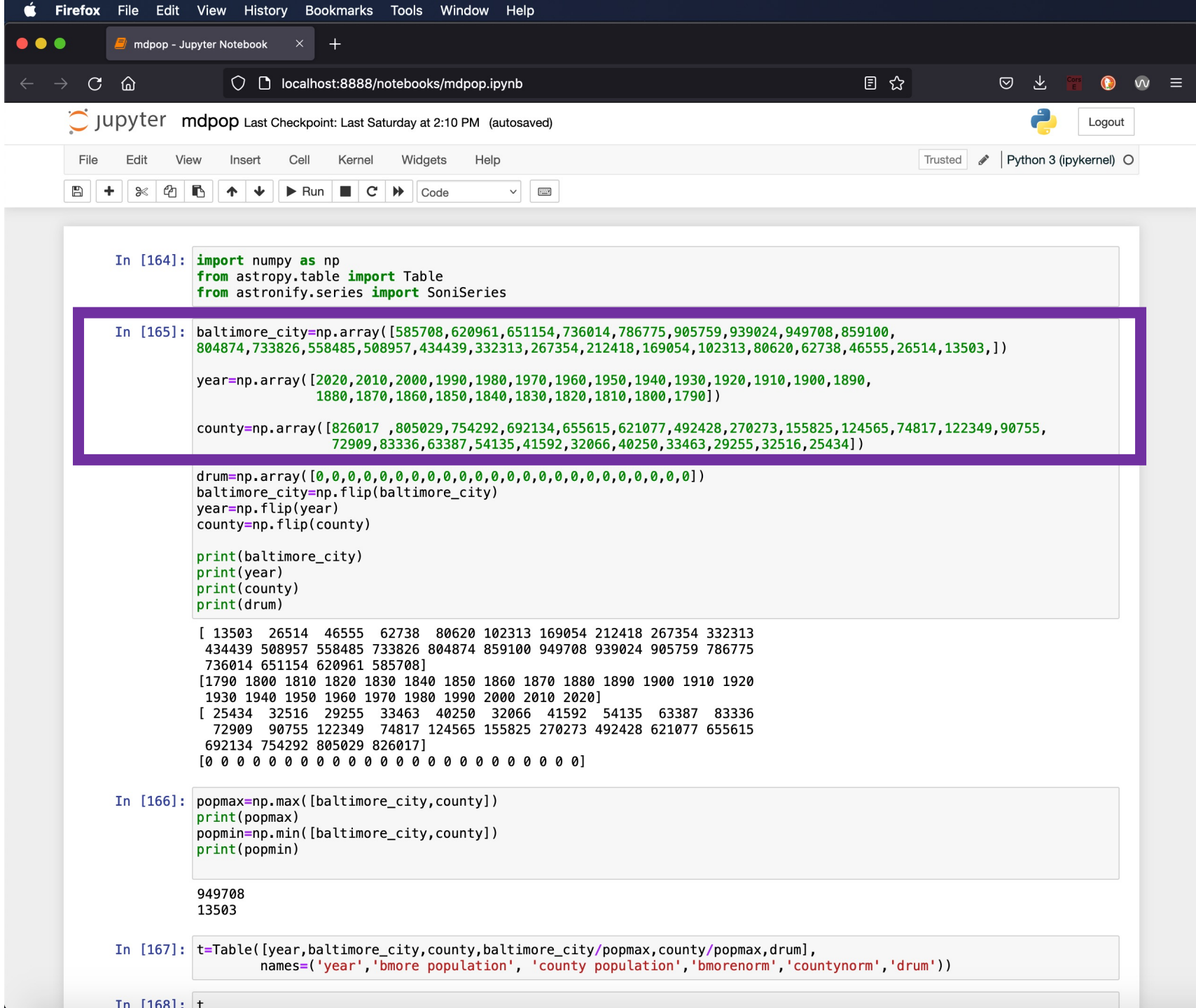
It is meant to be used with lightcurves, but I knew it would work as long as I had a list of numbers



First I Installed some required libraries and Python



Then I created a Jupyter notebook and pulled in the census data



I created a table that Astronify could use to sonify

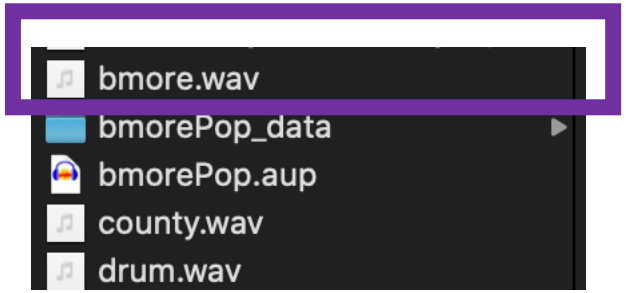
```
In [168]: t
```

```
Out[168]: Table length=24
```

year	bmore population	county population	bmorenorm	countynorm	drum
int64	int64	int64	float64	float64	int64
1790	13503	25434	0.014218054391455058	0.026780863170574536	0
1800	26514	32516	0.027918054812637146	0.0342378920678777	0
1810	46555	29255	0.04902033045946754	0.030804205081983095	0
1820	62738	33463	0.06606030485159649	0.03523504066513076	0
1830	80620	40250	0.0848892501695258	0.04238144777131497	0
1840	102313	32066	0.10773100784662233	0.03376406221701828	0
...	...	...	...	...	...
1960	939024	492428	0.9887502263853732	0.5185046351088967	0
1970	905759	621077	0.9537236708546206	0.6539662717382606	0
1980	786775	655615	0.8284388464664929	0.6903332392693333	0
1990	736014	692134	0.7749897863343259	0.7287861110994116	0
2000	651154	754292	0.6856360060144803	0.7942357019210116	0
2010	620961	805029	0.6538441289322613	0.8476594911277993	0
2020	585708	826017	0.6167242984159341	0.8697589153718828	0

```
In [169]: sonidf=SoniSeries(t,time_col='year',val_col='bmore population')
          sonidf.note_spacing=2
          sonidf.note_duration=.4
          sonidf.pitch_mapper.pitch_map_args['minmax_value']=[0,popmax*4]
          print(sonidf.pitch_mapper.pitch_map_args)

          {'pitch_range': [100, 10000], 'center_pitch': 440, 'zero_point': 'median', 'stretch': 'linear', 'minmax_value': [0,
          3798832]}

In [170]: sonidf.sonify()
          sonidf.play()

          Pyo warning: Portaudio input device `MacBook Pro Microphone` has fewer channels (1) than requested (2).
          Pyo warning: Portmidi warning: no midi device found!
          Portmidi closed.

In [171]: sonidf.write('bmore.wav')

          Pyo message: Offline Server rendering file bmore.wav dur=46.400000
          Pyo message: Offline Server rendering finished.
```

Then I generated separate sonifications representing the city and the county's population data



In [169]:
```
sonidf=SoniSeries(t_time_col='year',val_col='bmore_population')
sonidf.note_spacing=2
sonidf.note_duration=.4
sonidf.pitch_mapper.pitch_map_args['minmax_value']=[0,popmax*4]
print(sonidf.pitch_mapper.pitch_map_args)
```

```
{'pitch_range': [100, 10000], 'center_pitch': 440, 'zero_point': 'median', 'stretch': 'linear', 'minmax_value': [0,
3798832]}
```

In [170]:
```
sonidf.sonify()
sonidf.play()
```

```
Pyo warning: Portaudio input device `MacBook Pro Microphone` has fewer channels (1) than requested (2).
Pyo warning: Portmidi warning: no midi device found!
Portmidi closed.
```

In [171]:
```
sonidf.write('bmore.wav')
```

```
Pyo message: Offline Server rendering file bmore.wav dur=46.400000
Pyo message: Offline Server rendering finished.
```

I spent some time playing with different sonification settings: pitch, speed, adding extra beats, etc.

I could *hear* something that I hadn't noticed when inspecting the data *visually*.

There were 3 main sections of differing trends.

Since the sonification by itself is not self explanatory, I decided to write a script and use that as an opportunity to hone in on those 3 section trends.

My Script:

This sonification compares population in Baltimore City with Baltimore County through time. Using census data from 1790 to 2020, We get a snapshot of both populations every 10 years.

To understand this sonification, here is what you need to know. Population size is represented through pitch, a lower number of people is represented through a deeper pitch and a larger number of people is represented through a higher pitch. The first tone you will hear represents Baltimore cities population in 1790. The next tone you heal represents Baltimore county's population in 1790. The tone with a higher pitch is the area with higher population. Then there will be a pause as 10 years passes, and you will hear another tone representing Baltimore cities population in 1800, then Baltimore county's tone, another pause, and so on—ending with the two tones representing the city and county's population in 2020.

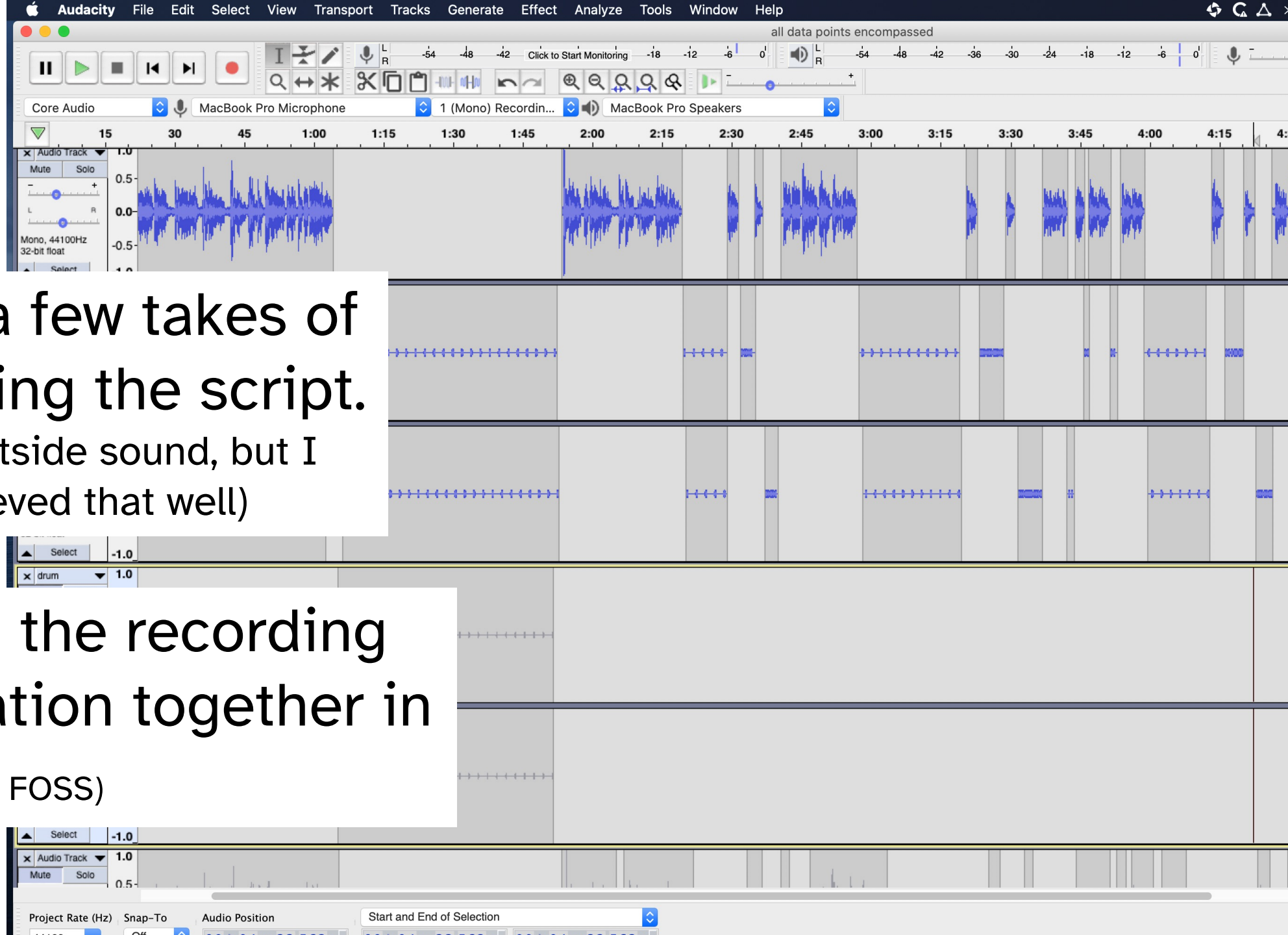
You just listened to 240 years of population data! Let's listen again. This time I am going to break it into 3 sections whose trend tells different stories.

For the first 50 years (1790 - 1830), at first the outlying county has a larger population, they are both growing but Baltimore city grows faster and eclipses the counties population. ((Play both together)) Now here is the city's data by itself ((Play Baltimore)) and the county's by itself ((play county))

For the next 110 years (1840-1950), both the city and the county's population trend upward, but the city grows at a much faster pace. The city reaches its peak population in 1850, while the county population is still significantly lower. (Play both together)) Now here is the city's data by itself ((Play Baltimore)) and the county's by itself ((play county))

But the county is about to hit its stride. In the next 20 years, the county's population explodes upward, over doubling itself.((Play those 2 tones next to each other)) While the city starts to decline. The most notable population drop between 1970 and 1980. ((Play those 2 tones next to each other))

Here are the last 70 years of data, bringing 1950 to the present day (Play both together)) Now here is the city's data by itself ((Play Baltimore)) and the county's by itself ((play county))



I recorded a few takes of myself reading the script.

(I tried to limit outside sound, but I don't think I achieved that well)

Then edited the recording and sonification together in Audacity (also FOSS)

I shared the final recording on Github along with the notebook I used to generate the files.