

Visualizing Structural Racism Data in Augmented Reality

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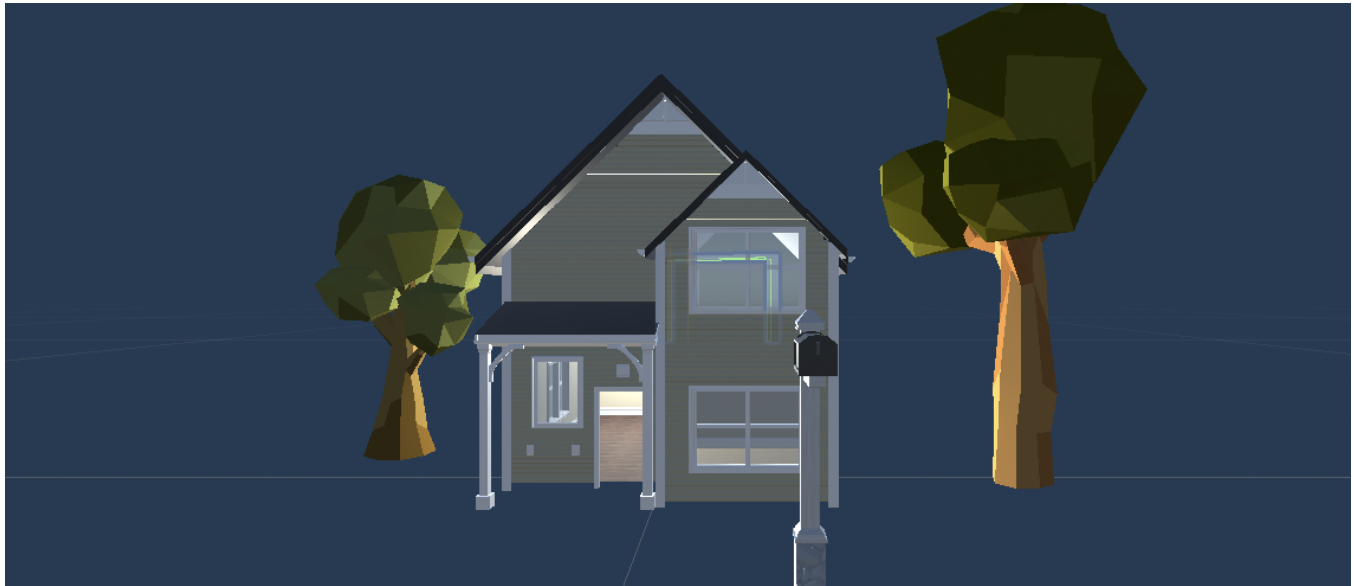


Figure 1: Photo of visualization in Unity

ABSTRACT

Structural racism has been found within much of United States' housing systems and data; this is a topic which scholars have begun to investigate and collect data on. However, when it comes to visualizing these disparities, often simple maps are used. This project seeks to create an impactful visualization of housing data displaying the devaluation of Black-owned houses in North American cities. To do so, we use an Augmented Reality (AR) application to create an AR map with case studies on locations around the United States. These case studies are represented by houses on a sliding scale, corresponding from homes in the area in neighborhoods where greater than fifty-percent of the population is Black to other comparable homes in neighborhoods where less than one percent of the population is Black. This project represents an investigation into the dynamic visualization of data illuminating structural racism. It has also served as a space to record the challenges of effectively representing this issue in a complex, three-dimensional manner.

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1 INTRODUCTION

The aim of this project is to create an effective virtual reality based visualization which brings light to the disparities of structural racism within housing. This visualization is based on data from different cities within the United States. We use property value data as well as racial demographics of the areas as the input; this data is represented as a three dimensional residential area with houses of changing dimension; the dimension of the house is proportional to its value over time with color displaying the racial component. The goal of this project is to immerse viewers within a scene which communicates the housing data in a clear and emotionally impactful manner. As opposed to a graph that must be read, the data is presented as a scene that can be watched and explored.

2 RELATED WORK

There exists much related research delving into the causes and data surrounding the topic of structural racism within housing in the United States. A report from Brookings Institute [3] provides a solid foundation for the data and goals for our visualization. It

investigates the devaluation of Black owned homes in comparison to white owned ones and presents some visual mapping of this phenomena. Their data is taken from the American Community Survey done by the US Census Bureau as well as from the house listing site Zillow. By taking into consideration structural characteristics as well as neighborhood amenities, the report is able to identify houses and areas of similar value, thus attempting to control for the variable of race. We use their data of different case studies around the United States in our work.

Many sources seek to analyze the data and review its effects, and also to map this data in a direct fashion. From some background research, the strength of the issue is clear. However, there is a distinct lack of creative visualization when it comes to this issue. Housing is a major part of the conversation when evaluating structural racism. "Structural racism in residential housing patterns were most commonly evaluated, including indices of racial residential segregation and redlining – the practice of mortgage lending discrimination based on racial neighborhood composition and purposeful financial disinvestment in non-white neighborhoods ('red zones')." [2] Studies have shown that housing is one of the most researched locations of structural racism. In addition, this has been mapped in two dimensions to display elements such as redlining and historic laws against non-white tenants.

Processes such as these which stigmatize Black owned and rented housing have lasting effects on the perceived value of Black homes. We see these impacts manifest in the Brookings Institution report, and we see the process discussed in the New England Journal of Medicine. "Redlining required the cooperation of government; the banking, credit, and real estate industries and private developers; as well as homeowners. Together, these parties helped stoke cultural beliefs that Blacks made bad neighbors whose presence would lower real-estate values and increase crime." [1] There is scholarly discussion about race as an indicator or factor on the value of a neighborhood.

3 METHODOLOGY

Overall, we created a mobile application to display our housing visualization in augmented reality using the phone camera. To do this, we first had to select and understand our data. The data which we use comes from the Brookings Intuition report. They report housing devaluation in specific United States cities and geographic areas. This data

In order to create an accurate visualization we thought deeply about audience perception. Our goal was to reflect the Brookings Institution data which focuses on the devaluation of houses in majority Black neighborhoods in comparison to housing in neighborhoods with little to no Black residents. In order to highlight the disparity embedded within this system, it was important to isolate the variable of race as much as possible. They did this by comparing other value affecting features of the houses and neighborhoods such as amenities, number of rooms, and available education.

We found that we had to use one house in our visualization rather than two, as we had limited access to the data we wanted. Originally, we wanted to look at devaluation over time, but we only had access to comparable data points for singular time segments. Because of this, we decided to focus more on the devaluation comparison and

to create one house where its representation morphs between the neighborhoods we are comparing.

In order to reflect the similarities of the neighborhoods being compared, we wanted to keep the presentation of the house as similar as possible outside of our variables. We added scenery of trees and a mailbox to ground it within a setting, as well as to show that the morphed houses are comparable in terms of location.

In addition to this we also came to a choice about which colors should represent racial makeup. Not only did we want colors which are easy to interpret, but we also wanted colors which did not give our visualization any connotation outside of our data. Thus, we created multiple versions of the visualization utilizing different color-maps for the roof.



Figure 2: House Representing Majority Black Owned Neighborhoods in Rochester, NY (\$57,960)

4 RESULTS AND DISCUSSIONS

Throughout this project we discovered and raised many questions about effective and valid visualization methods. We considered different representations of our data, experimenting with size and color. We also had to develop the fundamental structure of our visualization. Should there be one house or two? How much change and difference should we show when comparing very similar neighborhoods?

Once we created the visualization with one morphing house where its height correlates to its value and its roof color to the racial makeup of the neighborhood we began asking more questions. Should the value be represented by the size or does this allow people to perceive the comparable houses as different structures? And then how else can we represent the value? Other options include color or some sort of filling animation. These options can be investigated in the future.

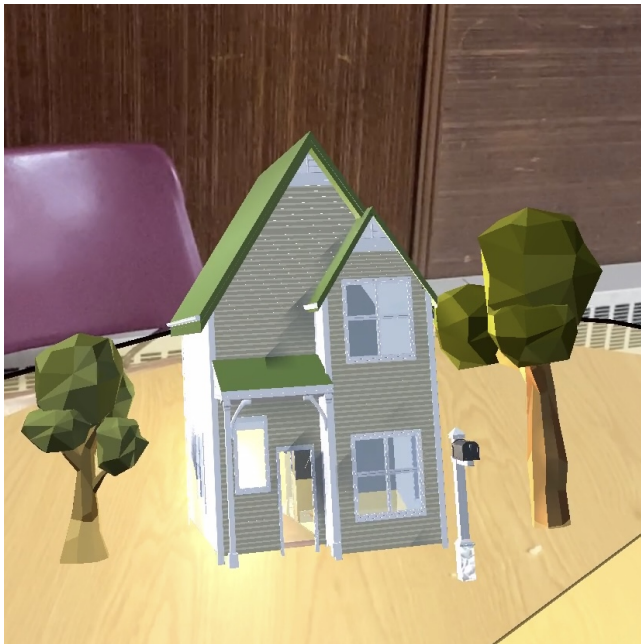


Figure 3: House Representing Non-Black Owned Neighborhoods in Rochester NY, (\$110,984)

We created three models with different color maps for the roofs of the house so that we could compare these options. The color maps are red to green, black to white, and brown to orange, representing majority Black neighborhoods and non-Black neighborhoods respectively. It would be ideal to preform a user study on these models to get feedback on the impacts of the different colors on the visualizations readability and perceived meaning.

Currently we have one case study representing data from Rochester, New York. This location was chosen for the large devaluation of homes in majority Black neighborhoods. There is available data for further case studies in other areas around the United States and a future endeavor could be to create a map of these to convey the issue on a larger scale.

5 CONCLUSION

We created an educational visualization representing a case study of housing data from Rochester, New York. This visualization displays the devaluation of Black owned housing in the area and serves as a starting point for further research into the most effective ways to represent this data using augmented reality. In the future, user studies can be carried out to evaluate the best presentations of this data and compare different options. There is also the opportunity to map entire cities and highlight systemic issues such as redlining.

This project shows us that we have a long way to go and many questions to consider when trying to creatively visualize data in augmented reality when addressing societal issues like structural racism. We were able to start building and advance our conversation on the subject; now we know what questions to ask. The next step would be to begin answering a few of them and create more maps and models to compare and educate.

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