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Project Title: Study on Correlation Between Safety with the Urban Form in Chicago

Abstract:

This study intends to contribute to the overall knowledge base about how the form of urban spaces affects the crime rate (objective safety) by analyzing Chicago's urban intersection. For this purpose, we focus on the top ten percent of least safe urban blocks intersection and collect a set of significant attributes (such as the height of the buildings, the width of the streets, and tree canopies) associated with morphological contexts of the intersections in the 50-meter buffer area of 3986 intersections in Chicago. Two primary regression analyses are used to assess the correlation of morphologic features and the objective safety: (1): Linear Least Squares Methods (Ordinary Least Squares and Weighted Linear regression model); (2) Cluster and Factor Analysis. The results will be presented in interactive maps and graphics using Tableau.

This project is in line with my thesis project subject.

Overview:

This study employs an in-depth analysis of Chicago's morphological variables associated with urban intersections using spatial mapping and statistical modeling in Arc GIS Pro 2.9.2 and IBM SPSS 19. For this purpose, we will develop maps and graphic visuals about how Intersections are the spatial locations selected to study the streetscapes' morphology in Chicago.

In the present study, a road intersection was defined as having a 50 m (164 ft) buffer zone from the crossing point of two road centerlines.

First, intersections in the top ten percent urban blocks with the highest crime rates (80 census blocks) were recognized. Secondly, 22 significant indicators correlated with morphological contexts, such as patterns of buildings, blocks, streets, and land use, were collected for a 50-meter buffer area of 3986 intersections in Chicago. The morphological measurements were derived from publicly available building footprint, tree canopy, and street centerline data processed using a GIS-based method.

After developing 50 m buffers around each buffer, these buffers with individual IDs were related to the processed geographical data using spatial join in Arc GIS Pro. A final dataset was derived in which each buffer's ID was associated with a set of morphological data.

To analyze the correlation between intersections' morphology and objective safety, this research employs two main methods: (1): Linear Least Squares Methods (Ordinary Least Squares and Weighted Linear regression model); (2) Cluster and Factor Analysis. The results will be presented in the forms of interactive maps and graphics using Tableau.

Technology: Tableau, Arc GIS Pro, IBM SPSS

Inspiration:

https://public.tableau.com/app/profile/anastasia.komissarova/viz/MoscowMap_16242110055380/MoscowCityCenterMap

https://public.tableau.com/app/profile/sara.anne.willette/viz/USMultisourceWastewaterData/WastewaterData

https://public.tableau.com/app/profile/louisyu/viz/BringingbacktheCHARMtoBalitmore/LivabilityScores

Potential Challenges: Linking shapes or graphics to special features on the map

Variable	Variables	Description	Source
Parcels, and buildings	parcel count	Number of parcels per buffer zone	Chicago data portal
	parcel size (area)	Mean value of parcel areas in SF.	Chicago data portal
	parcel size (perimeter)	Mean value of parcel perimeters in feet.	Chicago data portal
	parcel setback	Mean value of the straight-line distance from every parcel centroid point to the nearest street centerline.	Chicago data portal
	building (count)	Number of buildings per Buffer zone	Chicago data portal
	building size (area)	Mean value of building areas in SF.	Chicago data portal
	building size (perimeters (perimeter)	Mean value of building perimeters in feet	Chicago data portal
	building setback (perimeter)	Mean value of the straight-line distance from every building centroid point to the nearest street centerline.	Chicago data portal
	building size (height)	Mean of the height of the buildings	Chicago data portal
Streetscape attributes	street width	Mean value of the distance between opposing edges	Chicago data portal
	cross-sectional proportion	The quotient of height divided by the width	Chicago data portal
Pedestrian-oriented attributes	sidewalk	Cumulated street length with sidewalks per acre.	Chicago data
	bike route	Cumulated bike route length per acre.	Chicago data
	tree canopy	Cumulated value of tree canopy area per acre	Chicago data portal
	bus stop	Bus stop counts per acre	Chicago data portal
	walking index	Points are awarded based on the distance to amenities in each category. Amenities within a 5-	redfin.com
Property land uses	mixed use %	% of parcel area with mixed land use.	Chicago data portal
	commercial %	% of parcel area including retail stores, restaurants, coffee shops, bakery, bookstores, farmers market.	Chicago data portal
	multifamily residential %	% of parcel area including single-family home/duplex – attached (2–4units); Townhome/condo/apartment housing (5 units or more).	Chicago data portal
	single family residential %	% of the parcel area, including detached single-family homes.	Chicago data portal
	vacant lot %	% of the vacant parcel area	Chicago data portal