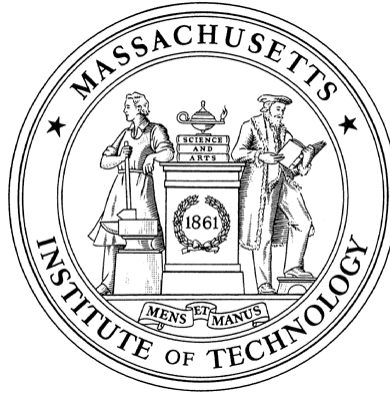


**Massachusetts Institute of Technology
Department of Urban Studies and Planning**



**11.204: Planning, Communications & Digital Media
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**Recitation 9: Using GIS Tools to Compare Two Aspects
of Central Square**

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I. Scenario--Research Design--Hint for Project 2

I.1 Research Questions

- What is the education status and income status of central square? How does it compare to the city of Cambridge?
- Is there any relationship of the education status and the income status?

I.2 Research Boundary

- 1) Time boundary--Only current condition (year 2000)--no vertical temporal comparison.
- 2) Spatial Domain

- Central Square--Research Object--highlight
- Cambridge--Comparison Background --limits
- Massachusetts--Data Availability Unit

I.3 Objective Variables Selection

- Education--High Educated People--College degree or higher--Ratio of college degree or higher to the population of 18 year or older
- Income--Household income--Median Household Income
- Control Variables

I.4 Data Availability

	Different Resources	Different Formats
Geographical Data (Cambridge, Central Square)	ESRI shape, TIGER	ArcView Shape file
Education and Income Data	Census 2k	MS Access file
MBTA Lines and Stop	MBTA	Shape

- Educational Attainment, by Census Tract, for the Commonwealth of Massachusetts
- Median Household Income, by Census Tract, for the Commonwealth of Massachusetts
- City of Cambridge Census Tracts
- City of Cambridge Boundary
- Central Square Boundary
- MBTA Lines and Stations (as a geographical reference)

MS Access feeds the data into ArcView--Direct linkage vs. Indirect Export/Import.--convert the data from ".mdb" into dBase IV ".dbf."

Census2kMass.mdb--qryEdu, qryMHI

Be patient when you open the database--109mb. It takes time to read the file and run the query across the network.

Sense of using the database in practices. Slow, sometime doesn't work even at MIT

I.5 Comparison Methodology--Visual Comparison or Statistical Comparison

II. More on ArcView Operation

II.1 Project with Multiple Views

General Structure of the ArcView Project

- Project--(View/Table/Layout)
- View--Themes
- Table--Attribute table vs. External Tables
- Layout--multi layouts

View "Education"--Existence, Visibility, Activeness

- Cambridge Boundary
- Cambridge Census Tract
- MBTA lines
- MBTA stations
- Central Square Boundary

View "Median Household Income" --same shape files

View Property

- Map Units: Meter
- Distance Units: Miles
- View name: Education or Median Household Income

Theme Property

theme name--pay special attention to the theme, "Cambridge Census Tract" in the view "Education" and the view "Median Household Income." (We'll need to change the name of each after we decide what each will represent.

II.2 Table Join

The education and median household income information--External Table (Access-->dBase)

Geographical Information--Shape File --Attribute table

Table Join --Attribute table with External Table

- Attribute table of Cambridge Census Tract theme in view "Education"-- primary key "Stcntytr"
- External table "MAEDU2K.dbf"--primary key "TRACTID"

Repeat for MHI

Table join is done in ArcView on-the-fly, each time you open this project file all the table joins will be rebuilt--What is saved in the ".apr" file--no mystery --open it in txt editor--example

Export the theme after joining into a shape file.

II.3 Refining Symbology

Abstraction--Geometry Representation

- Point--only location matters--Is Boston a point?--At different levels, Boston could be a point or polygon.
- Line--only one dimension matters
- Polygon--2-d make sense

Symbology Factors

- color
- shape
- width
- height
- size
- pattern
- labels
- pictures

Point:

- MBTA Stops (Shape: Triangle/ Color: Dark Red/ Size: 12)

Line:

- MBTA Routes (Unique Value as Legend Type) (Style: Single line / Size: 2 / Color: According to the line name)

Polygon:

- Cambridge Border themes (Fill pattern: Empty / Outline width: 3 / Outline Color: Black)
- Central Square Boundary (Fill pattern: Empty / Outline width: 2/ Outline Color: Yellow)
- Census Tract--Key Information (all others are references, background)

For the "Education" view,

Legend Type: Graduated Color
Classification Field: hedu18up
Classification Type: Quantile
Number of classes: 5
Round value at: d
Color Ramps: Cyan Monochromatic

For the "Median Household Income" view,

Legend Type: Graduated Color
Classification Field: mhi
Classification Type: Quantile
Number of classes: 5
Round value at: d
Color Ramps: Orange Monochromatic

Two themes begin to have different meanings.

Display Orders--Turn on an order the themes in the table of contents so that the map is legible. (From top to bottom in this order: MassMBTAsstop, MassMBTAline, Central Square Boundary, Cambridge Boundary, and Education/Median Household Income.)

II.4 More on Layout--A Layout with Two Views

Same Scale: 1:80000.

Extent: the city of Cambridge (not the extent of all the MBTA lines)

One layout with two view frames.

Other Map Elements: legends, north arrow, scale bar, title, data sources, creator name, and the date

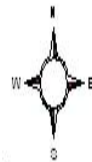
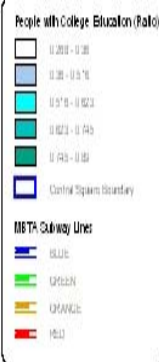
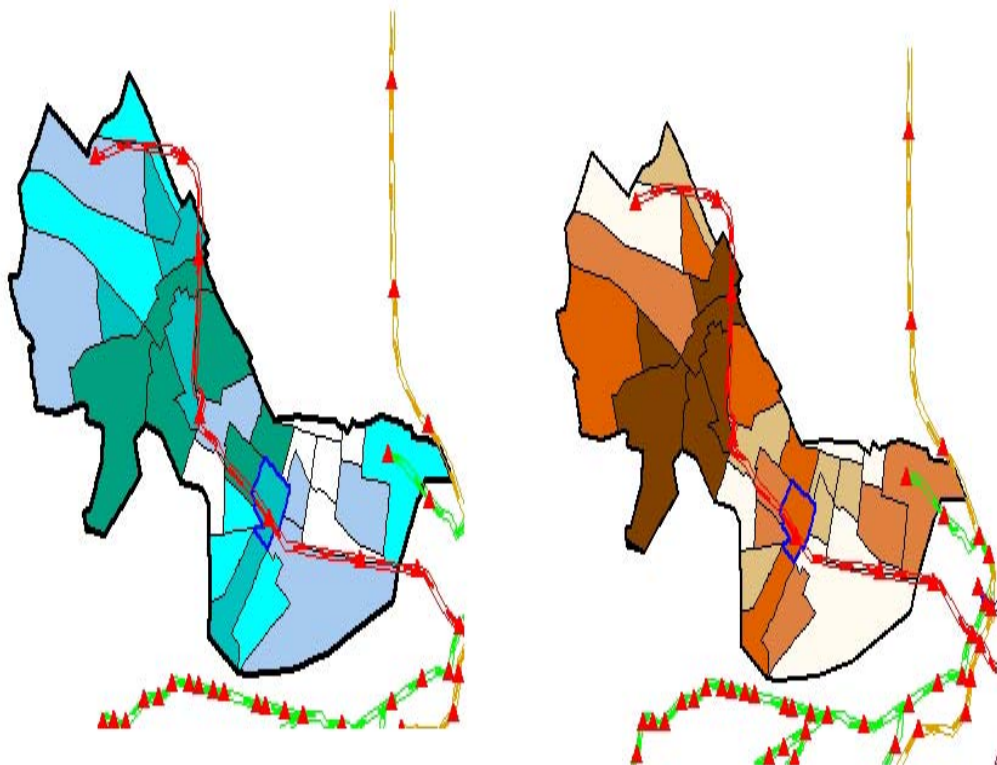
Refine the layout.

Export the final layout into an image

III. Things to Ponder--Interesting finding from the maps.

An Analysis of Central Square

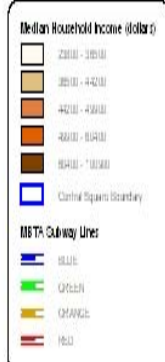
Is There A Relationship Between Educational Attainment and Household Income?



Scale



First and Last Name
Contact Number/Address
Date
Data Sources



ArcView, Access, SPSS are only tools. It is we that do the analysis.

III.1 Key Findings

What is the education status and income status of central square? How does it compare to the city of Cambridge?

- Central Square is in the middle both in terms of high education and in terms of income

Is there any relationship of the education status and the income status?

- Correlated: Higher educated area tend to have higher income
- Harvard Square most high educated people and accordingly high income people
- Central Square is in the middle both in terms of high education and in terms of income

Exceptions:

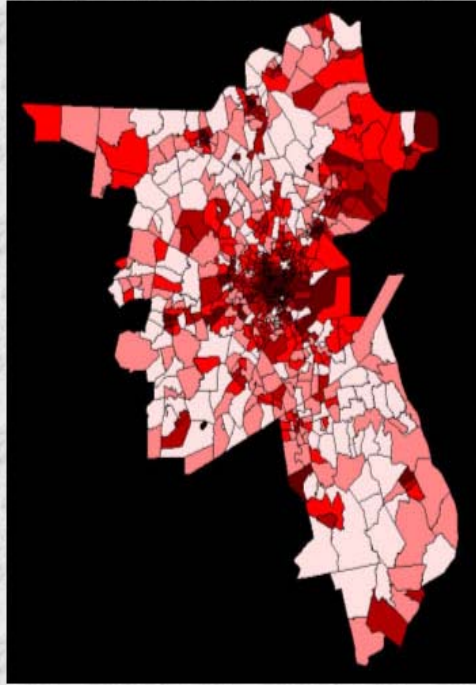
- MIT is strange. high educated people but poor income because of us--poor high educated students.
- Census counts by where you live not where you work. Professors are not counted.

III.2 Correlation vs. Causality--one example of a more complicated study

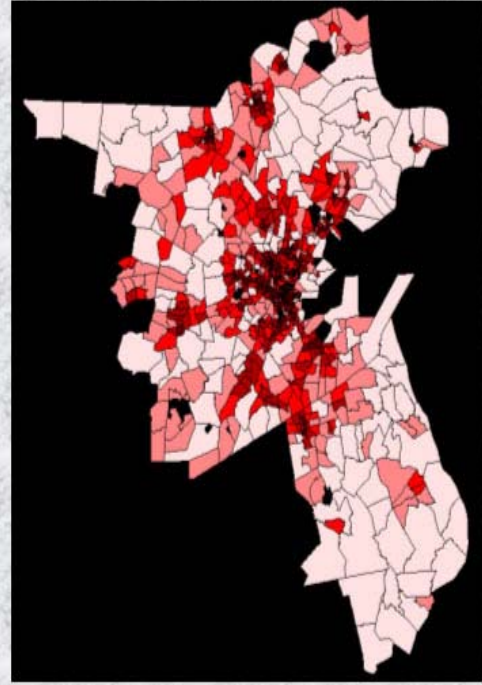
Diversity of Land Use Pattern and its Relation with Transportation Modes

Final: Compare WR & DI--Visually

■ Walker Ratio



■ Dissimilarity Index



Final: Compare WR & DI--Statistically

Correlations

		WALKERRATI	DI
WALKERRATI	Pearson Correlation	1.000	.348**
	Sig. (2-tailed)	.	.000
	N	764	764
DI	Pearson Correlation	.348**	1.000
	Sig. (2-tailed)	.000	.
	N	764	764

** . Correlation is significant at the 0.01 level (2-tailed).

Jinhua_LanduseDissimilarity_WalkerRatio.ppt (PDF)

OR

Jinhua_LanduseDissimilarity_WalkerRatio.htm (PDF)

III.3 Visually vs. Quantitatively

- Quantitatively: systematic, strict, precise
- Visually: intuitional, heuristic, inspiring

What makes a good scientist? What distinct him from the commons? --Not the advanced statistical methods, not the skillfulness of using ArcView but the sensitivity to the world, the inspiration to discover and create. Visual analysis helps.

Created November 2002 by Jinhua Zhao.