Reading reflections

USP 570

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Week 7

- The 'Diamond of Design'

Levinson and Krizek (2018 Chapter.11) introduced a new 'Diamond', a structure of four key design tenents-hierarchy, morphology, layers, and architectural content. Here author define the term 'design' as "how elements of place and plexus arrange their parts into a whole on a variety of scales, from the neighborhood to the metropolis." This framework even coveres the cities system as a high-level hierarchy place. This perspective is more from engineering or computer science. The author compare the layers of place and plexus with the OSI (Open Systems Interconnetion) Model, a computer networking framwork. This view point is different with the planner who have design background but it provide a powerful tools to explain the complexity of urban land use and transportation.

- Objectively measure subjective qualities

The study by Ewing et al. (2006) attempts to quantitatively measure five urban design qualities in terms of physical characteristics of street for walkability. The research team selected nine from 51 perceptual qualities, 48 from more than 200 video clips, and 10 urban design and planning experts. The expert panel are invloved in defining the 'operational' and give the walkability ratings for each clips and assign a score for each quality on a scale from 1 (low) to 5 (high). This study used the fractional factorial design, the crossed multilevel Design, random effects models, and linear regression models to built up the relationship among physical teatures, urban design qulities ad overall walkability.

At the end the team dropped four qualities and choose imageability, enclosure, human scale, and transparency as the measurement of walkability based on five criteria including significant level, ICC,[1] and variance components. This study found that 38 of more than 130 physical features have significant effects on one or more perceptual qualities. In a later paper, Ewing and Handy (2009) gave all the consensus qualitaitive definiations and operational definitions for each qualities and identify detailed physical features associated with each qualitty

- Discussion: predetermined or prior information.

Inversing input and output. The team selected 48 clips that "best matched the combinations of high/low values in a 2^{8-4} fractional factorial design (FFD)." FFD is for simplify and improve experiment.[2] (Montgomery 2017) Through examining all the combination of factors,

[1] Intraclass Correlation Coefficient reflects the proportion of the variance of an observation that is the result of differences between treatments.

[2] "A major use of fractional factorials is in screening experiments—experiments in which many factors are considered and the objective is to identify those factors that have large effects. Screening experiments are

the result of FFD should tell us which factors and interactions are improtant or non-negligible. On the contrary, this reaserch use FFD as a method of sample selection. "The 2^{8-4} sample allowed us to capture the main effects[3] of each urban design quality on overall walkability,. . . to maximize geographic diversity." (Clemente and Ewing 2005) Actually, what this step do is not sample selection, is treatment selecetion. The 48 clips were rated by viewer in the next step giving 480 observations on walkability and 480×9 observations on qualities.

The 2^{8-4} FFD means k=8 factors, p=4 independent generators and 48 observations can assign each of 16 runs with 3 replication. Properly choosing the generators make the effects of potential interest are not aliased with each other. However, the papar don't provide the list of generators and alias, don't clarify which factors are confounded and which factors and interaction have significant effects.

The nonrandomized 'random effects models'. At the beginning of research design, research team define their purpose are "trying to operationalize design concepts, not assess public preferences". They believe "average person" cannot rate streetscapes as to their "legibility," "transparency," and so on. The expert define the criteria and rate the clips being selceted to match some designated qualities. Both of the viewers and the scenes are not randomly selected. These fixed treatments don't satisfy the assumptions of random effects models. It is not strange that "eight of the nine qualities were collinear. Tolerance values were unacceptably low when all variables were included in a regression at once." In this situation, we cannont extend the conclusions to all treatments in the population. Technically, this reaserch selected 5 from 9 urban design qualities are more amenable and would be defined operationally in the field survey instrument. The relationship about qualities and walkability are predetermined.

It is also not enough to examine the relationship between walkability and physical features by significant level in linear regression. We can look this study as an iteration of the Bayesian paradigm. The prior information $\pi(\theta)$ (qualities) combined with the sample information $f(\vec{x}|\theta)$ (viewers and scenes) to obtain the posterior distribution $\pi(\theta|\vec{x})$. (Casella and Berger 2002) Collecting more and more scenes and viewers to train the models and draw the inference.

References

Casella, George, and Roger L Berger. 2002. *Statistical Inference*. Vol. 2. Duxbury Pacific Grove, CA.

Clemente, Otto, and Reid Ewing. 2005. "Final Report-Identifying and Measuring Urban Design Qualities Related to Walkability."

usually performed in the early stages of a project when many of the factors initially considered likely have little or no effect on the response. The factors identified as important are then investigated more thoroughly in subsequent experiments."

[3]In FFD, "significant interaction will often mask the significance of main effects. In the presence of significant interaction, the experimenter must usually examine the levels of one factor, say A, with levels of the other factors fixed to draw conclusions about the main effect of A."

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