A Multifaceted Exploration of Spatial Openness in Rental Housing: Big Data Analysis Across Tokyo's 23 Wards

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Contents

List of Figures

List of Tables

Abstract

Understanding spatial openness in residential housing is important for enhancing living quality and guiding architectural design. This study proposes a multifaceted evaluation method of spatial openness in rental housing by leveraging large-scale data from Tokyo's 23 wards. Visibility Graph Analysis (VGA) is applied to floor plan images to assess two-dimensional spatial connectivity. In addition, semantic segmentation is performed on interior photos to capture three-dimensional openness features such as window ratios and ceiling visibility. The study investigates how openness characteristics vary by geographic location and construction year, identifying spatial and temporal patterns. Finally, it explores the relationship between these openness features and subjective housing preferences, providing insights into how spatial openness influences perceived residential quality.

Acknowledgements

This is a good place to acknowledges those who helped you along the way.

Also please note how LaTex has put this on a new page as it is a new chapter. No command (apart from starting a new chapter) was needed to do this.

Also note the lack of number on the title, and contrast this to proceeding chapters, the abstract and acknowledgements should be unnumbered, the proceeding chapters should be numbered.

Chapter 1

Introduction

Temporary placeholder citation to satisfy BibTeX: [1]

1.1 Research Background and Objectives

1.2 Overview of Research Methods and Workflow

1.3 Structure of the Thesis

Chapter 2

Data Source and Preprocessing

2.1 Overview of the LIFULL Real Estate Dataset

2.2 Definition of Openness

2.3 Data Filtering and Cleaning

2.4 Generation of Subjective Impression Scores (Introduction of the Impression Evaluation Model)

Chapter 3

Quantifying the Openness of Residential Spaces

Temporary placeholder citation to satisfy BibTeX: [1]

3.1 Floor Plan Processing and Visibility Graph Analysis (VGA)

3.2 Openness Feature Extraction from Interior Images

- Estimating Window Proportions

- Segmenting Ceilings, Walls, Doors, etc.

3.3 Matching Strategy for Floor Plans and Interior Images

3.4 Visualization Examples of Openness Features

Chapter 4

Influence of Age and Geographic Factors

4.1 Impact of Building Age on Openness-Impression Relationship

4.2 Comparative Analysis Across Geographic Areas

4.3 Spatial Visualization and Cluster Analysis

Chapter 5

Correlation Analysis Between Subjective Impressions and Openness

5.1 Impression Score Outputs and Interpretation

5.2 Correlation Between Openness Features and Subjective Impressions

5.3 Case Studies and Visual Comparisons

Chapter 6

Conclusion and Future Work

6.1 Summary of Findings and Contributions

6.2 Limitations and Sources of Error

6.3 Future Research Directions

Appendix A

An example of an appendix

This is what an appendix looks like!

Appendix B

Session Protocol

Zigzag Session Protocol

Samuel Meijer

March 2019

1 Introduction and Motivation

In order to understand how to steer a boat, it is necessary to understand how the boat responds to rudder inputs. The methods used in this protocol to measure the response of the boat are adapted from the methods presented in the work of Abkowitz[1] and Lewis[2].

2 Description

The goal of this session is to perform the zigzag maneuver (also known as *Kempf Overshoot* or "Z" maneuver[3]) to derive a relationship between the rudder angle, δ, and the rate of rotation of the boat, $\dot{\theta}$. This involves steering the boat in a controlled zigzag pattern.

3 Procedure

The maneuver is conducted as follows:
while rowing,

1. the boat is set travelling straight (rudder angle, $\delta = 0$)
2. the rudder is turned to a set angle ($\delta = \delta_1$) for a set period of time, τ (until the change of rate of rotation, $\dot{\theta}$, is equal to zero [$\dot{\theta} = 0$])
3. the rudder it turned to a set angle in the opposite direction ($\delta = -\delta_1$)

Steps 2 and 3 are repeated a number of times the same rudder angles, δ_1 and the same length of time for the rate of rotation to approach zero, τ.

For this session, the rudder position will be controlled **automatically** by a servo running a programmed course. In this case, $\tau = 15s$ and $\delta_1 = -\delta_2 = 20°$.

[1] Martin A. Abkowitz. *Measurement of Ship Hydrodynamic Coefficients in Maneuvering From Simple Trials During Regular Operations.* M.I.T. Department of Ocean Engineering, Cambridge, November 1984.

[2] Edward V. Lewis. *Principles of naval architecture.* Society of Naval Architects and Marine Engineers, Jersey City, 2nd revision (3rd ed.) 1988.

[3] Ibid.

Appendix C

Software

```
#include <Wire.h>
#include <Adafruit_Sensor.h>
#include <Adafruit_BNO055.h>
#include <utility/imumaths.h>
#include <Adafruit_GPS.h>
#include <SPI.h>
#include <SD.h>
#include <Servo.h>
#include <math.h>
#include "Filter.h"

/* This driver reads raw data from the BNO055, Potentiometer and
   GPS

   Connections for ADALOGGER
   ===========

```

```
   Potentiometer
   _____________
   Connect one side to VCC
   Connect other to common ground
   Connect Middle to A0

   GPS
   _____________
   Connect VIN to VCC
   Connect GROUND to common ground
   Connect GPS TX to RX1 (D0)
   Connect GPS RX to TX1 (D1)

*/

/*********************************************/
/*BNO055 (orientation) setup, variables and def'n*/
/*********************************************/
// Sample delay
const float SAMPLERATE = 10;
// Setup for the differentiation variables
double psierror = 0;
double dt = 0;
double dpsierror_dt = 0;
double previouspsierror = 0;
```

Bibliography

[1] D. Author, "Placeholder reference," *Placeholder Journal*, 2024. This is a temporary placeholder reference.