

Research Topic	Pupils on stores and houses by facades	(Faculty)	Graduate School of Engineering
Host University	Technische Universität München / Munich / Germany	(Department)	Architecture ,Civil Engineering and Urban Design
Duration	From (month) (day) to (month) (day), 2022	(Student Name)	Kazuki Miyake

## Summary of the Research Activities

### Aim

The usage of buildings changes over time at the district and at the city level. This information and the changes made to it are significant parameters for example in urban planning and strategic urban development.<sup>1</sup> However, in digital twins of the built environment this information is often partially unavailable or not up-to-date. The project focuses on developing a novel data- and knowledge-driven methodology using Machine Learning (ML) methods combined with knowledge base to reconstruct semantic building data. The main focus will be on automatic identification of types of usage, e.g., store or pharmacy, based on multiple tagged image data available on the Internet. Knowledge representation of facades is the task of estimating the position and size of various structural (e.g., window, door) and non-structural elements (e.g., symbols, company plates) in a given image of a building. These grammars contain general pattern. These patterns contain semantic information about the building usage. Architecture can be expressed as grammars

### Text

The next section discusses the impact of signage and other text on judgements. When people visit a shop, they make judgements based on what the text indicates. In other words, signs guide people. This section compares images of shops in Japan and in the EU and discusses the effects



Above is a shop in Japan and below is a shop in Germany. I can judge Edeka because I know it is a supermarket. But I can see that people recognize shops by their letters, just as it is difficult for you to judge them when you see them in Japan.

### Color

The next section describes the impact of color on people. I will compare buildings with the same shape of façade but with different colors. Based on the results, we will examine whether color is relevant when people make decisions about shops and houses.



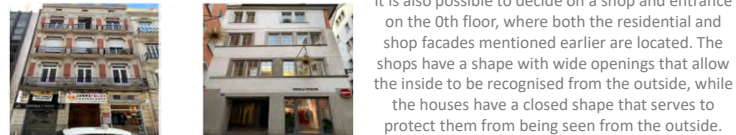
As can be seen in this figure, the impression of the facade does not change depending on the color. In the figure, there are two patterns in the 0th floor section: a storefront and a building that is the entrance to a residence. On the first floor, the window openings are small and the door is also small. In the next section, we will discuss the impression change by the shape of the entrance and the impression change by the sense of the window.

### Entrance

The shape of entrances is considered to differ between shops and houses. This is because they are used in different ways and have different purposes as entrances. Shops aim to increase the number of users, while residential buildings have an entrance as security.



As shown in the diagram, shops have a wide opening at the entrance so that the inside can be seen from the outside. In residences, the wooden door is hardly visible from the outside and is narrow enough to be perceived as a one-person door. In other words, we consider that people judge shop and residential entrances by the shape and material of the entrance.



It is also possible to decide on a shop and entrance on the 0th floor, where both the residential and shop facades mentioned earlier are located. The shops have a shape with wide openings that allow the inside to be recognised from the outside, while the houses have a closed shape that serves to protect them from being seen from the outside.

### Shape

This study investigates the differences between homes, offices and shops, focusing on the size and number of windows. It is considered that the shape of windows differs between houses and shops and offices due to different usage patterns, lighting, sight lines, etc. In this article, we will first investigate the differences between buildings in Japan and those in the EU, and then describe the contents related to window shapes.



What differs as buildings between Japan and the EU area are materials and form. In Japan, the number of concrete buildings has increased, but wooden buildings still remain. In Japan, parking spaces are generally located on the site, whereas buildings in the EU are more likely to be of concrete construction, with windows arranged at regular intervals, as can be seen in the photograph.



Shape of store windows

Shape of Residential windows

This is because houses are made narrower to block the view from the outside and for safety reasons. In addition, large windows in residences have balconies for safety reasons. In contrast, offices have large windows with narrow spaces between them to let in light. In other words, regardless of the size of the building, it is possible to classify buildings according to the size of their windows.

### Analysis

The above results show that the factors that lead to the perception of a façade as a house, shop or office can be identified. However, in the future these results must be presented quantitatively. In other words, we have been able to identify items that can be used to identify the actual perceptions of people, such as through questionnaires and surveys.

## About College Life, and Life as a study abroad

In my school life, I studied with friends in the library as well as in the laboratory. The library in Munich is highly used and seats are not available unless you go to school early in the morning. In Munich, there is a lot of student socializing, and we had a lot of fun with football and drinking parties every week. I also spent my holidays travelling on trips, as well as looking for buildings to use for my research. I travelled to 11 countries during my study abroad period. My favorite one was Hungary. The food was delicious, and the night-time landscape was beautiful. I had the opportunity to talk to people from different countries in my accommodation and I was also taken to Oktoberfest. My German friends also showed me around a lot of places, and I had a very good time. I'd like to take advantage of this opportunity to thank you all for your cooperation.



### 指導教員講評

専門分野の研究課題だけでなく、多くの研究者や学生との交流を通して、世界の広さと近さを知る機会になりました。

指導教員氏名：田中一成