

Understanding the visual image of Kailash sacred landscape: a perspective from GIS and computer vision

ZHANG Yucheng, Dr. HE Jie

Spatial Humanities and Place Computation Lab School of architecture, Tianjin University, China 2021.04

1.1 Landscape —— a way of seeing

"A landscape is a cultural image, a pictorial way of representing, structuring or symbolizing surrounding."

——*Cosgrove (1998)*

■ A way of seeing

<u>"Landscape"</u> can be considered as a skillful and cultivated way of visually forming and representing a physical environment (Urry & Larsen, 2011).

Spatial selection

People select <u>a specific part of landscape</u> to represent the information and characteristics of a whole region, using <u>"difference"</u> to create their <u>own geography</u> (Van Gorp & Béneker, 2007).



■ The image of Kailash (from internet)

- 1.2 The image of Kailash
 - The unique visual environment
 - A 'pyramid' like shape with four symmetric sides differs a lot from the nearby mountain peaks.
 - A all-year snow-capped peak looks magnificent mysterious under sunshine.
 - A highly ritualized terrain around Kailash is created by the surrounding peaks and valleys, which makes it a strong spiritual center full of centripetal force.



Kailash sacred landscape (from internet)

1.3 Generation of Kailash cultural landscape

Ancient belief

Since the ancient times, Kailash has been considered as a sacred site in <u>four religions</u>:

- Tibetan Buddhism
- Bön
- Hinduism
- Jainism



■ *Shiva on the Mount Kailash, Hinduism* (from internet)



1.3 Generation of Kailash cultural landscape

Modern times

The modern understanding of Kailash in the 20th century was a synthesis of many <u>different world-view</u>, which transformed this local sacred site into a <u>world-famous mountain(McKay, 2015)</u>.

Further, a series of <u>media</u> like travel guides, movies, artworks in modern times depict their own understanding of this mountain, which in turn shapes the image of Kailash in people's mind.



■ *The pilgrimage* —— Sacred mountain and lake depicted by the modern artist (Socrates Geens)



■ Paths of the Soul —— a Chinese film on eleven Tibetan's pilgrim to Kailash (from internet)

1.4 Kailash in a graph-reading era



• Kailash in the image search engine

- 2.1 Research question
 - The visual construction of Kailash sacred landscape in a web-based context

This research includes two parts:

- (1) to explore the relation between the visualscape of Kailash and spatial distribution of photos;
- (2) to find the most representative elements of the landscape and the paradigms within the photos.



Research framework

2.2 Research area

• the core research area Two research areas 81"15'0"E 81°20'0'E 81"25'0"E 81"20'0"E 81"25'0"E 81"15'0'E Manasarovar Lhanag-tso Elevation (m) 7678 20 KM 10 • the overall research area 3665

2.3 Research data

Virtual landscape data

- 90m digital elevation model (DEM)
- 1: 250,000 hydrological data
- 1: 250,000 road data

UGC geo-tagged photos

- Keywords "冈仁波齐(Kailash)" and "普兰县 (Burang County)"
- Two famous online tourist platforms in China (www.fooooot.com and www.2bulu.com)
- <u>8,092 photos in total</u>







■ A typical model page of www.2bulu.com

2.3 Research data



UGC(user-generated content) photo

• Users publish their original content through the network platform, and photos are among one of the main information carriers.

• Photos on social media accompanied with texts share a way for people to construct or reconstruct their <u>experiences of the places</u> (Lo &

McKercher, 2015).

Geotagged photo

- Photos that contain latitude and longitude information.
- It is a independent and unique analysis data for obtaining <u>spatial distributions characteristics</u> of photos.

2.4 Research method

Viewshed analysis based on GIS

Viewshed analysis

Viewshed analysis can help divide a certain area into those that can be seen and those cannot from a selected viewpoint based on DEM.



■ The result of viewshed analysis reveals the visible and invisible area of the Kailash-Manasarovar region

2.4 Research method

Visual content analysis based on semantic segmentation

Visual content analysis

A attribute-based method helps identify the main items in the pictures and record their frequencies, co-occurrence, clustering, and other related issues in a quantitative way (Stepchenkova & Zhan, 2013)

Semantic segmentation

<u>The DeepLabv3+ model</u> with Xception as network backbone pretrained on <u>ADE20k dataset</u> provided by PixelLib in Python (PixelLib, 2021) is used to realize the semantic segmentation, which can identify at most <u>150 classes of objects</u> from images.



Introduction

The visual environment of Kailash is the basis of people's perception of the landscape. To understand how people seek out views from the environment, the <u>GIS spatial analysis</u> is used to reveal <u>the relationship between the geo-location of photos and the visualscape of Kailash</u>.



Research framework for visual environment analysis

3.1 Visualscape of Kailash



3.1 Visualscape of Kailash

Total viewshed analysis

Analysis

Kailash as a lone mountain peak, compared with other mountain ranges with high visual prominence, stands out from its surrounding peaks.



3.1 Visualscape of Kailash

Visual angle analysis

■ Concept

Visual angles can be used to describe <u>the visible</u> portion of whatever concerned of the investigation. (Llobera, 2003)



3.2 Spatial distribution of geo-tagged photos

Photo distribution

Photos are generally distributed <u>along the route</u> <u>of kora</u>, the outer path in particular.







The relation between the change of photo density and the visual exposure of Kailash along the kora

The spatial distribution of photos

Introduction

<u>The content of images</u> reflects what elements are spatially selected from the landscape to represent the whole region. The computer vision and statistics method are adopted to facilitate the information extraction from photos.



Research framework for visual content analysis

4.1 Image Content

Method

- image semantic segmentation
- compute the frequency for each of the recognized elements
- Word cloud
- Natural elements: <u>"sky", "mountain", "earth"</u>
- Human-related elements: <u>"person", "building", "signboard"</u>

name	frequency	name	frequency	name	frequency
mountain	7671	grass	1349	tree	730
sky	7594	dirt track	1333	car	665
earth	7015	path	1249	land	598
rock	4773	signboard	1117	river	577
person	3824	road	1102	fence	576
ceiling	2911	wall	1091	apparel	574
hill	1860	field	1011	bag	513
building	1804	tent	819	house	447
water	1746	plant	787	flower	418
sand	1379	sea	745	pole	414

■ The frequency of top 30 elements



■ The word cloud depicts the relative frequency of elements appeared in the collected photos

4.1 Image Content

Perception type

• 8 kinds of visuals elements

Result

- The top 3 elements: "Mountain"(30.23%), "Sky"(28.00%), and "Land"(18.56%)
- Other elements: less than 2%

Visual element	Attribute
Construction	building; tent; signboard; wall; house; fence
Creature	person; apparel; animal
Land	earth; field; sand; land
Mountain	mountain; rock; hill
Plant	grass; flower; tree; plant
Sky	sky
Traffic	car; dirt track; road; sidewalk; path
Water	water; sea; river

Eight visual elements developed from top 30 recognized attributes



The statistical differences in visual elements

4.1 Image Content

Content diversity

Diversity can reflect the number of elements people want to express in a single photo.

$$D = 1 - \sum_{i=1}^{S} P_i^2$$

Where D is the diversity of elements in the photo, S is the number of all perception types, P_i is the proportion of element i's pixels in the photo.



4.1 Image Content

Representative element

The representative element refers the most common element in a given area.



• The spatial distribution of average diversity of photos

4.2 Paradigms of photos

■ Concept

When photos with similar elements accumulate, a "style" or <u>"paradigm"</u> will form to stress the unique points of the landscape (Dai & Chen, 2010).

Method

A <u>hierarchical clustering</u> algorithm is applied to divide the photos are into <u>eight major defined</u> <u>groups</u>.



Some typical images of Kailash



4.2 Paradigms of photos

Analysis

- Focus on one kind of visual elements Type 1, type 5, type 7
- As one falls, another rises Type 2, type 3, type 4, type 6
- The human-related objects Type 8



■ The average proportion of each element appeared in different paradigms



The typical photo of each paradigm

4.2 Paradigms of photos

Analysis

• The distribution of paradigms

Type 4 is the most common paradigm among most grids during the kora.

Type1 (land), type 7(sky) and type 8 (building) occur mostly outside the valley.



Discussion and conclusion

- The visual image of Kailash sacred landscape in a web-based context
- The high visibility of Kailash makes itself stands out from the surrounding mountains, and is selected by people to represent the whole region.
- Most photos focus on depicting the landscape as "a high mountain under the sky", which contributes to the generation of image of Kailash.

Discussion and conclusion

- Future work
- Understanding the meanings of the visual images ٠













大唐强汉一路向前#神山冈仁波齐。

乘坐飞机一路走来,看到了不少喜马拉雅山脉和冈底斯山脉的名山,这其中最让人难忘的就是冈 仁波齐峰了。它是多个宗教共认的神山,就像大自然鬼斧神工自然造就的一座巨大金字塔,在网 底斯山脉里格外引人注目。此前有部影视作品就是讲一群朝圣者一路跪拜磕长头, 历经千辛万 苦,只为到达心中的圣地——冈仁波齐峰去礼佛。

在那个啥都缺就是不缺山的地区,海拔6638米的冈仁波齐在高度上并不算突出。稍远处喜马拉雅 山脉里的"圣母之山"纳木那尼峰海拔7694米 (图2), 与冈仁波齐遥遥相望, 虽然距离稍远但依然 能感知到前者更加高大。

然而,多个宗教的信徒们依然因为冈仁波齐独特的魅力,选择了它作为神山,认定其为"世界的中 心"。收起全文へ



04月10日 21:13 来自 小米10 青春版 5G



现在, 犹记得在《冈仁波齐》里, 那风雪弥漫的路途中, 一群朝圣者, 重复上万次的动作, 没有 高潮,没有意义,那就是人生。@自驾游@VLOG#旅游##自驾游##随手拍##西藏##说走就走的 旅行##自然风光##不止旅行##自驾游##西藏#



转发 15 评论 凸4 收藏 ■ Kailash in Weibo ——a social media site like Twitter

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Spatial Humanities and Place Computation Lab

School of architecture, Tianjin University