

# SideGuide

## A Large-scale Sidewalk Dataset for Guiding Impaired People

We introduce a new large-scale sidewalk dataset called SideGuide that could potentially help impaired people. Unlike most previous datasets, which are focused on road environments, we paid attention to sidewalks, where understanding the environment could provide the potential for improved walking of humans, especially impaired people.

Concretely, we interviewed impaired people and carefully selected target objects from the interviewees' feedback (objects they encounter on sidewalks). We then acquired two different types of data: crowd-sourced data and stereo data. We labeled target objects at instance-level (i.e., bounding box and polygon mask) and generated a ground-truth disparity map for the stereo data.

SideGuide consists of 350K images with bounding box annotation, 100K images with a polygon mask, and 180K stereo pairs with the ground-truth disparity. We analyzed our dataset by performing baseline analysis for object detection, instance segmentation, and stereo matching tasks. In addition, we developed a prototype that recognizes the target objects and measures distances, which could potentially assist people with disabilities. The prototype suggests the possibility of practical application of our dataset in real life.

### ■ Paper

Park, Kibaek, et al. "SideGuide: A Large-scale Sidewalk Dataset for Guiding Impaired People."  
 IEEE/RSJ International Conference on Intelligent Robots and Systems.  
 IEEE/RSJ International Conference on Intelligent Robots and Systems, 2020.



[PDF Download](#)

# 1. Sidewalk Dataset



Fig.1 : an example image-pair and annotation of a sidewalk.  
 (a) Stereo image pair captured by a ZED stereo camera (top and bottom images indicate left and right images, respectively),  
 (b) instance-level bounding box and polygon mask annotations in the left image, and (c) The ground-truth dense disparity map.



Fig 2: example of distinct objects.  
 Such objects are often encountered on sidewalks and could be obstacles for impaired people

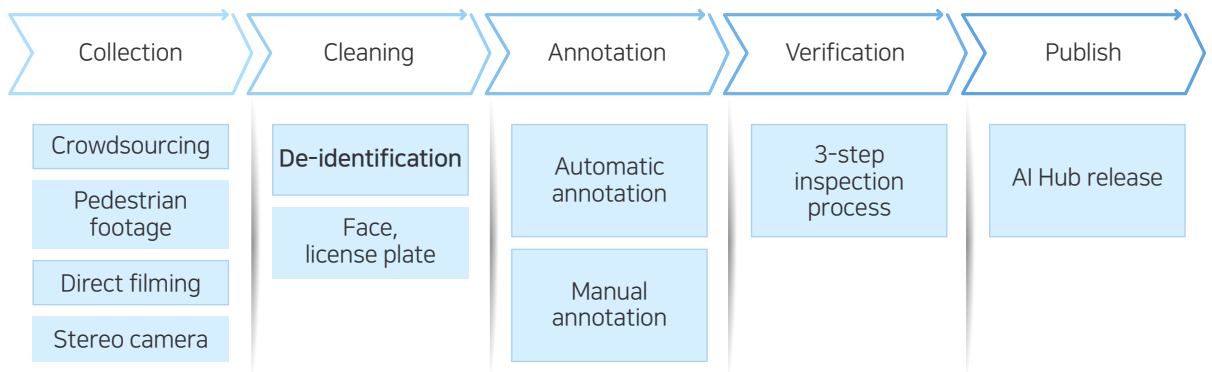
<b>Dynamic (13)</b>	Bicycle, bus, car, carrier, cat, dog, motorcycle, movable signage, person, scooter, stroller, truck, wheelchair
<b>Static (16)</b>	Barricade, bench, bollard, chair, fire hydrant, kiosk, parkingmeter, pole, potted plant, power controller, stop, table, traffic light, traffic light controller, traffic sign, tree trunk

[Download Sidewalk Dataset](#)

## Purpose of Deployment

- Promotion of mobility rights for the disabled
  - Ensure the safety of disabled individuals from various obstacles (automobiles, people, trees, streetlights, etc.) with the help of artificial intelligence
- Lack of public datasets in the field of artificial intelligence related to sidewalks
  - Need for datasets designed to meet the needs of Korea in particular - of various types of infrastructure such as sidewalks, roads, walkways, and driveways.

## 2. Dataset Construction Process



## Applications

### General

- Support development of commercial services in AI development through the advancement of this dataset

- Support for the development of AI pilots – a service with high public interest – geared towards aids in mobility  
Ex. Autonomous wheelchairs, walking aids, personal navigators

#### Industry

- Development of safe road services using road recognition technology : Detection and providing information on various sidewalk-related conditions such as sidewalk blocks or braille blocks
- Development of sidewalk damage detection services
- Development of automated driving services and monitoring systems, such as a Korean delivery robot.
- Development of risk monitoring systems for mobile and delivery service vehicles such as motorcycles, electric kickboards, bicycles, boards, etc.

#### Research

- Object Recognition Technology
  - Object recognition of delivery vehicles (bicycles, buses, vans, trucks), cats, dogs, motorcycles, scooters, public displays
  - Signs, people, strollers, wheelchairs and fixtures (Barricades, benches, bollards, chairs, fire hydrants, independent terminals)
  - Small stores, parking meters, stands/pillars, flower pots, power control boxes, bus
  - Taxi stops, tables, traffic lights, traffic signs, trees
- Technology Research
  - Development of object recognition technology specific to Korea, objects unique to Korea's infrastructure are recognized and ensured of proper installation
  - Research on social facilities and environments through vision-based normal/abnormal identification of sidewalk installations
- Depth prediction research using stereo vision
- Technology research on recognition of objects such as road damage and road type

## 3. Data Collection

### Image Collecting Method

The image data was collected using two methods – crowdsourcing and direct photography. The process for crowdsourcing was implemented through mobile app services, filmed with mobile phone cameras (1,920×1,080px). Self-acquired image data was collected using ZED Stereo cameras (left/right images 1,920×1,080px), where members of the Korea Spinal Disability Association carried out the filming process. The filming process entailed taking shots at 1 photo per second, while traveling at 5km/h in a wheelchair. Images that were unfocused, blurry, or unidentifiable were discarded to ensure data quality, however, some images may still be slightly blurred or tilted to less than 30 degrees.

### Image Criteria

Images were collected under various filming conditions, varying in location, weather and time in a walkable area to ensure maximum time and spatial diversity for AI model learning. Data consisting of 350,000 bounding box and 100,000 polygon segmentation labels with variables such as time of day, precipitation, total filming time, etc. is provided as csv files.

## 4. Data Refinement

### Image Refining Method

De-identification to protect privacy and personal information.

- 1) Detection algorithms were developed through deep learning to automatically extract faces and license plates from the collected image data.
- 2) Auto-extracted faces and license plates were supplemented with manual inspection for misdetection, undetection, over-detection, etc.
- 3) Detected faces and license plates were blurred using the OpenCV Library to complete the de-identification process.

### Data

Summary of dataset splits. For bounding box set and polygon set, we also provide number of annotated instances

		Training	Validation	Test
Bounding box set	#Images	249K	37K	67K
	#boxes	2,379K	351K	652K
	#avg box per image		9.6	
Polygon set	#images	70K	10K	20K
	#masks	409K	61K	118K
	#avg mask per image		5.9	
Disparity set	#images	147K	-	33K

Bounding Box/Polygon Segmentation/Surface Masking Data field description

Tag	Attribute	Description
image	Id	Image ID
	Name	Image Name
	Width	Image Width
	Height	Image Height
box	Label	Label Name
	Occluded	Occluded
	Xtl/ytl	Box Coordinates (X Top Left/ Y Top Left)
	Xbr/ybr	Box Coordinates (X Bottom Right/Y Bottom Right)
	Z_order	Order of Appearance
polygon	Label	Label Name
	Points	Polygon Point Coordinates
	Occluded	Occluded
	Z_order	Order of Appearance
attribute	Group_id	polygon group information Same group_id = same group
attribute	name	Attribute value