Data Collection for LG Robot Cleaner

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Motivation

Background
- Robot Cleaners do not operate effectively when they strike obstacles like wires, socks etc. as they may get entangled.
- Also pet poop lying in the robot's path will cause it to spread all over the house.
- The floor may need to be cleared of such obstacles by the user prior to Robot operation
- For enhanced user experience, there is a need to automatically detect such obstacles and change the robot path accordingly
- H&A Living Team in LGSI is collaborating with HQ to develop an AI solution to detect obstacles from images captured by a camera mounted on the robot cleaner. The solution is planned to be commercialized in Q4 this year.
- A total of 17 categories of obstacles are currently being targeted.

Challenge:
In order to develop a good AI solution to solve the above problem, we need to collect a good realistic dataset that has
- High Coverage: Number of categories for which data is available
- Large Diversity: Variety in dataset – different objects, background etc.
- Large Volume: Number of images in the dataset

Objective:
- We intend to collect such a dataset via crowdsourcing with the help of LGSI employees.
- Every LGSI employee is requested to collect data (images) from their homes using their mobile phones as per the simple guidelines specified in the next page.
- To make the process of data capture as simple as possible, an application has been developed to capture and upload the images. The application can be accessed by scanning a QR code (to be shared). There is no need to install anything on the mobile phone.
- The H&A Living Team will utilize the data shared by all contributors to train an AI model for detecting obstacles in robot cleaner path.

Robot Cleaner · Camera · ~3 inches · Obstacle

S.No	Obstacle Category
1	Pedestal Fan
2	Weighing Scale
3	Shoes / Slippers
4	Wires/ Power strips (earphones, charging cables, power cords etc.)
5	Socks
6	Towel
7	Chair (Rod Type base)
8	Drying Rack (Rod Type base)
9	Foot Mat
10	Sliding Door Threshold
11	Cup
12	Bottle
13	Pet Bowl
14	Flower Pot
15	Dustbin
16	Bag
17	Pet Poop

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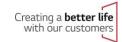with our customers

Data Collection Guidelines - 1

Guidelines

1. All pictures must be captured in indoor (home) scenarios only, where a robot cleaner is expected to operate.
2. All pictures must be captured in landscape mode as shown below. Do not capture in portrait mode.

3. Disable 'bokeh' (background blur) or other effects in the phone's camera application.
4. Select (i) icon located next to each object category name to view sample images of that category. This will provide a sense of what is expected.
5. Select an object category (other than 'Multi Category') from the LGSI application. The 'Multi Category' option is covered in 11.
6. Now, place one or more objects of the selected category on the floor and capture multiple pictures from various distances and camera angles (see 7). Recommended distance: 1 ~ 5 feet.
7. To capture a picture, position the phone about 1 to 2 inches above the floor and click the picture in landscape mode as shown below. Try to place the phone vertical to the floor so that it is not leaning forward or backward.

Data Collection Guidelines - 2

8.   Review and upload the pictures
9.   Repeat steps 6 to 8 for any other objects of the above selected category.
10. Now choose a different object category from the menu and repeat steps 5 to 9. Try to cover as many object categories as possible.
11. The "Multi Object" Category can be selected to capture pictures of objects belonging to different categories in the same frame. A single picture can contain two, three or four objects. All objects must be on the floor. The remaining steps are the same.
     Samples:

Bottle, wire

foot-mat, cup

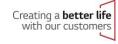
bottle, wire, flower pot, flower pot

Bag, wire, bottle

bag, wire, bottle

bottle, bottle, wire

12. Do not worry about other non-obstacle objects (furniture, door, appliances, pets etc.) being visible in the camera view. It is perfectly alright and is actually encouraged. In some cases, you may need to create a setup to capture the objects of interest. However, feel free to also capture a few objects in their 'natural positions' as you see them in your house.
13. Remember, all objects of interest must lie on the floor. For instance, a bottle on a table is not an obstacle to a Robot Cleaner.
14. While uploading, kindly review the images and filter out the ones added inadvertently.

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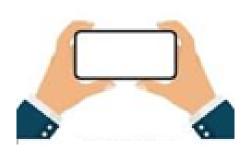with our customers

Data Collection Guidelines - 3

Good Samples ✅

Phone is 1~2 inches above the floor

Captured image

Landscape mode

Captured Image

Bad Samples ❌

Phone is too high

Captured image

Portrait mode

Captured Image

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Data Collection Guidelines - 4

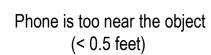**Good Samples** ✅

Bad Samples ❌

Phone is between 1 feet and 5 feet from the object

Phone is too near the object
(< 0.5 feet)

Phone is too far from the object
(> 6feet)

Phone is too far from the object
(> 6feet)