Data Descriptor

Video of LEGO Bricks on Conveyor Belt Dataset Series

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Abstract

The dataset series titled Video of LEGO bricks on conveyor belt is composed of 14 datasets containing video recordings of a moving white conveyor belt. The recordings were created using a smartphone camera in Full HD resolution. The dataset allows for the preparation of data for neural network training, and building of a LEGO sorting machine that can help builders to organise their collections.

Keywords: LEGO, videos, neural networks

https://doi.org/10.34808/x55q-sz53_dyr_roz39

Specification table (data records)

Subject area	Computer and information, Information and communication technology
More specific subject area	Video recordings
Type of data	Video
How the data was acquired	The data was collected at the Gdańsk University of Technology using a commercially available phone camera (Huawei P20 Pro) using a conveyor belt and stand made of LEGO bricks powered by the LEGO Boost set
Data format	The videos are in .mp4 format
Experimental factors	The data contained in the dataset were not processed
Experimental features	The recordings were made with natural light facing the front of the conveyor belt

Data source location	MOST Wiedzy Open Research Catalog, Gdańsk University of Technology, Gdańsk, Poland
Data accessibility	The dataset is accessible and is publicly and freely available for any research or educational purposes. Derivative works need to be shared using the same conditions

Background

LEGO bricks are extremely popular and allow almost any type of construction to be built. This can be done thanks to the multiple shapes available. Utilising the full potential of construction possibilities however requires proper arrangement of the bricks. The usual sorting, for average collections, is done by shape, as the colours and decals can be easily distinguished even in a big container of bricks (Alphin, T., 2020). This cannot be said about the shape, and the basic problem is to find a brick of the required shape and size. With over 3700 different LEGO parts (Maren, T., 2018), the ability to find a given part is crucial in everyday constructing, especially for very large LEGO collections, where shuffling through large boxes of mixed bricks is not acceptable.

Unfortunately there is no simple solution for brick sorting. LEGO Group provides only a simple sorting mechanism based on the brick size in the form of LEGO Sort and Store which was released in 2011. Other solutions usually rely on optimising the process of sorting rather than automating it (e.g. Adam, 2017). With the constant development of deep neural networks and the performance of modern computers, it is possible to construct a viable sorting device using the bricks themselves or 3D-printed elements. Independently of the method of building the sorting machine, it requires a well-trained neural network able to distinguish between different, often very similar, bricks, or at least divide them into smaller categories, allowing further manual selection of proper bricks. To date, few projects have taken this approach, with the notable example of (West, D., 2019). The approach is based on images generated using the LDraw library (https://www.ldraw.org/), containing 3D models of every brick available.

Our dataset series, Video of LEGO bricks on conveyor belt, took another approach and has been designed to help gather the data necessary to train a neural network to recognise different LEGO brick shapes using real LEGO pictures. Automatically generated LEGO images, using e.g. the LDraw library, usually are not realistic enough to perform proper training, and usually such images are just too perfect to be used in real applications without the noise introduction and additional augmentation. A neural network trained with such images has difficulties detecting e.g. blurred images taken with a camera. At the time of writing, the datasets in the series contain recordings of the 267 most common LEGO brick shapes in multiple, random positions and in multiple colours.

Methods

The aim of the data gathered was to train a neural network to identify LEGO bricks moving on a conveyor belt. The aim was to use home-available devices during the sorting,

thus for data capturing, we used a smartphone camera and a LEGO-based machine and camera stand was build (Fig. 39.1) to mimic the pre-sorting part of the machine, where bricks will be separated and recorded. All videos were recorded using a Huawei P20 Pro smartphone located 14.5 cm above the belt. The recordings were created with 1920x1080 resolution, H.264 high profile codec, 15 frames per second and natural sunlight coming from a window to limit the amount of shadows and greyness of the background.

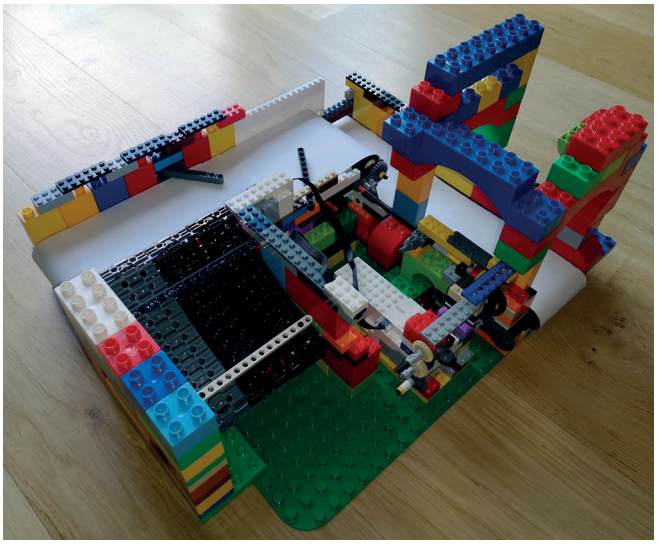

Fig. 39.1. Stand and conveyor belt for video recording. The camera was placed on the stands in the right side of the construction

Data quality and availability

All recordings were created using the default settings of the Huawei P20 Pro smartphone camera, at 1920x1080 resolution and encoded with the H.264 high profile codec at 15 frames per second. The conveyor belt was lit by the natural light coming from a window on the same side that the camera was placed. This way, the recordings tend to be as similar to ones that will be potentially taken during the sorting of LEGO bricks.
Series:
https://mostwiedzy.pl/pl/open-research-data-series/niema,202011132226557715481-0/catalog

Datasets DOI
10.34808/43yh-ck53
10.34808/pw5b-hr02
10.34808/mhdg-9e26
10.34808/5gwb-5y67
10.34808/kn9k-nf31
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10.34808/qt92-qj93
10.34808/f7xv-nz92
10.34808/1v0v-0j40
10.34808/f5nc-7x81
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