Dataset of manually classified images obtained from a construction site

Alexandre Del Savio*, Ana Luna, Daniel Cárdenas-Salas, Mónica Vergara, Gianella Urday

Faculty of Engineering and Architecture, Universidad de Lima, Peru

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A B S T R A C T

A manually classified dataset of images obtained by four static cameras located around a construction site is presented. Eight object classes, typically found in a construction environment, were considered. The dataset consists of 1046 images selected from video footage by a frame extraction algorithm and txt files containing the objects’ class and coordinates information. These data can be used to develop computer vision techniques in the engineering and construction fields.

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* Corresponding author.
E-mail address: delsario@gmail.com (A. Del Savio).

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**Specifications Table**

| Subject          | Engineering                                      |
|------------------|--------------------------------------------------|
| Specific subject area | Civil and Structural Engineering, Image Classification, Computer Vision |
| Type of data     | Images.jpg, Archives .txt                        |
| How data were acquired | The data were acquired by four static cameras located around a construction site: one bullet type camera, model IPC-HFW2831T-ZS-S2, and three motorized IP PTZ cameras, model SD10A848WA-HNF. The cameras were programmed using the DSExpress-Base-License software [4], and for image classification the LabelImg v1.8.1 tool [3] was used. |
| Data format      | Raw and filtered (jpg, txt).                     |
| Parameters for data collection | Four static cameras were located at distances ranging from 5 to 90 meters, with heights varying from 15 to 55 meters. The images were taken from November 2020 to January 2021, between 08:00 and 12:00 hours. |
| Description of data collection | The data was collected by executing a frame extraction algorithm applied to the videos provided by the surveillance cameras. |
| Data source location | All images were acquired from the construction project of the University Wellness Center located at the Universidad de Lima, Lima, Perú. |
| Lat.             | –12.084307°, Long. –76.971031°                   |
| Data accessibility | The data is hosted on a public and trusted repository. Repository name: Repositorio Institucional – Universidad de Lima. Direct URL to data: https://doi.org/10.26439/ulima.datasets.13359 The algorithm corresponding to the extraction of frames has been provided publicly through the GitHub repository [2]. |

**Value of the Data**

- This data provides 1046 manually classified images and their corresponding .txt classification files, including 8 types of objects (Table 1) found in a construction site. The images were taken from four cameras placed at different points, at different moments, around a construction site.
- The data presented is useful for researchers who wish to use or add these classified images to their databases, for further classification and object detection training through construction monitoring systems with computer vision.
- This dataset can be used to validate a neural network of object recognition.
- This dataset contains images that are specific to construction sites, focusing on both machinery and construction personnel.

1. **Data Description**

Images of the construction site for the University Wellness Center located at Universidad de Lima were obtained by four static cameras video footage (Fig. 1). A total of 1046 images were collected. This data was verified by Del Savio et al. [1] to use artificial intelligence in object detection in a construction site.

Table 1 shows the classes used for manual classification and their respective images. These elements are found in the classes.txt file. As the elements are part of a Python list, the ID starts with the number 0 for element 1, and finishes with ID 7 for element 8.

These classes could be further classified in groups according to the needs of the research, particularly in cases where our granularity level is not desired, as per the example shown in Fig. 2. This hierarchical classification proposed, however, was not applied to the dataset.

Table 2 shows two examples used for the manual classification: the original images, the images during the manual classification, and the results, in .txt format, after the process. The first column presents the images obtained through the execution of the frame extraction algorithm, from the videos of the surveillance tools. The images are in jpg format, with 3840 × 2160 pix-
Table 1
Classes used for manual classification. Adapted from [1].

| ID | Classes                  | Objects                              |
|----|--------------------------|--------------------------------------|
| 0  | Dump_truck               | ![Dump_truck](image)                 |
| 1  | Excavator                | ![Excavator](image)                  |
| 2  | Concrete_mixer_truck     | ![Concrete_mixer_truck](image)       |
| 3  | Skid_steer               | ![Skid_steer](image)                 |
| 4  | Tower_crane              | ![Tower_crane](image)                |
| 5  | Truck_crane              | ![Truck_crane](image)                |
| 6  | Truck                    | ![Truck](image)                      |
| 7  | Person                   | ![Person](image)                     |

The algorithm corresponding to the extraction of frames has been provided publicly through the GitHub repository [2]. The second column shows the pictures of the construction site during the manual classification process, with the LabelImg v.1.8.1 software [3]. The objects to be classified were indicated in the green quadrilaterals around them. Finally, the results of their respective manual classification are shown in the third column. The archives are .txt format and the structure is: the first column is the ID of the class classified (Table 1), the second and third columns are the X and Y coordinates of the beginning of the selection, and the fourth and fifth columns are the X and Y coordinates of the end of the selection of the green quadrilateral.

Fig. 3 shows a section from IMG100.jpg (Table 2) where the objects are linked to their respective ID, according to Table 1.
| Original image | Images during classification | Results in .txt format |
|----------------|-----------------------------|------------------------|
| ![Original image](image1.png) | ![Images during classification](image2.png) | 4 | 0.328125 | 0.217138 | 0.367708 | 0.433333 |
| ![Images during classification](image3.png) | ![Images during classification](image4.png) | 4 | 0.328125 | 0.217138 | 0.367708 | 0.433333 |
| ![Images during classification](image5.png) | ![Images during classification](image6.png) | 4 | 0.328125 | 0.217138 | 0.367708 | 0.433333 |
| ![Images during classification](image7.png) | ![Images during classification](image8.png) | 4 | 0.328125 | 0.217138 | 0.367708 | 0.433333 |

Table 2
Examples of selected images before, during and after classification.
Fig. 1. Construction site location. Adapted from [1].

Fig. 2. Hierarchical classification proposed.
Fig. 3. Extract of IMG100.jpg's objects with their respective IDs.

2. Experimental Design, Materials and Methods

This dataset was gathered using four static cameras: a bullet-type camera (Dahua Technology, 8MP Lite IR Vari-focal Bullet Network Camera) and three motorized IP PTZ cameras (Dahua Technology, 4K 48x Starlight+ IR WizMind Network PTZ Camera). These cameras recorded video footage from four different points of view around the construction site (Fig. 4) using the video management system DSS Express [4]. The images used were collected between November 2020 and February 2021, Table 3 shows the date and time, according to the ID of the image Table 4. shows an average of the weather conditions during the dates of the collected images, describing the illuminance and air temperature.

A frame extraction algorithm was used to obtain the images from the video footage in jpg in a 3840 × 2160 pixels format, every 200 frames. The images went through a manual classification process with the Labelling v.1.8.1 software [3] to identify the construction objects on site by creating quadrilaterals around the objects and assigning them a class. The results were exported in a .txt file for each image.
Table 3
Date and time of images.

| Image ID      | Date (MM, DD, YY) | Time (24 hrs) |
|---------------|-------------------|---------------|
| IMG1          | December 02, 2020 | 09:10         |
| IMG2 – IMG54  | January 06, 2021  | 10:59 – 11:05 |
| IMG55 – IMG106| December 02, 2020 | 09:09 – 09:15 |
| IMG107 – IMG157| January 06, 2021 | 10:59 – 11:05 |
| IMG158 – IMG207| February 12, 2021| 08:59 – 09:05 |
| IMG208 – IMG258| November 20, 2020| 01:09 – 01:15 |
| IMG259 – IMG260| November 20, 2020| 09:05 – 09:05 |
| IMG261 – IMG302| November 20, 2020| 11:08 – 11:13 |
| IMG303 – IMG322| November 20, 2020| 13:12 – 13:14 |
| IMG33 – IMG361| December 02, 2020| 09:11 – 09:15 |
| IMG362 – IMG450| January 06, 2021| 11:00 – 11:05 |
| IMG451 – IMG457| November 20, 2020| 09:05 – 09:05 |
| IMG458 – IMG562| January 22, 2021| 08:36 – 11:10 |
| IMG563 – IMG627| November 20, 2020| 08:59 – 09:05 |
| IMG628 – IMG699| November 20, 2020| 11:13 – 11:13 |
| IMG700 – IMG764| December 02, 2020| 09:09 – 09:15 |
| IMG765 – IMG827| January 06, 2021| 10:59 – 11:05 |
| IMG828 – IMG901| February 12, 2021| 08:59 – 09:04 |
| IMG902 – IMG969| November 20, 2020| 08:59 – 09:05 |
| IMG970 – IMG1043| December 02, 2020| 09:10 – 09:10 |
| IMG1044 – IMG1049| January 22, 2021| 11:10 – 11:11 |

Table 4
Weather conditions during collected images.

| Date (MM, DD, YY) | Time (24 hrs) | Illuminance (lx) | Air temperature (°C) |
|-------------------|---------------|------------------|----------------------|
| November 20, 2020 | 09:05 – 13:15 | 62000            | 24                   |
| December 02, 2020 | 09:09 – 09:15 | 70000            | 23                   |
| January 06, 2021  | 10:59 – 11:11 | 32400            | 22                   |
| January 22, 2021  | 08:36 – 11:10 | 17500            | 22                   |
| February 12, 2021 | 08:59 – 09:05 | 50000            | 25                   |
Ethics Statement

This research did not involve any human subjects, animal experimentation nor social media platforms.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

CRediT Author Statement

Alexandre Del Savio: Conceptualization, Validation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition; Ana Luna: Validation, Formal analysis, Visualization, Resources; Daniel Cárdenas-Salas: Methodology, Software, Validation, Formal analysis, Investigation; Mónica Vergara: Investigation, Data curation, Writing – original draft, Visualization; Gianella Urday: Software, Investigation, Data curation, Writing – original draft.

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