**Protocol for the *Apple Sizing Ground Truth* dataset**

**Naming goal**: merge image-based datasets with their ground-truth data

# **Ground-truth data**

**Nomenclature rules:**

* **Index based nomenclature**
* **Info separator is underscore “\_”**
* **Unique attributes**

**Item**: main identifier – it indicates the object (apple/ Tennis ball) position in the artificial tree frame (values 1-25). This information is the one to be merged with the image dataset, since it is a labelled dataset with a description from 1 to 25.

**Trial (index 0)**

|  |  |
| --- | --- |
| **Categorical value** | **description** |
| **0** | Trial1 (Tb\_err\_map) |
| **1** | Trial2 (size\_pos) |
| **2** | Trial3 (perspective) |

**Repetition (index 2)**

|  |  |
| --- | --- |
| **Categorical value** | **description** |
| **0** | Only existing repetition |
| **1** | repetition1 |
| **2** | repetition2 |
| **3** | repetition3 |
| **4** | repetition4 |
| **5** | repetition5 |
| **6** | repetition6 |

**Attributes (index 4)**

* **id**: object identifying string (apple: 1-45 / Tennis ball: Tb)
* **setup**: trial setup (2d, 3d)
* **d1**: diameter 1 (u.d.m. *millimeters, mm*)
* **d2**: diameter 2 (u.d.m. *millimeters, mm*)
* **h**: height (u.d.m *millimeters, mm*)
* **w**: weight (u.d.m. *grams, g*)
* **position:** categorical string to describe the object alignment in the tree frame

|  |  |
| --- | --- |
| string | description |
| L | left |
| M | middle |
| R | right |

* **level**: artificial tree branch id (1 is the top branch, 5 is the bottom branch)
* **x**: horizontal distance from the centre of the frame (u.d.m. *millimeters, mm*)
* **y**: height of each level from the trunk origin which is the bottom\_left corner of the pink tag in the images. The latter is 12,5cm above the soil plane (u.d.m. *millimeters, mm*)
* **ydef**: definitive y, height of the centre of the object from the trunk origin (u.d.m. *millimeters, mm*)
* **z**: object- camera distance
* **zdef**: object centre-camera distance
* **camh**: height of the camera from the ground plane.

**Derived Attributes (index 4)**

* **d\_mean**: media dei diametri
* **ydef:** height of the centre of the object from the trunk origin.

***k***: y\_object\_offset = -80 mm

Tball 'petiole' length is 60mm from the centre of the level.

Each level is 40mm thick

*k*= -70 (in the **id 16-25** of the trial **1\_6**)

* **zdef**:

***j***: z\_object\_offset= -40 mm for frame width.

j= has different values in the **id 16-25** of the trial **1\_6.**

**Data field meaning examples:**

* 0\_0\_ trial 1, only existing repetition
* 1\_1\_ trial 2, repetition 1- ‘big’
* 1\_2\_ trial 2, repetition 2- ‘med’
* 1\_3\_ trial 2, repetition 3- ‘small’
* 1\_4\_ trial 2, repetition 4- mixed fruit
* 1\_5\_ trial 2, repetition 5- mixed Tball
* 1\_6\_ trial 2, repetition 6- mixed Tball
* 2\_1\_ trial 3, repetition 1- Tball
* 2\_2\_ trial 3, repetition 2- fruit

|  |  |  |  |
| --- | --- | --- | --- |
| **Error\_mapping (folder)** | | | |
| TB\_err\_map (folder) | | | |
| Nºimg\_trial\_repetition\_background\_position (folder) | | | |
| color\_ / depth\_ / annot\_  (file) | 0\_0\_ → trial 1, only existing repetition | 1\_ Black  0\_ Leaves | L → Left  M → Middle  R → Right |

|  |  |  |  |
| --- | --- | --- | --- |
| **Perspective (folder)** | | | |
| Presp\_Apple (folder) | | | |
| Nºimg\_tiral\_repetition\_diameter\_cam (folder) | | | |
| color\_ / depth\_ / annot\_  (file) | 2\_1\_ → trial 3, repetition 2 - fruit | d1\_ → diameter 1 (u.d.m. *millimeters, mm*)  d2\_ → diameter 2 (u.d.m. *millimeters, mm*)  d3\_ → diameter 3 (u.d.m. *millimeters, mm*) | camh1 → height camera1 (mm)  camh2 → height camera2 (mm)  camh3 → height camera3 (mm) |
| Presp\_Tball | | | |
| color\_ / depth\_ / annot\_  (file) | 2\_1\_ → trial 3, repetition 1 - Tball | d1\_ → diameter 1 (u.d.m. *millimeters, mm*)  d2\_ → diameter 2 (u.d.m. *millimeters, mm*)  d3\_ → diameter 3 (u.d.m. *millimeters, mm*) | camh1 → height camera1 (mm)  camh2 → height camera2 (mm)  camh3 → height camera3 (mm) |

|  |  |  |
| --- | --- | --- |
| **xyz\_positioning\_and\_sizing\_error (folder)** | | |
| 2D (folder) | | |
| Nºimg\_trial\_repetition\_background (folder) | | |
| color\_ / depth\_ / annot\_  (file) | 1\_1\_ → trial 2, repetition 1- ‘big’  1\_2\_ → trial 2, repetition 2- ‘med’  1\_3\_ → trial 2, repetition 3- ‘small’  1\_4\_ → trial 2, repetition 4- mixed fruit  1\_5\_ → trial 2, repetition 5- mixed Tball in 2D set-up | 1 Black  0 Leaves |
| 3D | | |
| color\_ / depth\_ / annot\_  (file) | 1\_6\_ → trial 2, repetition 5- mixed Tball in 3D set-up | 1 Black  0 Leaves |