

Dataset documentation for the paper "BeeHIVE: Behavioral Biometric System based on Object Interactions in Smart Environments"

January 31, 2023

1 Overview

This document provides a detailed description of the dataset that was used in the paper "BeeHIVE: Behavioral Biometric System based on Object Interactions in Smart Environments" [1]. The data were collected using two types of sensors that can typically be found in modern smart homes—ICM20948 9-DOF inertial measurement units (IMUs), and USB microphones. 9-DOF IMUs consist of an accelerometer, a gyroscope, and a magnetometer. In addition, magnetic contact switches were used to establish ground truth and timestamp interactions. These sensors were mounted on various appliances and controlled through Raspberry Pis.

2 Dataset structure

2.1 Folder Hierarchy

Folders are named to reflect the numbering of the Raspberry Pi (RPI) devices attached to objects. Inside each device folder (e.g., **O1**) there are folders belonging to the days that the experiment was conducted on (e.g., **O1\day1**). The experiment was conducted over the course of two days in order to give the attackers in the second attack group time to watch video recordings of the victim from different angles overnight. These folders contain folders named **data** that contain files with sensor values.

2.2 File format

All files are formatted as **.csv** files. Their names correspond to the following template: **[Object number]_[participant alias]_[trial number]_[timestamp]_[sensor].csv**.

For example, the **O2_participant_A_1_202011241947_acc.csv** file contains the values of the 9-DOF IMUs sensor on object O2 for participant A gathered during their first run of the experiment. If the trial was part of an attack run, then the keyword **attack** is included in the filename after the participant name. The **mic** files contain sound pressure level (SPL) values. The **contact** files capture two types of events—open and close, which denote the start and end of an interaction. All sensor values are timestamped.

2.3 Mappings

The RPI devices were placed on different objects in the environment. Figure 1 presents the locations of these devices and the associated objects they were attached to.

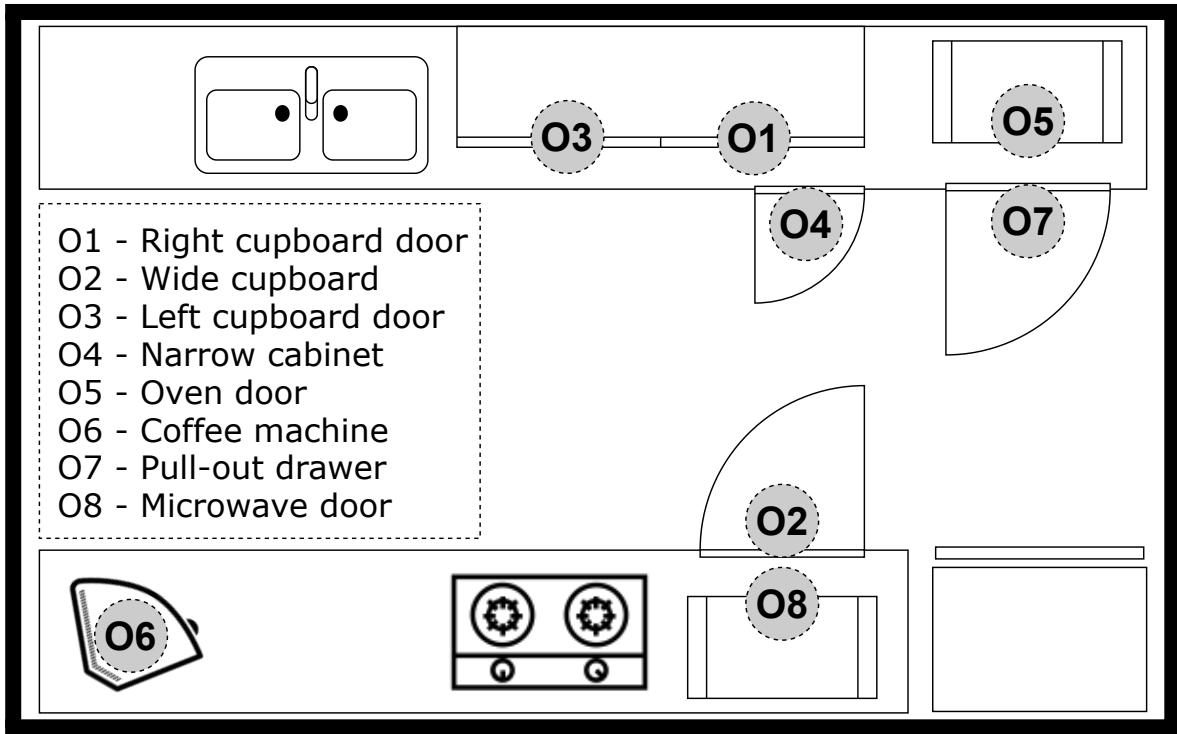


Figure 1: Placement of RPI devices on common household objects during the experiment.

3 Citing This Work

This dataset has been published with the paper [1]. If you wish to use it, please cite the research paper:

```
@article{krawiecka2022beehive,
  author = {Krawiecka, Klaudia and Birnbach, Simon and Eberz, Simon and Martinovic, Ivan},
  title = {BeeHIVE: Behavioral Biometric System based on Object Interactions in Smart Environments},
  year = {2022},
  url = {https://arxiv.org/abs/2202.03845},
  eprint = {2202.03845},
  archivePrefix = {arXiv},
  primaryClass = {cs.CR}
}
```

References

- [1] Klaudia Krawiecka et al. “BeeHIVE: Behavioral Biometric System based on Object Interactions in Smart Environments”. In: (2022). arXiv: [2202.03845](https://arxiv.org/abs/2202.03845) [cs.CR]. URL: <https://arxiv.org/abs/2202.03845>.