

HERIOT-WATT UNIVERSITY / UNIVERSITY OF SAO PAULO (HWU-USP)

ACTIVITIES DATASET

1. CITATION REQUEST

Caetano M Ranieri, Scott MacLeod, Mauro Dragone, Patricia A Vargas, Roseli A F Romero. "Activity Recognition for Ambient Assisted Living with Videos, Inertial Units and Ambient Sensors". *Sensors*, 2021.

2. GENERAL INFORMATION

As the result of an international collaboration between the University of Sao Paulo (USP), Brazil, and the Heriot-Watt University (HWU), United Kingdom, we present the HWU/USP-MHAD, a multimodal human activities dataset composed of different activities of daily living, all of them sharing a kitchen background and performed in the context of a regular breakfast. This dataset was composed of RGB and depth videos from the camera of a Tiago robot, data from IMU sensors attached to the users' wrist and waist, and a set of ambient sensors from a smart home. A set of 16 participants performed 9 activities at the Robotic Assisted Living Testbed (RALT), Heriot-Watt University, in a period of 2 weeks during March 2020, performing a single repetition of each activity.

3. ENVIRONMENTAL SETUP

The data collection was based on multimodal data from individuals performing activities of daily living. It considered inertial data from wearable devices, RGB and depth videos, as well as data from environmental sensors. All participants were adults without incapacitant physical or cognitive disabilities. The experiments were performed at the Robotic Assisted Living Testbed (RALT), Heriot-Watt University, Edinburgh Campus. A TIAGo robot, manufactured by Pal Robotics, was placed at the corner of the kitchen of the smart home, and recorded RGB and depth videos, while inertial sensors were placed at the participant's wrist and waist to record its movements. The recordings also included ambient sensors, i.e., switches at the cupboards and drawers, current measurements and presence detectors. All data was synchronised, in order to allow experiments on multimodal human activity recognition. The activities considered were "making a cup of tea", "making a sandwich", "making a bowl of cereals", "setting the table", "using a laptop", "using a phone", "reading a newspaper", "cleaning the dishes", and "tidying the kitchen".

In Figure 1, the environment in which data was collected is shown, with the TIAGo robot at the corner of the kitchen, as used to record the RGB and depth videos. In Figure 2, the placements of the inertial sensors at the user's waist and wrist, respectively, are shown.



Figure 1. Environment and TIAGo robot.



Figure 2. Waist clip and wristband with the inertial sensors.

4. DATA ORGANISATION

Each modality of data is organised in a folder. The RGB videos were converted to 25 fps videos in mp4 format. Faces were blurred for privacy concerns. The depth videos were recorded as numbered series of 16-bit png images, recorded in a rate of about 15 fps. Inertial data was recorded in csv files, with the first row comprising a timestamp, and the remaining ones, the 3D readings from accelerometer and gyroscope. Data from the ambient sensors was recorded to text files, determining events and the timestamps on which they happened (synchronised with the timestamps of the inertial sensors).

5. CONTACT INFORMATION

This is a joint project between the Heriot-Watt University at Edinburgh, Scotland, and the University of Sao Paulo, Brazil. The responsible researchers are:

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