Fuzzy protoform for hyperactive behaviour detection based on commercial devices

Smart Hyperactive Behavior Detect

Smart HyBeDe is an application for hyperactivity behaviour detect through intelligent data processing of acceleration, gyration and heart rate sensors from generated by the wearable devices PolarM600.

Figure

The collected data **of Smart HyBeDe** is stored in **5 minute sessions** with a **heart rate of 1Hz** and **acceleration and rotation of 50Hz**

Each sample has the following format:

Sample

- **Type**. It indicates the type of measurement generated by the sensor, which can be: ACC (acceleration), GYR (gyroscope) or HR (heart rate).
- **Timestamp**. It indicates the date and time of the measurement generated by the sensor.
- **V1, V2 and V3**. These values depend on the type of sensor measure:
  - **Acceleration**: V1, V2 and V3 correspond to the acceleration respectively on the X, Y and Z axis.
  - **Gyroscope**: V1, V2 and V3 correspond to the rotation respectively on the X, Y and Z axis.
  - **Heart rate**: The value V1 corresponds to the heart rate measured by the sensor, the values V2 and V3 not being applicable.

Three datasets are available:

- **Dataset A - Wrist choice**. Person A (17-year-old female subject) working on a personal computer with two wearable devices, one on each wrist. Data collection was performed on 2020/07/28 over a study session of approximately 15 minutes. Files included in each folder store the data captured by the sensors every 5 minutes. One of the wearable devices was placed on the wrist of non-dominant hand and the other on the wrist of the dominant hand. The two sets correspond to the folders:
  - 1: Person A (17-year-old female subject), dominant wrist.
  - 2: Person A (17-year-old female subject), non-dominant wrist.
    Person A was evaluated as restless and nervous, without highly hyperactive behaviour.
- **Dataset B - Working at home with computer**. Two people (A and B) working on a personal computer with a wearable device on the non-dominant hand (left, the two people are right-handed). Data collection took place on 2020/07/27 during a study session of approximately 20 minutes. A wearable device was assigned to each person: Person A (17-year-old female subject) and Person B (16-year-old male subject). The wearable device was placed on the non-dominant wrist of each user. The two sets correspond to the folders:
  - 1: Person B (16-year-old male subject).
  - 2: Person A (17-year-old female subject).
    Person A was evaluated as restless and nervous, without highly hyperactive behaviour and Person B

was evaluated as calm by the expert consultant.

- **Dataset C - Group activity**. Three people (A, C and D) in the same group activity with a wearable device on their non-dominant hand (left, the three are right-handed). Data collection was performed on 2020/07/28 during a group activity of approximately 95 minutes. A wearable device was assigned to each user: two female subjects aged 17 (Person A) and 15 (Person D), and a male subject aged 16 (Person C). The three datasets correspond to the folders:
    - 1: Person A (17-year-old female subject).
    - 2: Person C (16-year-old male subject).
    - 3: Person D (15-year-old female subject).
      Person A is evaluated as restless and nervous, without highly hyperactive behaviour, Person C is evaluated as overexcited and nervous and, finally, person D is evaluated as very calm by the expert.