README

Dataset of continuous human activities performed in arbitrary directions collected with a distributed radar network of five nodes

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Table of Contents

Referencing the dataset

Guendel, R.G., Unterhorst, M., Fioranelli, F., Yarovoy, A.. *'Dataset of continuous human activities performed in arbitrary directions collected with a distributed radar network of five nodes'*. (4TU.ResearchData, 2021 [Online]. doi: https://doi.org/10.4121/16691500.v2. Available from: https://data.4tu.nl/articles/dataset/Dataset_of_continuous_human_activities_performed_in_arbitrary_directions_collected_with_a_distributed_radar_network_of_five_nodes/16691500/2

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@misc{guendel_unterhorst_fioranelli_yarovoy_2021,
 author={Guendel, Ronny Gerhard and Unterhorst, Matteo and Fioranelli, Francesco and Yarovoy,
Alexander},
 title={Dataset of continuous human activities performed in arbitrary directions collected
with a distributed radar network of five nodes},
url={https://data.4tu.nl/articles/dataset/Dataset_of_continuous_human_activities_performed_in_
arbitrary_directions_collected_with_a_distributed_radar_network_of_five_nodes/16691500/2},
 DOI={doi.org/10.4121/16691500.v2},
 publisher={4TU.ResearchData},
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 month={Nov} }
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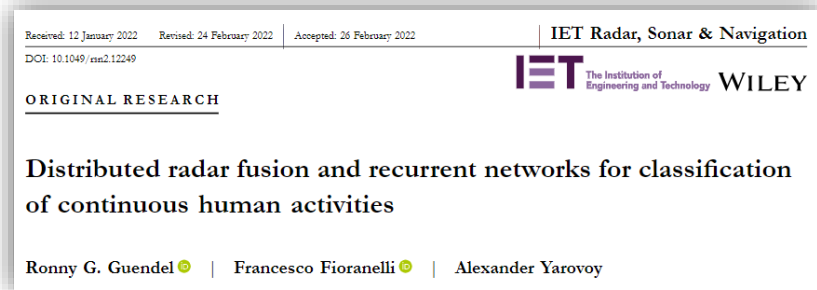
References and background reading material for the used dataset:

Distributed radar fusion and recurrent networks for classification of continuous human activities

Guendel, R.G., Fioranelli, F.,Yarovoy, A.: *Distributed radar fusion and recurrent networks for classification of continuous human activities.* IET Radar Sonar Navig. 1–18 (2022). https://doi.org/10.1049/rsn2.12249

Link: https://doi.org/10.1049/rsn2.12249

Distributed radar fusion and recurrent networks for classification of continuous human activities

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Evaluation Metrics for Continuous Human Activity Classification Using Distributed Radar Networks

R. G. Guendel, F. Fioranelli and A. Yarovoy, "*Evaluation Metrics for Continuous Human Activity Classification Using Distributed Radar Networks,*" 2022 IEEE Radar Conference (RadarConf22), 2022, pp. 1-6, doi: 10.1109/RadarConf2248738.2022.9764181.
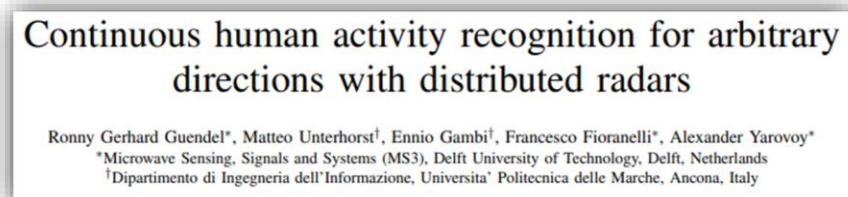
Link: https://ieeexplore.ieee.org/abstract/document/9764181

Evaluation metrics for continuous human activity classification using distributed radar networks

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Continuous human activity recognition for arbitrary directions with distributed radars

R. G. Guendel, M. Unterhorst, E. Gambi, F. Fioranelli and A. Yarovoy, "*Continuous human activity recognition for arbitrary directions with distributed radars,*" *2021 IEEE Radar Conference (RadarConf21),* 2021, pp. 1-6, doi: 10.1109/RadarConf2147009.2021.9454972.

Link: https://ieeexplore.ieee.org/document/9454972

Continuous human activity recognition for arbitrary directions with distributed radars

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Matlab read file

The data can be read with <dataread.mlx>.

Python read file

The data can be read with <dataread_numpy.py>.
This script requires the following packages:

- Scipy
- Numpy
- Matplotlib

Radar setup

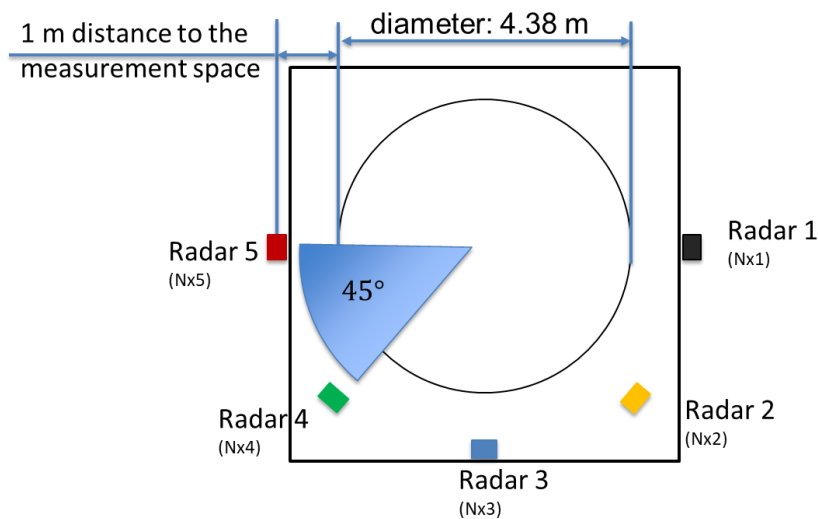The radar setup is shown in Figure 1.

Figure 1: Distributed radar setup.

The radarsystem as shown in Figure 2 of the type PulsON P410 - Time Domain (Humatics) is a Ultra Wideband radar with the following parameters:

Center frequency: 4.3 GHz
Bandwidth: 2.2GHz
Oeration mode: Monostatic
Pulse integration Index: 10 (1024 coherent integrations)
PRI/PRF: 8.2ms / 122Hz
Antennae: Omnidirectional broadband antennas

Figure 2: The PulsON P410 - Time Domain (Humatics) radar.

The data file contains the following information:

Folder description

The 15 folders from 1.7z to 15.7z are assigned to the 15 participants.

File description

Example: 005_mon_WandS_1.mat
seq. 005 … number | mon … monostatic | WandS ... Walking and stationary | 1 … participant 1

Description and Notification

(a) the sequence numbers between 1 and 28 contain the training data typically and
(b) sequence number (Example: 029_mon_Mix_1.mat) contains the test sequence with all classes performed on the locations where the training data was collected.
(c) sequence number (Example: 030_mon_Mix_1.mat) contains the test sequence with all classes performed in random locations.
(d) the activities can be indicated as follows with [x] as the individual participant:

- training data of "Walking" -- '001_mon_wal_[x].mat'
- training data of "Walking" -- '002_mon_wal_[x].mat'
- training data of "Walking" -- '003_mon_wal_[x].mat'
- training data of "Walking" -- '004_mon_wal_[x].mat'
- training data of "Walking and Stationary" -- '005_mon_WandS_[x].mat'
- training data of "Walking and Stationary" -- '006_mon_WandS_[x].mat'
- training data of "Walking and Stationary" -- '007_mon_WandS_[x].mat'
- training data of "Walking and Stationary" -- '008_mon_WandS_[x].mat'
- training data of "Sitting down and Standing up" -- '009_mon_sit_[x].mat'
- training data of "Sitting down and Standing up" -- '010_mon_sit_[x].mat'
- training data of "Sitting down and Standing up" -- '011_mon_sit_[x].mat'
- training data of "Sitting down and Standing up" -- '012_mon_sit_[x].mat'
- training data of "Bending from Sitting" -- '013_mon_BfSi_[x].mat'
- training data of "Bending from Sitting" -- '014_mon_BfSi_[x].mat'
- training data of "Bending from Sitting" -- '015_mon_BfSi_[x].mat'
- training data of "Bending from Sitting" -- '016_mon_BfSi_[x].mat'

- training data of "Bending from Standing" -- '017_mon_BfSt_[x].mat'
- training data of "Bending from Standing" -- '018_mon_BfSt_[x].mat'
- training data of "Bending from Standing" -- '019_mon_BfSt_[x].mat'
- training data of "Bending from Standing" -- '020_mon_BfSt_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '021_mon_WandF_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '022_mon_WandF_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '023_mon_WandF_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '024_mon_WandF_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '025_mon_FandS_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '026_mon_FandS_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '027_mon_FandS_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '028_mon_FandS_[x].mat'
- test data of "Mixed Sequence (predefined locations)" -- '029_mon_Mix_[x].mat'
- test data of "Mixed Sequence (randomly locations)" -- '030_mon_Mix_[x].mat'

Plot the corresponding range maps with units and label vector

The corresponding classes

All classes in the label vector are associated as:

1. *'Walking'*
2. *'Nothing (stationary)'*
3. *'Sitting down'*
4. *'Standing up from sitting'*
5. *'Bending from Sitting'*
6. *'Bending from Standing'*
7. *'Falling from Walking'*
8. *'Standing up from the ground'*
9. *'Falling from Standing'*
0. Undefined class and should not being used (i.e., people changed locations while '*Falling from Standing*')

Range maps example

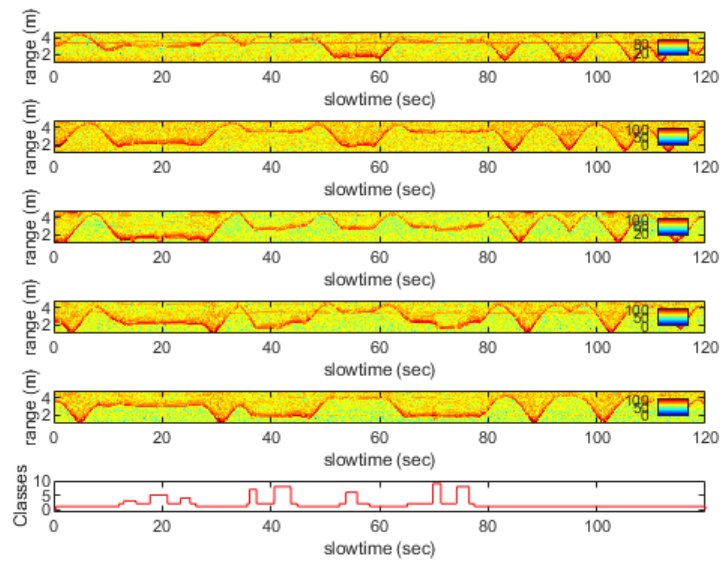The range maps are with the corresponding label vector are shown in Figure 3.

Figure 3: Example of the range maps and label vector.