Data Sheet for Project: *Intelligent RF Sensing for Falls and Health Prediction* – INSHEP (EP/R041679/1)

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This document is for the data obtained in March 2017 (University of Glasgow), December 2017 (University of Glasgow), June 2017 (University of Glasgow), July 2018 (University of Glasgow), February 2019 (North Glasgow Housing Association facilities), and March 2019 (Age UK West Cumbria centre).

What did people do?

They were asked to perform two or three repetitions of five different activities, which were walking back and forth, sitting down on a chair, standing up, bending to pick up an object, and drinking from a cup or glass. We asked people to perform each activity separately one from another in "snapshots.

In some cases, an additional activity, a simulated frontal fall, was also collected. This was only possible in laboratory-controlled conditions and only for some subjects for safety reasons.

What is the aim?

The ultimate aim is to create a system (device plus algorithms) that is capable of monitoring the activity levels and patterns of people, to

-detect critical events such as a fall;

-learn the usual activity level so that changes can be promptly detected and in the case discussed with the person and where needed health professionals (is the person walking less than usual? Is the person more sedentary and less active? Is the person showing signs of more random behaviour? And so on).

We propose radar as a sensor because it is contactless (no need to wear or touch any sensor) and more privacy compliant than cameras (no plain pictures or videos of faces or private spaces are collected).

Data collection.

The data was collected using an off-the-shelf FMCW radar (by Ancortek) operating at C-band (5.8 GHz) with bandwidth 400 MHz and chirp duration 1ms, delivering an output power of approximately +18 dBm as shown in Fig. 1. The radar is connected to transmitting and receiving Yagi antennas with a gain of about +17dB and is capable of recording micro-Doppler signatures of the people moving within the area of interest.

Fig. 1 – Typical radar configuration with transmitting and receiving antennas (the radar is the blue device on the table, and the two antennas are the white cylinders on the two support tripods)

File format.

The data have been organised in separate folders with .dat files for each data collection, with details provided in the remainder of this document.

The data files have been named with this generic approach **KPXXAYYRZ** so that

- the digits **K** 1 2 3 4 5 and 6 at the beginning indicates the activities walking, sitting down, stand up, pick up an object, drink water, and fall respectively;
- the characters **XX** indicate the subject (individual person) having ID XX (01, 02, etc…);

- the characters **YY** indicate the activity being performed such as A01, A02, A03, A04, A05, and A06;
- the character **Z** indicates the repetition of the activity such as R1, R2, etc.

Some information about the subjects (age, height, gender, dominant hand) is also reported in this document as metadata. Note also that in some cases not all the information were available, and this has been replaced by n/a for some subjects.

When imported into MATLAB (or equivalent software), each file is seen as a long 1D complex array (or table). The first 4 elements include in this order the carrier frequency (5.8 GHz), the duration of the chirp (1 ms), the number of samples per recorded beat-note signal (128 samples), and the bandwidth of the chirp (400 MHz); the following elements are the complex samples of the sequence of recorded beat-notes one after the other.

1 - December 2017 Datasets

- *360 DAT Files*
- *6 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *20 volunteers participated*
- *3 repetitions*

Location - University of Glasgow laboratory room

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P36	27	182	Right Hand	Male
P37	27	176	Right Hand	Male
P38	28	182	Right Hand	Male
P39	23	182	Right Hand	Male
P40	22	183	Right Hand	Male
P41	23	185	n/a	Male
P42	22	180	Right Hand	Male
P43	25	181	Right Hand	Male
P44	27	167	Right Hand	Male
P45	25	173	Right Hand	Male
P46	31	167	Right Hand	Male
P47	27	180	Right Hand	Male
P48	34	172	Right Hand	Male
P50	24	182	Right Hand	Male
P51	26	178	Right Hand	Male
P52	26	170	Right Hand	Male
P53	21	180	n/a	Male
P54	21	180	Right Hand	Male
P55	23	188	Right Hand	Male
P56	32	170	Right Hand	Male

2 - March 2017 Datasets

- *48 DAT Files*
- *6 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *4 volunteers participated*
- *2 repetitions*

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P03	23	180	Right Hand	Male
P10	23	182	Right Hand	Male
P11	23	182	Right Hand	Male
P12	31	170	Right Hand	Male

3 - June 2017 Datasets

- *162 DAT Files*
- *6 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *9 volunteers participated*
- *3 repetitions*

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P14	n/a	n/a	n/a	Female
P28	27	180	Left hand	Male
P29	27	176	Right hand	Male
P30	23	180	Right hand	Male
P31	23	149	Right hand	Female
P32	26	173	Right hand	Male
P33	24	173	Right hand	Male
P34		176	Left hand	Male
P35	36	175	Right hand	Male

4 - July 2018 Dataset

- *288 DAT Files*
- *6 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *16 volunteers participated*
- *3 repetitions*

Location - University of Glasgow common room

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P57	32	170	Right Hand	Male
P58	25	168	Right Hand	Female
P59	32	168	Left Hand	Male
P60	25	170	Right Hand	Male
P61	27	173	Right Hand	Male
P62	26	173	Right Hand	Male
P63	27	178	Right Hand	Male
P64	28	177	Right Hand	Male
P65	23	180	Right Hand	Male
P66	26	180	Right Hand	Male
P67	27	165	Right Hand	Male
P68	25	180	Right Hand	Male
P69	36	182	Right Hand	Male
P70	26	180	Right Hand	Male
P71	24	178	Right Hand	Male
P72	28	168	Right Hand	Male

5 -February 2019 Dataset UoG Dataset

- *306 DAT Files*
- *6 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *17 volunteers participated*
- *3 repetitions*

Location - University of Glasgow laboratory room

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P01	25	180	Right Hand	Male
P02	37	182	Right Hand	Male
P03	32	183	Right Hand	Male
P04	36	170	Right Hand	Male
P05	31	170	Right Hand	Male
P06	44	177	Right Hand	Male
P07	34	165	Right Hand	Female
P08	33	170	Right Hand	Male
P09	30	167	Right Hand	Male
P10	27	173	Right Hand	Male
P11	25	161	Right Hand	Female
P12	25	182	Left Hand	Male
P13	31	179	Right Hand	Male
P14	32	168	Right Hand	Male
P15	27	181	Right Hand	Male
P16	25	180	Right Hand	Male
P17	25	180	Right Hand	Male

6 - February 2019 Dataset NG Homes Dataset

- *301 DAT Files*
- *5 activities including walking, sitting down, standing up, pick up an object and drink water*
- *20 volunteers participated*
- *3 repetitions (note that for P21 and P23 one repetition of A01 walking could not be recorded; for P08 also three extra repetitions of activity 06 falling were recorded)*

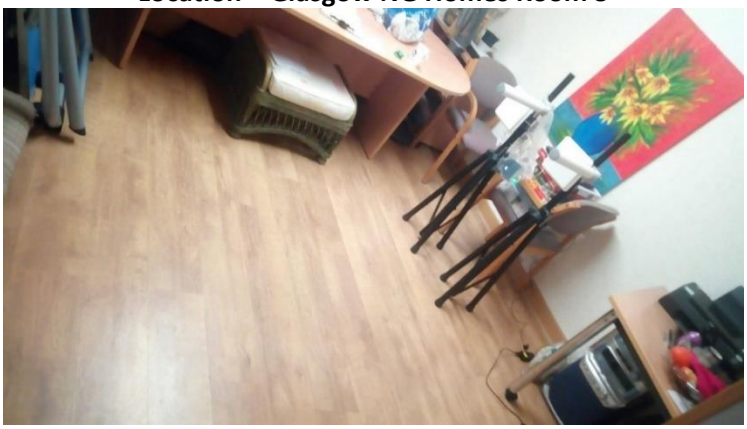
Location – Glasgow NG Homes Room 1

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P08	33	170	Right Hand	Male
P18	65	164.5	Left Hand	Male
P19	82	170.6	Right Hand	Male
P20	78	170.6	Right Hand	Male
P21	66	152.4	Right Hand	Male
P22	33	161.5	Right Hand	Female
P23	50	155.5	Right Hand	Male
P24	56	152.4	Right Hand	Male
P25	25	155.4	Right Hand	Female

Location – Glasgow NG Homes Room 2

Subject ID	Age	Height [cm]	Dominant Hand	Gender
P26	88	n/a	Right Hand	Male
P27	63	176.7	Right Hand	Male
P28	79	176.7	Left Hand	Male
P29	68	n/a	Right Hand	Female
P30	65	178.3	Right Hand	Male
P31	24	n/a	Right Hand	Male
P32	84	n/a	Right Hand	Male

Location – Glasgow NG Homes Room 3

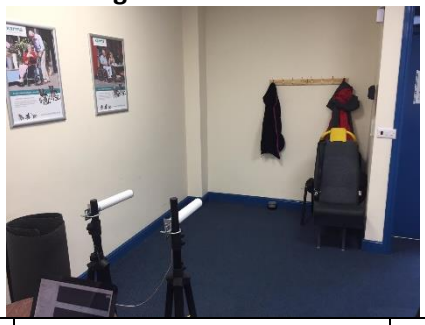


Subject ID	Age	Height [cm]	Dominant Hand	Gender
P33	79	n/a	Right Hand	Female
P34	60	n/a	Left Hand	Female
P35	64	n/a	Right Hand	Female
P36	70	n/a	Right Hand	Female

7 - March 2019 Dataset West Cumbria Dataset

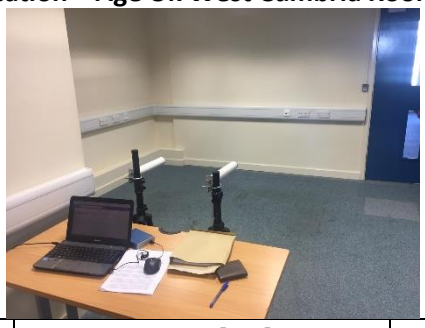
- *289 DAT Files*
- *5 activities including walking, sitting down, standing up, pick up an object, drink water and fall*
- *20 volunteers participated*
- *3 repetitions (with the exception of P42 for which only limited data were collected)*

Location – Age Uk West Cumbria Room 1



Subject ID	Age	Height [cm]	Dominant Hand	Gender
P37	75	n/a	Right Hand	Female
P38	74	n/a	Right Hand	Female
P39	52	n/a	Left hand	Male
P40	48	n/a	Right Hand	Female
P41	84	n/a	Right Hand	Female
P42	85	n/a	Right Hand	Male
P43	67	n/a	Right Hand	Male
P44	45	n/a	Right Hand	Female
P45	78	n/a	Right Hand	Female
P46	67	n/a	Right Hand	Female
P47	98	n/a	Right Hand	Female
P48	47	n/a	Right Hand	Female
P49	57	n/a	Right Hand	Male

Location – Age Uk West Cumbria Room 1



Subject ID	Age	Height [cm]	Dominant Hand	Gender
P50	71	n/a	Right Hand	Female
P51	50	n/a	Right Hand	Female
P52	49	n/a	Right Hand	Female
P53	84	n/a	Right Hand	Male
P54	69	n/a	Right Hand	Female
P55	57	n/a	Right Hand	Female
P56	25	n/a	Right Hand	Female