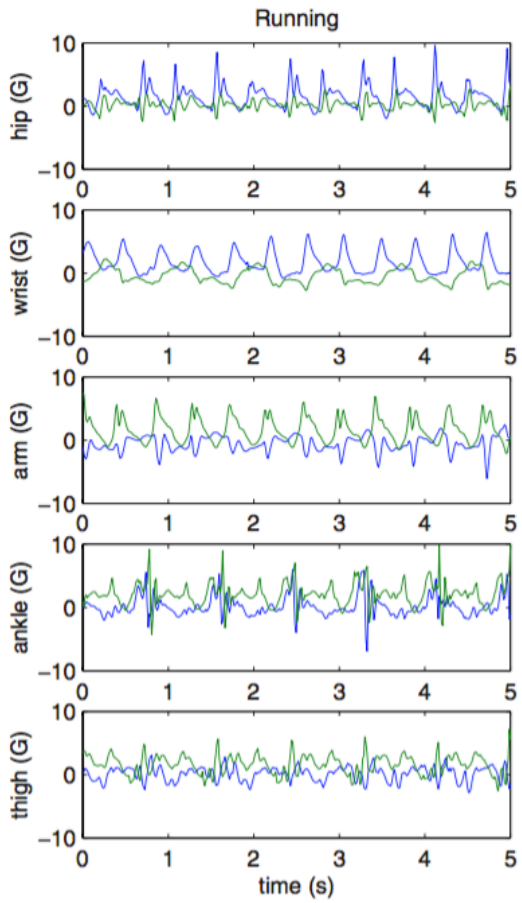
Activity Recognition

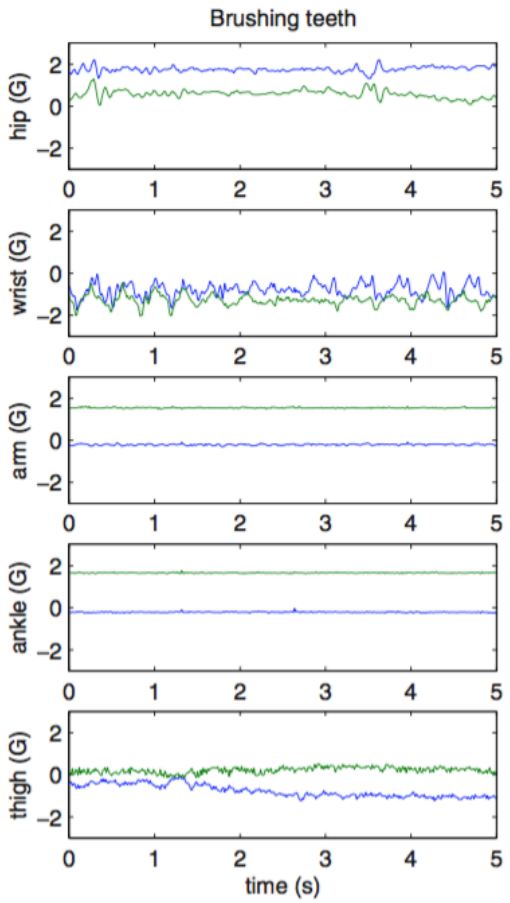
6.S062

3/14/2016

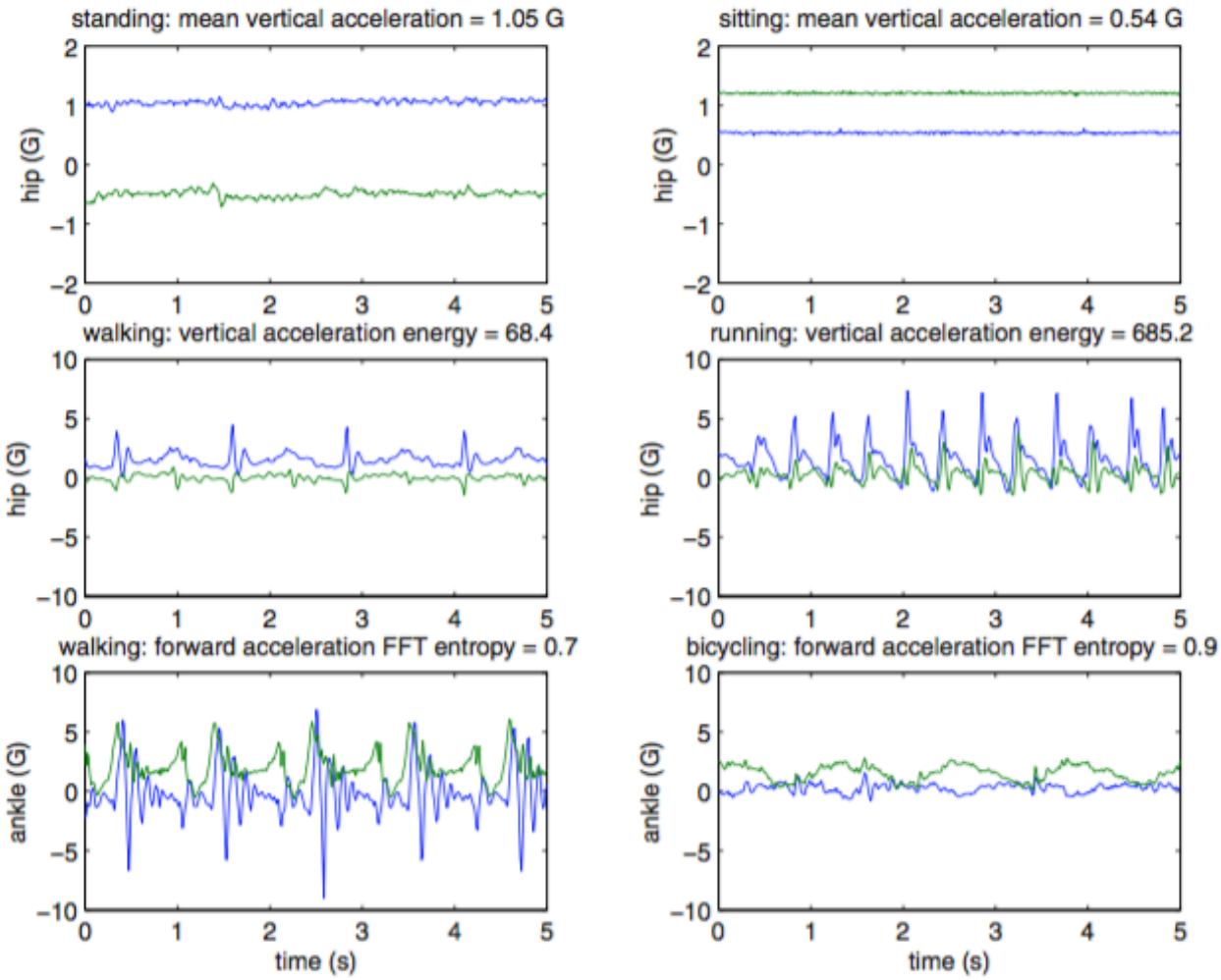
(a)

(b)


Running
hip (G)
wrist (G)
arm (G)
ankle (G)
thigh (G)
time (s)


Brushing teeth
hip (G)
wrist (G)
arm (G)
ankle (G)
thigh (G)
time (s)

(c)


standing: mean vertical acceleration = 1.05 G
sitting: mean vertical acceleration = 0.54 G
walking: vertical acceleration energy = 68.4
running: vertical acceleration energy = 685.2
walking: forward acceleration FFT entropy = 0.7
bicycling: forward acceleration FFT entropy = 0.9
hip (G)
ankle (G)
time (s)

Accuracy

Classifier	User-specific Training	Leave-one-subject-out Training
Decision Table	36.32 ± 14.501	46.75 ± 9.296
IBL	69.21 ± 6.822	82.70 ± 6.416
C4.5	71.58 ± 7.438	84.26 ± 5.178
Naive Bayes	34.94 ± 5.818	52.35 ± 1.690

Fig. 4. Summary of classifier results (mean $\pm$ standard deviation) using user-specific training and leave-one-subject-out training. Classifiers were trained on laboratory data and tested on obstacle course data.

Activity	Accuracy	Activity	Accuracy
Walking	89.71	Walking carrying items	82.10
Sitting & relaxing	94.78	Working on computer	97.49
Standing still	95.67	Eating or drinking	88.67
Watching TV	77.29	Reading	91.79
Running	87.68	Bicycling	96.29
Stretching	41.42	Strength-training	82.51
Scrubbing	81.09	Vacuuming	96.41
Folding laundry	95.14	Lying down & relaxing	94.96
Brushing teeth	85.27	Climbing stairs	85.61
Riding elevator	43.58	Riding escalator	70.56

Fig. 5. Aggregate recognition rates (%) for activities studied using leave-one-subject-out validation over 20 subjects.

Confusion Matrix

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	<	classified as
942	46	0	0	2	0	0	0	8	3	8	1	4	2	7	0	3	8	8	8	a	= walking
83	**1183**	9	0	3	2	0	0	8	1	3	8	14	1	16	0	8	53	38	11	b	= walking/carry
0	9	**762**	11	0	1	17	3	0	0	0	0	0	0	0	1	0	0	0	0	c	= sitting relaxed
0	0	10	**893**	9	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	d	= computer work
0	0	0	7	**774**	11	0	0	0	6	1	2	2	0	4	0	2	0	0	0	e	= standing still
0	2	1	0	12	**712**	9	1	0	0	2	1	10	1	18	0	26	1	4	3	f	= eating/drinking
0	0	42	21	0	1	**320**	28	0	0	0	0	0	0	0	0	0	0	0	1	g	= watching TV
0	0	23	1	1	6	16	**961**	9	0	2	0	0	1	0	1	2	0	2	22	h	= reading
14	12	0	0	1	1	0	17	**491**	10	1	1	1	1	1	0	1	3	4	1	i	= running
0	1	0	0	5	0	0	0	8	**830**	10	0	1	0	3	0	2	1	0	1	j	= bicycling
9	3	2	16	30	22	45	9	3	35	**309**	37	26	21	99	1	38	12	3	26	k	= stretching
4	10	0	0	6	5	2	7	0	6	23	**500**	13	2	9	3	6	5	3	2	l	= strength train
1	7	0	0	5	10	0	0	0	0	3	9	**403**	11	10	1	26	1	6	4	m	= scrubbing
1	0	0	0	0	3	1	0	0	2	0	1	9	**885**	11	0	1	0	2	2	n	= vacuuming
1	1	0	0	1	6	0	0	0	1	4	1	4	7	**822**	8	4	0	1	3	o	= folding laundry
0	0	4	9	0	2	1	7	0	0	0	0	1	0	10	**791**	8	0	0	0	p	= lying down
1	2	0	0	3	32	0	0	0	1	5	0	18	7	10	9	**637**	10	2	10	q	= brushing teeth
7	14	0	0	1	1	0	0	0	3	2	1	1	0	2	0	12	**351**	10	5	r	= climbing stairs
84	70	0	7	20	60	0	0	8	40	33	11	24	34	40	0	0	59	**502**	160	s	= riding elevator
5	2	0	0	5	6	0	1	0	1	0	3	3	1	0	0	3	7	16	**127**	t	= riding escalator