Table 1 Some of SHs research studies and their sensor technologies

Reference	Sensors	Activities	Purpose
Yamazaki (2007)	Video cameras, microphones, floor pressure, motion, RFIDs	Watching TV, cooking, tracking personal items	Behaviour monitoring, tracking personal items
Patel et al. (2008)	Air pressure	Not mentioned	Residents' location
Rantz et al. (2008)	Video cameras, bed pressure, stove door CSS, motion	Cooking, sleeping, walking in the house	Resting hours, behaviour monitoring
Viani et al. (2013)	Signal strength of wireless devices	Not mentioned	Resident's location
Wilson and Atkeson (2005)	Motion detectors, Pressure mats, CSSs, RFIDs	Eating, bathing, dressing, toileting, cooking, watching TV	Resident's location, behaviour monitoring and prediction
Baker et al. (2007)	Accelerometer, Blood pressure readings, microphones, heart rate, temperature	Movement, blood pressure changes, speech, sound	Healthcare monitoring
Intille et al. (2005)	Infra-red cameras, microphones, pressure mats, motion, water and gas flow, light switches	Cooking, socializing, sleeping, cleaning, relaxing, working	Behaviour monitoring
Noury and Hadidi (2012)	Motion	Not applicable	Producing elderly's life scenario
Riedel et al. (2005)	Video cameras	Getting home and watching TV, eating while watching TV, Reading	Behaviour monitoring
Le et al. (2008)	Motion, CSSs	Bathing, dressing, toileting, eating	Behaviour monitoring
Wood et al. (2008)	Heart rate, movements, ECG, pulse oximeter, weight, pulse monitoring	Toileting, sleeping, showering, eating and drinking, walking,	Healthcare monitoring, behaviour monitoring
Cook et al. (2013a)	Motion, CSSs	Bathing, walking, cooking, eating, relaxing, personal hygiene, sleeping, taking medicine	Behaviour monitoring
van Kasteren et al. (2008)	Motion, CSSs	Toileting, showering, eating and drinking, walking,	Behaviour monitoring

Table 2 Excerpt of SHs research studies

References	Dataset Type	Algorithm	Target	Evaluation metrics	Results
Mozer (1998)	Private	ANN (MLP)	ADL (general)	Not mentioned	–
Cook et al. (2013b)	Private	ANN (MLP)	ADL (general)	Accuracy	Activity recognition: 64 %
Rivera-Illingworth et al. (2005)	Private	ANN (EcoS)	ADL(healthcare)	Accuracy	Anomaly detection: 74.57 %, Activity recognition: 89.14 %
Li et al. (2008)	Private	ANN (OPNN)	ADL (healthcare)	Accuracy	Activity recognition: 92 %
Lotfi et al. (2012)	Private	ANN (ESN)	ADL (healthcare)	Accuracy	Abnormally detection: 93–99 %
Isoda et al. (2004)	Private	DT (C4.5)	ADL (general)	Accuracy	Activity recognition: 90–100 %
Ravi et al. (2005)	Private	DT (C4.5)	ADL (general)	Accuracy	Activity recognition: 57–97.29 %
Manley and Deogun (2007)	Private	DT (ID3)	Resident's location	Mean error of location prediction in meters	The mean error: 4.9 m on the first dataset and 2.5 m on the second dataset
Hagras et al. (2004)	Private	ISL (fuzzy)	ADL (general)	Number of the generated rules by the algorithm	280 rules in 72 h
Hagras et al. (2007)	Private	Fuzzy type-2	ADL (general)	RMSE	0.229
Bouchachia (2011)	Private	GFMMNN (fuzzy+ANN)	ADL (general)	Current error (Missed/no presentations)	Adapted: 0.01 for 220 online presentations
Andreu and Angelov (2013)	Private	Evolving fuzzy classifiers	ADL (general)	F-measure	60–70 %
Bouchachia and Vanaret (2014)	Private	GT2FC (fuzzy)	ADL (general)	Accuracy	For 70% labelled data accuracy is 81.65 %
Chua et al. (2009)	Public	HMM	ADL (healthcare)	Accuracy	90.75 % behaviour-level recognition accuracy, 98.45 % observation-level recognition accuracy
van Kasteren et al. (2010)	Private	HSMM	ADL (general)	F-measure	65.5 %
Gu et al. (2009)	Private	EPs	ADL (general)	Time-slice accuracy	85.84 %
Riboni et al. (2011)	Public	Ontological approach	ADL (general)	Accuracy	80.3 %