ERL Consumer Service Robots
Test Bed Certification

BRL Anchor Personalised Assisted Living Studio

Test bed name: BRL Anchor Personalised Assisted Living Studio

Test bed web page URL:
http://www.brl.ac.uk/research/researchthemes/assistedliving/assistedlivingstudio.aspx

Name of Institution where test bed is hosted: University of the West of England, Bristol

Designation of the lab/department/group where test bed is located: Bristol Robotics Laboratory
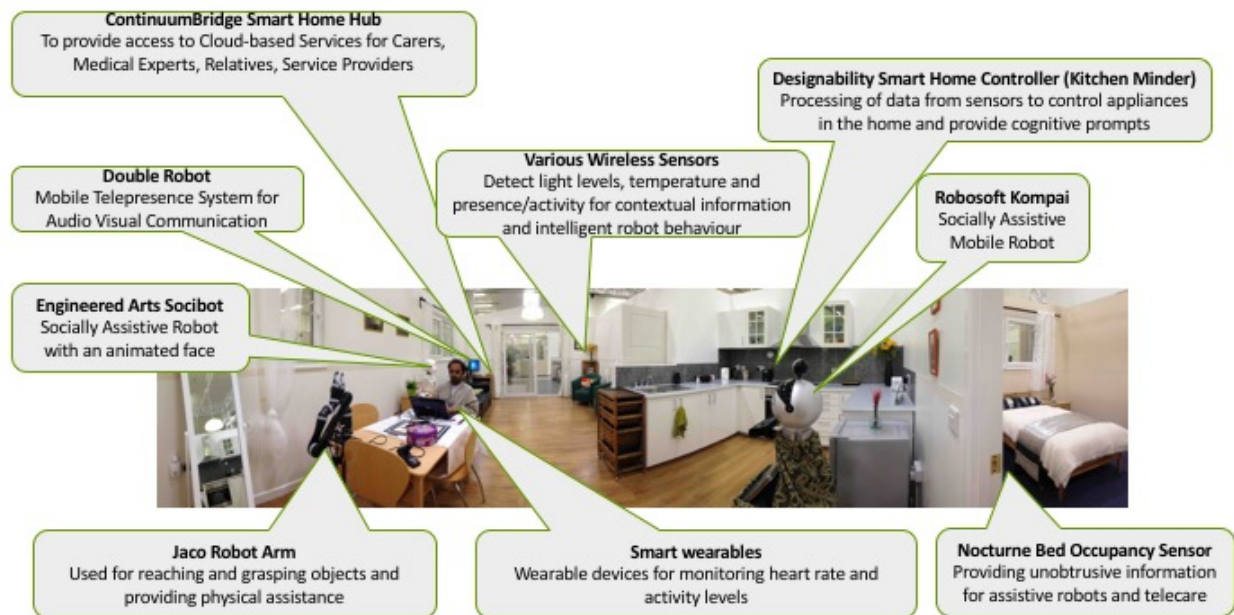
Name of responsible person: Praminda Caleb-Solly

Contacts of responsible person:
- **E-mail**: praminda.caleb-solly@uwe.ac.uk
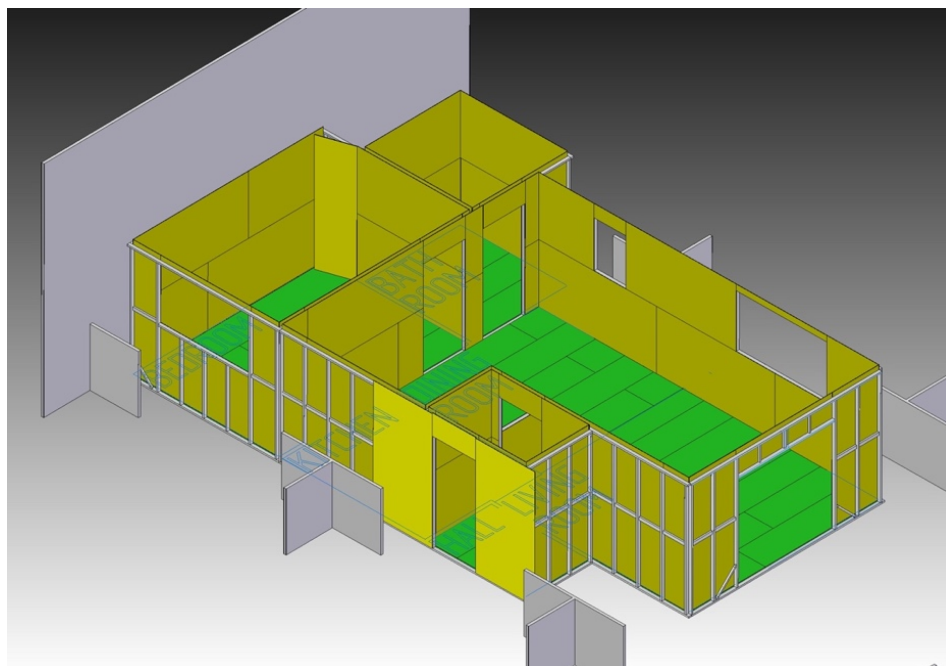- **Tel.**: (0044) 117 3283178

Test bed overview pictures

Open plan Kitchen, Dining Room and Living Room

ContinuumBridge Smart Home Hub
To provide access to Cloud-based Services for Carers, Medical Experts, Relatives, Service Providers

Designability Smart Home Controller (Kitchen Minder)
Processing of data from sensors to control appliances in the home and provide cognitive prompts

Double Robot
Mobile Telepresence System for Audio Visual Communication

Various Wireless Sensors
Detect light levels, temperature and presence/activity for contextual information and intelligent robot behaviour

Robosoft Kompai
Socially Assistive Mobile Robot

Engineered Arts Socibot
Socially Assistive Robot with an animated face

Jaco Robot Arm
Used for reaching and grasping objects and providing physical assistance

Smart wearables
Wearable devices for monitoring heart rate and activity levels

Nocturne Bed Occupancy Sensor
Providing unobtrusive information for assistive robots and telecare

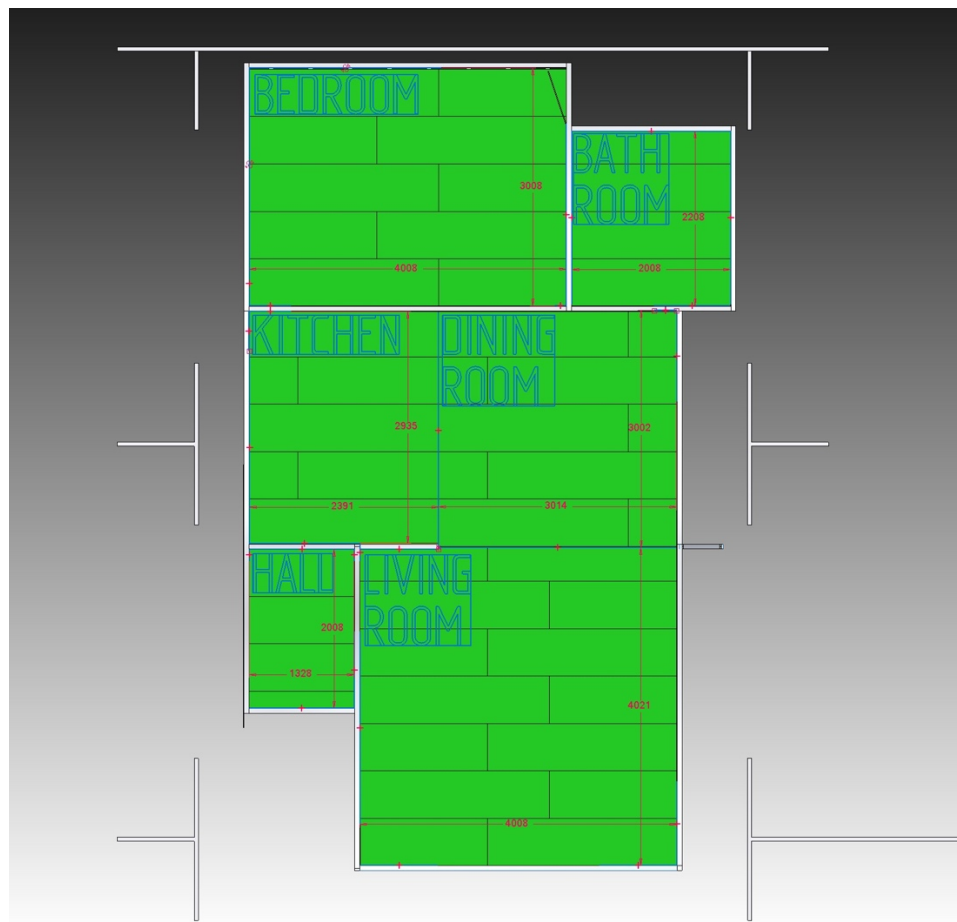**The Anchor Assisted Living Studio in the Bristol Robotics Laboratory at the University of the West of England, Bristol**

Aluminium Frame Structure

Test bed layout

Room Dimensions

Short description of the facility

The Anchor Personalised Assisted Living (ARPAL) Studio in the BRL offers facilities for research into innovative person-centred assistive robotics technologies to enable independent living and active ageing within a "Living Lab" testing environment.

The studio has been developed as a typical apartment to provide realistic conditions to pursue vital research on the design and development of assistive robotics that can be deployed in people's homes. Providing a multi-disciplinary working environment with access to teams of health care experts and end-users, it provides robotics researchers an opportunity to validate of concepts and trialling of users' actual experience of technology.

The facility has been constructed to standardised specifications, a v-rep model of the studio is also available.

A video of the test bed is available here:
https://www.dropbox.com/s/5nkm4shpmzqvcg9/AALStudio.mpg?dl=0

Test Bed Components	Material
Flooring	Timber Doors, Floorboards and Laminate
Inside Walls	Painted MDF
Frame (Walls and Base)	Aluminium Structure
Overhead Outside Frame	Aluminium Lighting Truss
Outside Walls	Brick Effect Cladding
Outside Windows and Patio Door	Glazed PVC and Glass
Kitchen	IKEA fully fitted Kitchen with Cooker & Oven (Heating element disconnected for safety), Sink, Fridge, microwave, toaster and kettle
Furniture	Living Room Sofa Suite, Display Cabinet and side book cases, Dining Table and four chairs, Bedroom Double bed, side cabinets and wardrobe, Coat hanging hooks in hallway.
Bathroom	Toilet, Washbasin and Shower (Bathroom fittings are not plumbed in)
ADSL Broadband Dedicated Line with Wifi and Ethernet Wired	Netgear Ethernet 16 Port Switch
Server for HAD	Linux and Windows PC Dual Boot

Table 3.1.3.1. Test bed components

Robots Platforms
Turtlebot 2 http://www.robotnik.eu/mobile-robots/turtlebot-ros/
Kompai (Robosoft) http://telepresencerobots.com/robosoft%E2%80%99s-kompai
Pepper (Softbank) https://www.ald.softbankrobotics.com/en/cool-robots/pepper
Double Telepresence Robot http://www.doublerobotics.com/
Jaco2 (Kinova) http://www.robotnik.eu/robotics-arms/kinova-jaco-arm/
Fetch Mobile Manipulator (http://www.robotnik.eu/manipulators/fetch/) Under order
Padbot v2 http://padbot.co.uk/ Under order

Table 3.1.3.2 List of Robot Platforms

List of home automation devices available

Continuumbridge Smart HOMe Hub
ContinuumBridge https://continuumbridge.readme.io/docs/start-here platform for connecting sensors to the Internet and managing them. The platform consists a local bridge, ContinuumBridge cbridge software running on a Raspberry Pi, and Bridge Controller, which provides links to a user web portal and application back-ends, a client interface, which can be used to connect to any web API (REST and Websocket). Sensor data can be directly accessed via TCPIP.

Z-wave Fibaro motion sensor
Sensor measuring activity, temperature and luminance, also data on connected/not connected and battery life. Available in each living area.

Z-wave everspring door & window detector
A magnetic switch fitted on front door, fridge, drawers and kitchen cupboards.

Z-wave TKB wall plug switch/meter
TKB on/off switch with addition of measuring current, voltage, power factor, power and energy usage. Power is reported as soon as it changes, so an app can know as soon as a connected appliance has been switched on.

Z-wave everspring smoke detector
It detects smoke and also has a low battery warning, but the battery state is only reported either when it is low or when the test button is pressed (or if smoke is detected).

Bluetooth Texas Instruments sensortag
TI development kit. It includes the following sensors: IR temperature Sensor, Humidity Sensor, Pressure Sensor, Accelerometer, Gyroscope, Magnetometer.

All of these are connected via Bluetooth LE (AKA Bluetooth Smart) and all the sensors apart from the pressure sensor are supported by the cbridge adaptor.

Bluetooth Texas Instruments Simplelink™ sensortag (sensortag 2)
Second generation device that includes more sensors.

Currently only the following sensors are supported: temperature, ir_temperature, humidity, luminance buttons.

Bluetooth beacons
The ContinuumBridge BTLE Beacon Scanner doesn't actually connect to a particular device, but detects any Bluetooth beacon is the area and passes its details to apps that are connected to it. This allows the distance between the beacon and the bridge to be determined.

In the studio we have Blukii key fob beacon, which can be used for tracking of people (or assets) using the ContinuumBridge hub.

VERA3 Smart Home Controller http://getvera.com/controllers/vera3/

Phillips Hue Lights and Hub - http://www2.meethue.com/en-gb/productdetail/philips-hue-white-and-color-ambiance-starter-kit-b22

Fibaro Flood Sensor http://www.fibaro.com/uk/the-fibaro-system/flood-sensor

Fibaro Roller Shutter http://manuals.fibaro.com/roller-shutter-2/

Available Motion Capture system

- Xbox Kinect I and II
- 3 Ethernet Cameras fitted in overhead lighting Gantry http://www.amazon.co.uk/Foscam-FI9821W-Megapixel-Wireless-Camera/dp/B00F3KWZW8
- Xsense MVN Biomech Suit https://www.xsens.com/products/mvn-biomech/
- Tobii EyeX tracker

Current list of TBMs and FBMs for which the test bed is certified (i.e., meets both the rulebook specifications and has available the required devices).

Benchmark	Minimum required system / devices	Available in Test Bed
TBM1: Getting to know my home	RSBB	No
TBM2: Welcoming visitors	RSBB, IP camera at entrance	No
TBM3: Catering for granny Annie's comfort	RSBB, HAD	HAD Partial
TBM4: Visit my home	None	Partial
TBM5: General purpose service robot	None	Partial
FBM1: Object perception functionality	RSBB, MoCap	MoCap
FBM2: Navigation functionality	RSBB, MoCap	MoCap
FBM3: Speech recognition functionality	None	Yes

List of the ERL-SR benchmarks with their corresponding required systems