



# **ERL Consumer Service Robots Test Bed Certification**

## **Leon@Home Testbed**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n° 780086.

**Test bed name:** Leon@Home Testbed

**Test bed web page URL:** <http://robotica.unileon.es/index.php/Testbed>

**Name of Institution where test bed is hosted:** Universidad de León (Spain)

**Designation of the lab/department/group where test bed is located:** Robotics Group /  
Dept. Mechanical, Computer and Aerospace Engineering

**Name of responsible person:** Dr. Vicente Matellán

**Contacts of responsible person:**

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**Pictures with overview of the test bed**



Picture 1: General view of the testbed



Picture 2: Kitchen cabinets



Picture 3: Living room

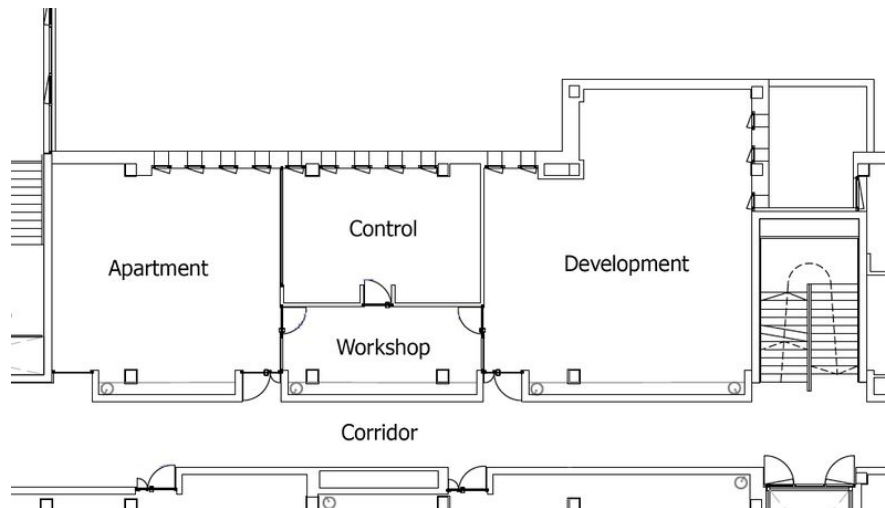


Picture 4: Detail of the Pentalo 3D cameras and KIO beacons for motion capture

**Short description of the facility, including the type of furniture used, wall materials, available objects and robot platforms**

The Leon@Home testbed main purpose is to benchmark service robots in a realistic home environment.

The experimental area of the ULE robotics group is made up by four parts: a mock-up *Apartment*, a *Control* zone with direct vision through a glass wall to the apartment, a small *Workshop* and a larger *Development* zone where researchers work. Next figure shows the distribution of the areas.



The Apartment area is the area that could be certified as ERL Testbed. It is a fifty square meters (50 m<sup>2</sup>) clear area, no pillars, where a small mock-up apartment has been built using 60cm height fixed plasterboard walls (Pladur type).

It has two glass walls from floor to ceiling: one that let operators in the control area oversee the testbed area and a smaller one that let external observers see the apartment from the corridor. It also has two doors, one to the corridor and one to the workshop area.

In the apartment four different rooms have been configured:

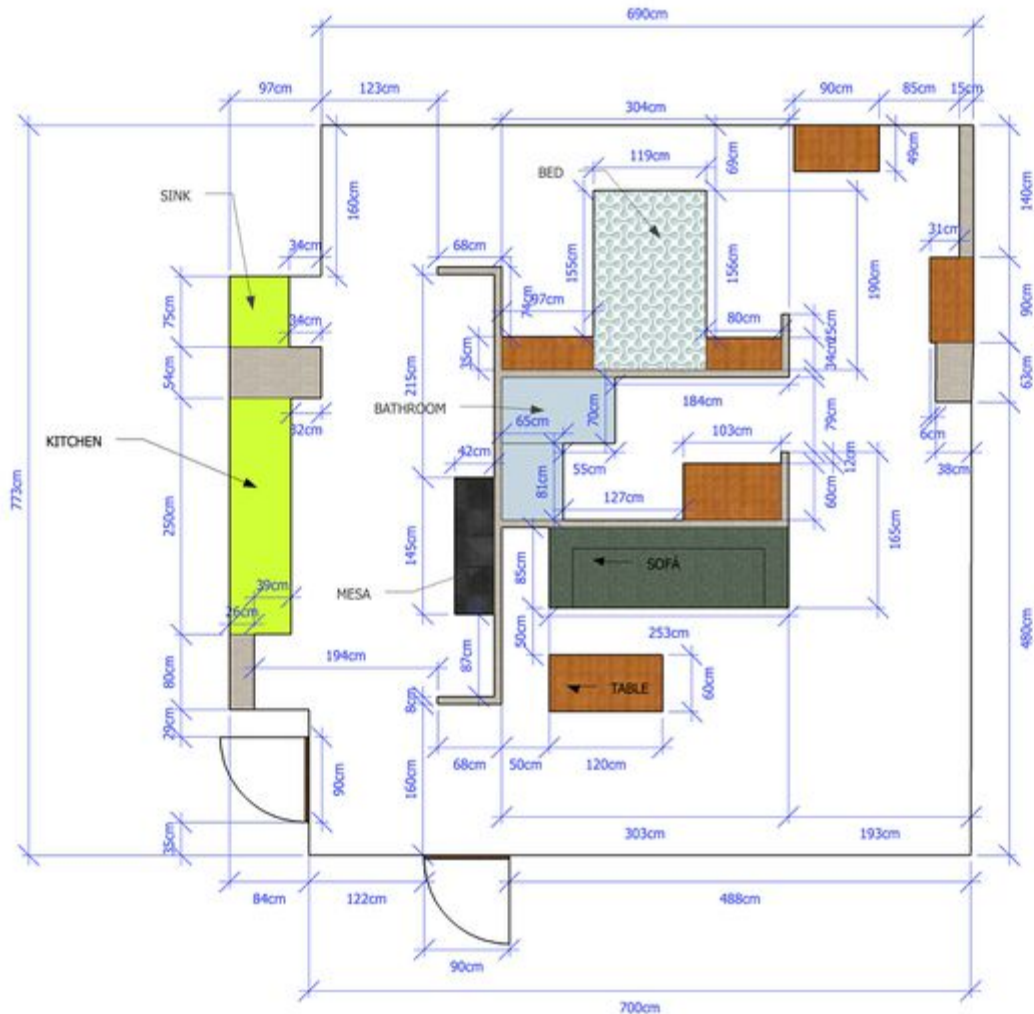
- Kitchen: it has a full equipped kitchen with a working two-door refrigerator, microwave oven, table, two chairs and full set of low and high kitchen cabinets and drawers with different handles (picture 2).
- Bedroom: full bed with two bedside tables, each one with a drawer, and two lights
- Living room: coffee table, sofa and (picture 3) and a fake TV set.
- Bathroom: White pedestal washbasin and fake lavatory.

There is a circular corridor to communicate the different areas.

The testbed area also has multimedia projection available (connectors are located in the kitchen) and a retractable screen.

Pentalo 3D motion capture system sensors (4 RGB-D cameras) are mounted on opposite corners on the apartment (picture 4)

### Test bed layout, including dimensions, areas and room designs



### Available Motion Capture system (make, model, and main features)

We offer three different motion capture systems for tracking your robots in the environment. Two of them are permanently install in the testbed area and the third one could be used under request:

1. [\[KIO RTL\]](#) ground-truth system based on Ultra Wideband (UWB) technology
2. [\[Pentalo 3D people tracker\]](#) based on RGB-D cameras (four cameras in the top corners of the apartment)
3. VICON 3D tracking system: 7 cameras T-Series T10s, capable of acquiring IR images at 1000Hz

### Other relevant information

Home automation devices will be included during 2017.

**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).

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

*Table 1: List of the ERL Consumer benchmarks with their corresponding required systems*