

S.E.Arch

Smart Environments Architecture





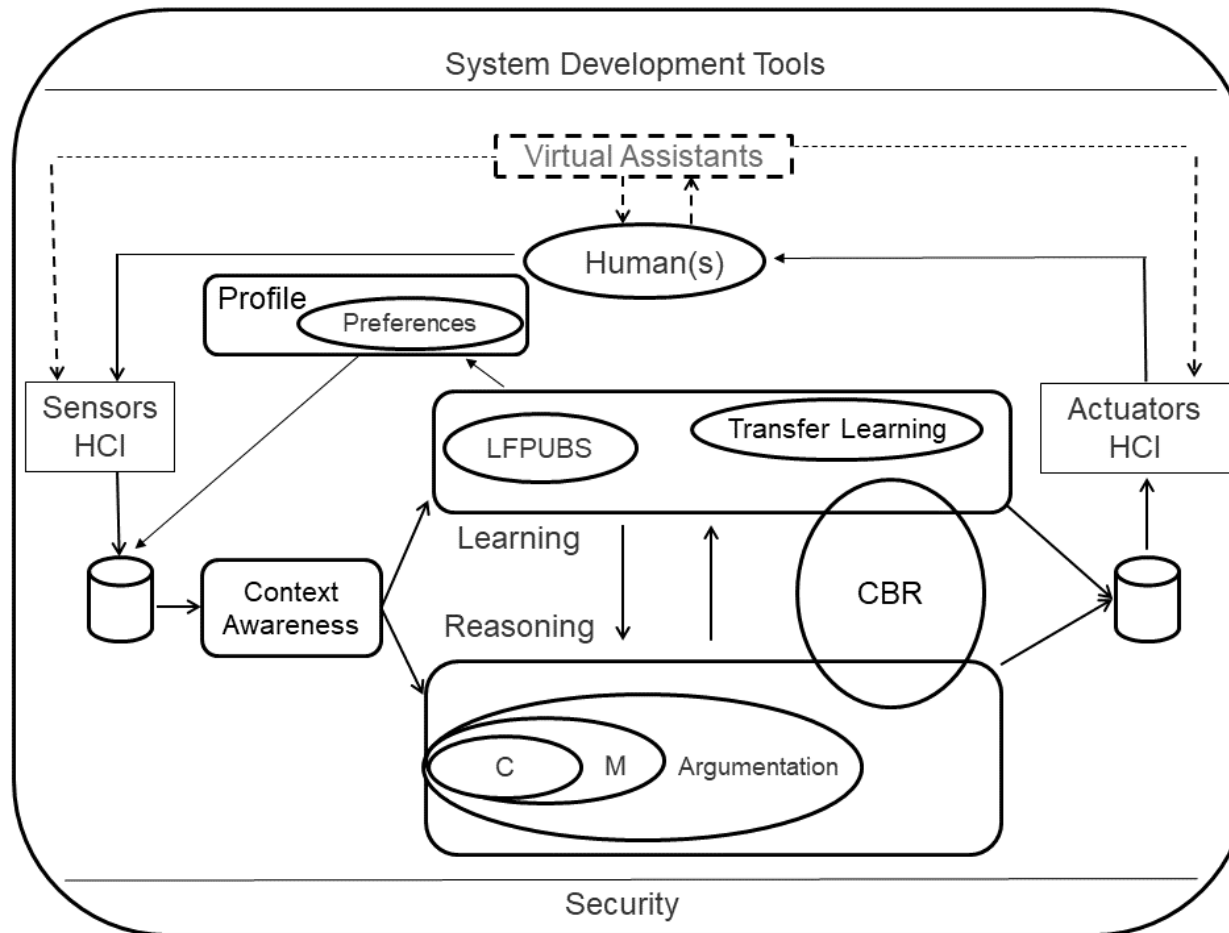
Impact

Demo

Foundations

S.E.Arch

A collection of AI resources developed bottom up to provide practical services.



Designed to align itself from the start with each user needs and preferences.

Breakfast

What locations the activity perform?
(Example: Kitchen, corridor, bedroom)

How many way perform each activity?
(Example: Breakfast can be done by cooking food or just tea or coffee)

What Objects you use to complete the activity?
(Example: For breakfast object can be milk, fridge, cupboard, furniture)

Briefly describe each of the way to performing activity?
(Example: "making breakfast", open the fridge, take milk, pour milk, open the cupboard take coffee or tea)

How long each way take to perform activity?
(Example: Make a tea for breakfast five minute)

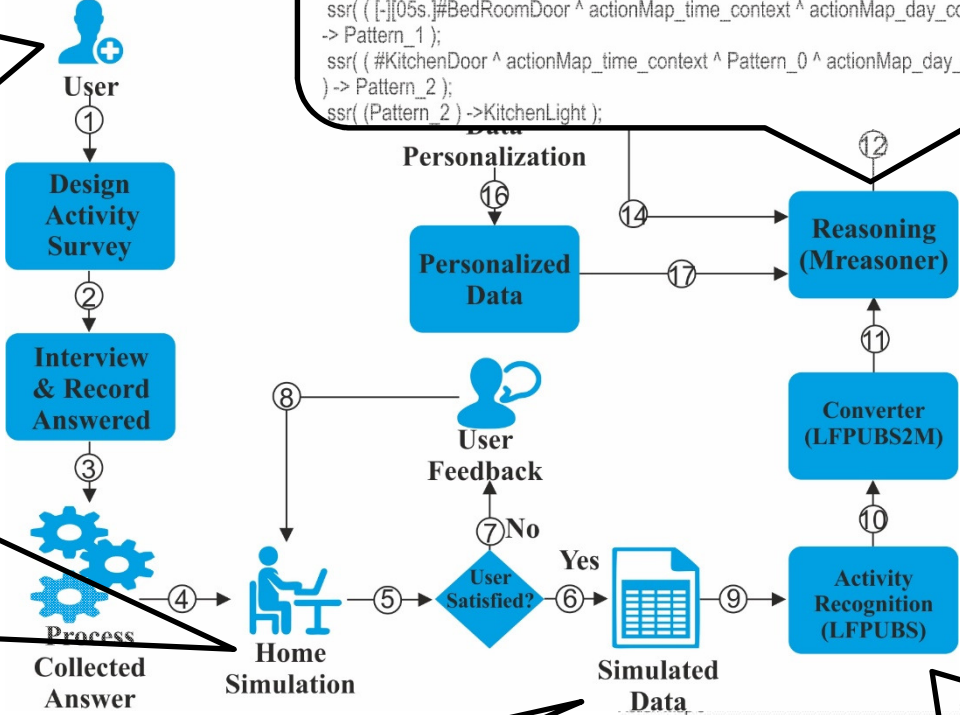


```

ssr( ( weekDayBetween(monday-friday ) ->actionMap_day_context ) ;
ssr( ( #weekDayBetween(monday-friday ) ->#actionMap_day_context ) ;
ssr( ( clockBetween(13:41:59-13:58:41 ) -> actionMap_time_context ) ;
ssr( ( #clockBetween(13:41:59-13:58:41 ) -> #actionMap_time_context ) ;

ssr( ( KitchenDoor ^ actionMap_time_context ^ Pattern_1 ^ actionMap_day_context )
-> Pattern_0 ;
ssr( ( [-][05s.]#BedRoomDoor ^ actionMap_time_context ^ actionMap_day_context )
-> Pattern_1 ;
ssr( ( #KitchenDoor ^ actionMap_time_context ^ Pattern_0 ^ actionMap_day_context )
-> Pattern_2 ;
ssr( ( Pattern_2 )->KitchenLight ;

```



“Habits in context” detection and automation

“Cold Start” Problem: semi-automated house adaptation

idMeasure	idUser	idDevice	oldValue	newValue	time
87245	1	446	1	0	04/06/2019 14:10
87244	1	505	1	0	04/06/2019 14:10
87243	1	35	1	0	04/06/2019 14:10
87241	1	505	0	1	04/06/2019 14:09
87242	1	446	0	1	04/06/2019 14:09
87240	1	35	0	1	04/06/2019 14:09
87239	1	450	1	0	04/06/2019 14:09
87238	1	505	1	0	04/06/2019 14:09
87237	1	35	1	0	04/06/2019 14:09
87236	1	450	0	1	04/06/2019 14:09

```

(General Conditions)
context (DayOfWeek (=,Monday,Tuesday,Wednesday,Thursday,Friday))&
context (TimeOfDay(>.09:24.08)) & context (TimeOfDay(<.00:00.00))

(Action Pattern 0)
ON occurs (start,-,10) Frequency: 7
IF context ()
THEN do {unordered,((OFF,Entrance {0}) & {OFF,Corridor {0}}), 1) when --

(Action Pattern 1)
ON occurs (unordered,((OFF,Entrance {0}) & {OFF,Corridor {0}}), 10) Frequency: 21
IF context ()
THEN do (simple,(OFF,ToiletMove {0}), 1) when t = 10 + 230.6107692719506 s.

```

Improving the Adaptation Process for a new Smart Home User. M Ali, J. C. Augusto, D. Windridge. To appear in AI-2019, Cambridge, 2019.

Learning frequent behaviours of the users in Intelligent Environments. A. Aztiria, JC Augusto, et al. IEEE's Tr. SMC 43(6):1265-1278, IEEE Press. Nov 2013.

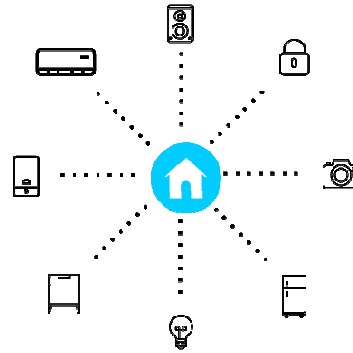


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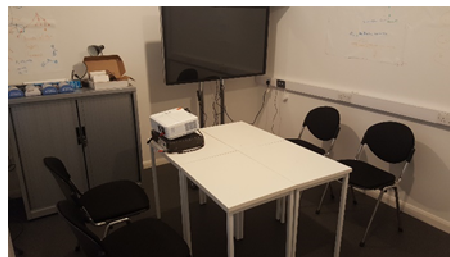
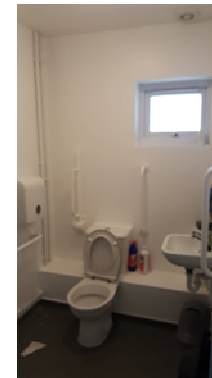
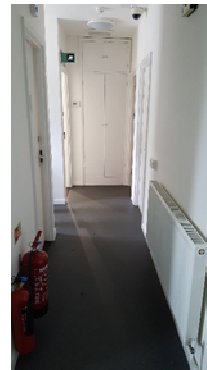
Demo

Foundations

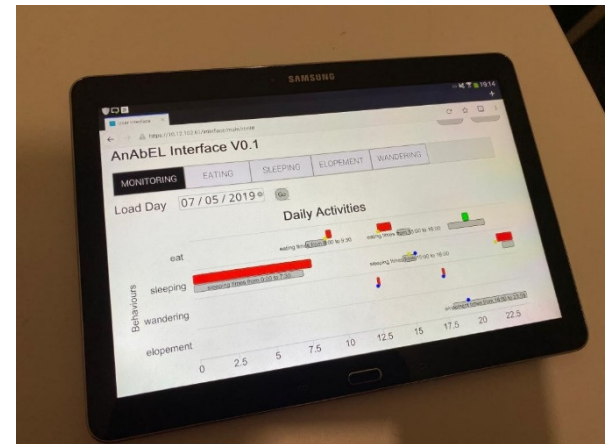
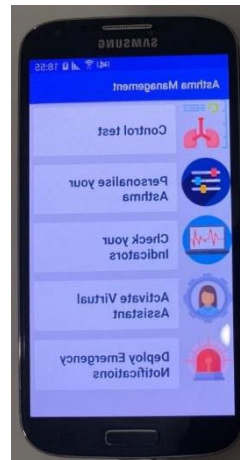
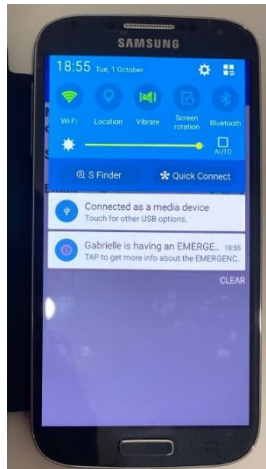
Smart Spaces Lab



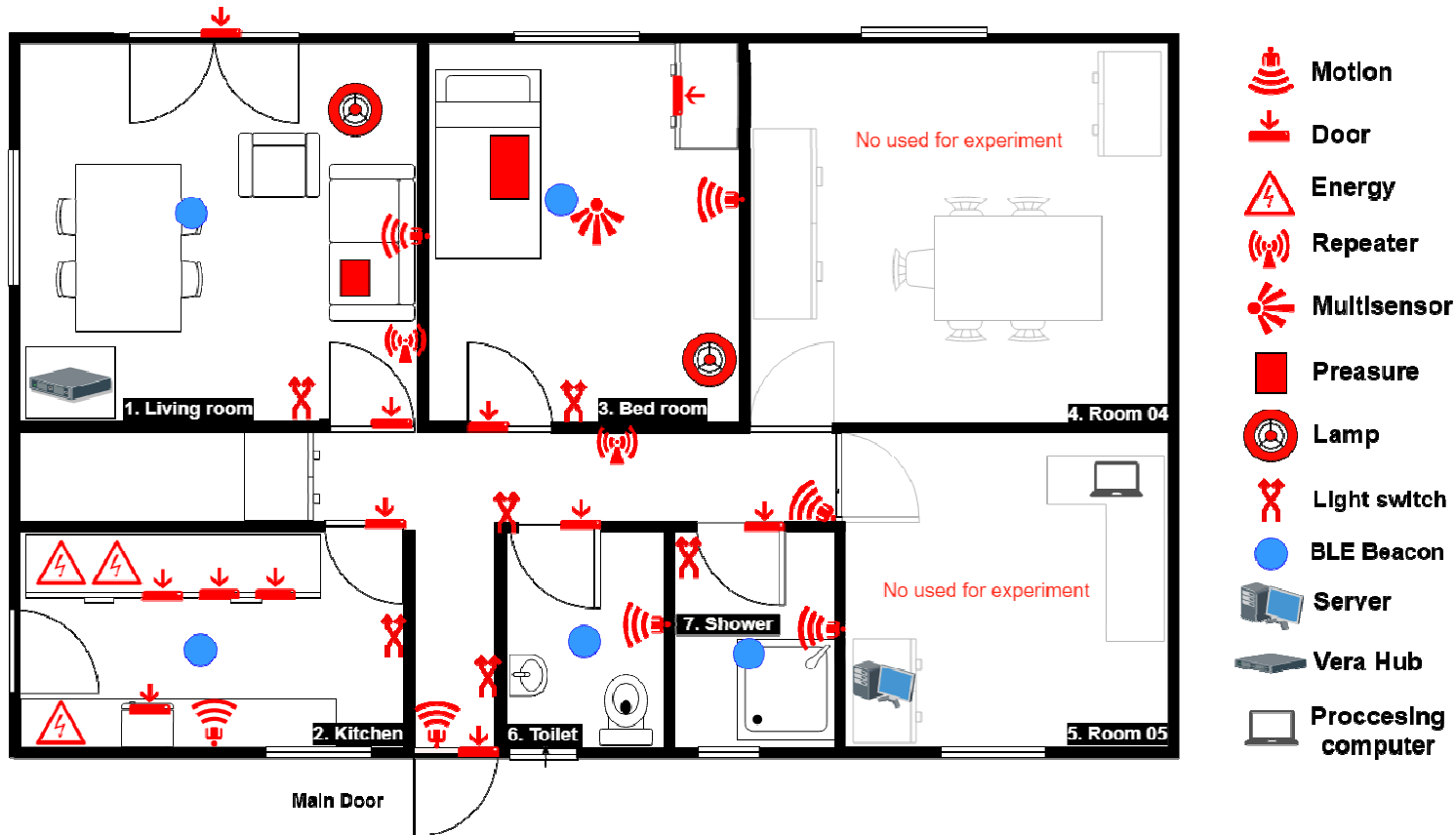
Currently our experimentation space: consists of a domestic living space (Smart Home) and additional general purpose rooms.



Samples of equipment (affordable / 'off the shelf')



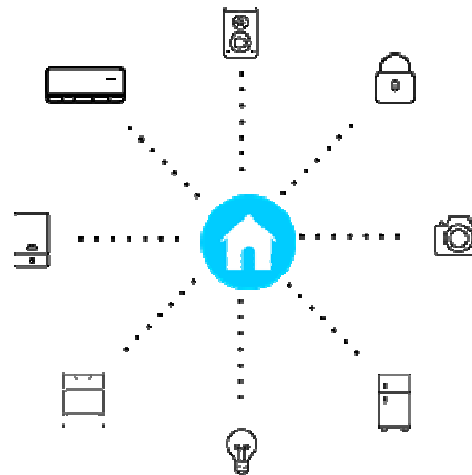
Distribution of technology in the Smart Home



Scenarios: detecting Activities of Daily Living (ADLs) in Ambient Assisted Living (AAL)

Demo

States + Events + Metric Time Operators (Monotonic Reasoning)



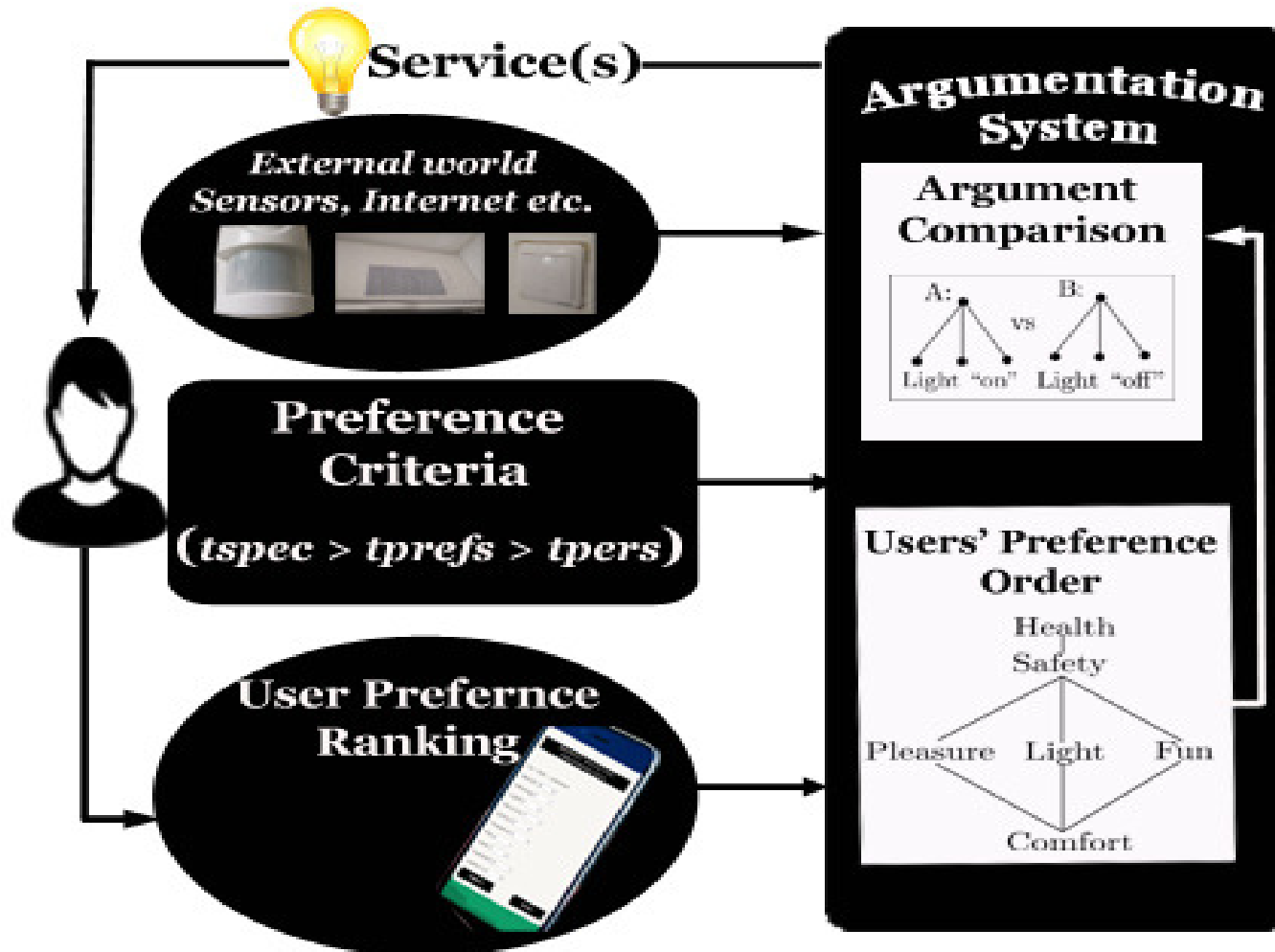
- *Stratified Causal Theories for Reasoning about Deterministic Devices and Protocols.*

A. Galton and J. C. Augusto. Proc. of 9th TIME, pp. 52-54, Manchester, 2002.


- *Temporal Reasoning for Intuitive Specification of Context-Awareness.*

U. Alegre, J.C. Augusto, A. Aztiria. Proc. 10th Int. Conf. on Intelligent Environments, pp. 234-241. IEEE Press. Shanghai, 2014.

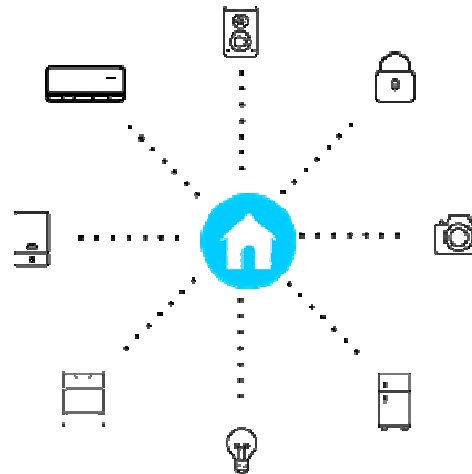
Scenario 3: Preferences + Conflicts + Explanations



Using Argumentation to Manage Users' Preferences. C. L. Oguego, J. C. Augusto, A. Muñoz, M. Springett. *Future Generation Computer Systems*, 81:235-243. Elsevier. April 2018.

Scenario: possibilities assessed through supporting arguments.
Shown: house automation
(also available in Figshare repository advice on healthy food for diabetic patient using **TESCO** API and  API).

Demo



Non-Monotonic Reasoning:

- Temporal Argumentation with Preferences
- User identification
- Specificity + User Preferences + Persistency
- Explainable AI



Impact

Demo

Foundations

Impact

- Ethical and privacy preserving AI (no multinationals looking at your daily data log or hearing your conversations)
- We have interacted with the following organizations:



Benefit for our scientific community and developers worldwide through open source projects:

Figshare

<https://mdx.figshare.com/account/home#/projects>



Github



<https://github.com/GOODIES-RG>

Publications

<http://ie.cs.mdx.ac.uk/publications/>



Thanks for your attention!

