

Some of my earlier (related) work in the area of Ubicomp...

Cheverst, K, Byun, HE, Fitton, D, Sas, C, Kray, C & Villar, N 2005, 'Exploring Issues of User Model Transparency and Proactive Behaviour in an Office Environment Control System.' *User Modeling and User-Adapted Interaction*, vol 15, no. 3-4, pp. 235-273. DOI: 10.1007/s11257-005-1269-8

Cheverst, K & Byun, HE 2004, 'Utilizing Context History to Provide Dynamic Adaptations.' *Applied Artificial Intelligence*, vol 18, no. 6, pp. 533-548. DOI: 10.1080/08839510490462894

General investigation...

- We wish to learn behaviour patterns of a user around a given task so that we can build a system to provide proactive support for that task.
 - How does the owner tend to cool his/her office?
- Sensors can be used to build up ‘Context History’ Tables that can act as training data
- Because its proactive we want the user to be able to query the system with questions such as *‘why did you do that, what rule were you following?’*

Comprehensibility

- When discussing key challenges in the ubicomp domain, (Abowd and Mynatt, 2000) make comments concerning the need for comprehensibility, :

“One fear of users is the lack of knowledge of what some computing system is doing, or that something is being done ‘behind their backs’”.

Abowd, G.D. and E. D. Mynatt.: 2000, 'Charting Past, Present and Future Research in Ubiquitous Computing'. *ACM Transactions on Computer-Human Interaction, Special Issue on HCI in the New Millennium*, 7(1), 29-58.

Example Proactive System: IOS...



Intelligent Office - Context From User - Touch Sensitive UI

Current State: ON		Turn Off Without Prompt <input type="checkbox"/>	
<input checked="" type="checkbox"/> Turn On Without Prompt <input checked="" type="checkbox"/>	Fan	OFF	
View Associated Rules (3)			
Current State: OFF		Turn On Without Prompt <input type="checkbox"/>	
<input checked="" type="checkbox"/> Turn Off Without Prompt <input checked="" type="checkbox"/>	Heater	ON	OFF
View Associated Rules (4)			
Current State: OFF		Turn On Without Prompt <input type="checkbox"/>	
<input checked="" type="checkbox"/> Turn Off Without Prompt <input checked="" type="checkbox"/>	Desk Lamp	ON	OFF
View Associated Rules (5)			

Date: 08 December 2004
Day: Wednesday
Time: 16:09
Temperature: 18.3°C (Cold)
Humidity: 26.8% (Low)
Sound Level: 55.0 dBa (Loud)
Light Level: 43.5 lux (Normal)
Window: Open

Location: IN

OUT	IN
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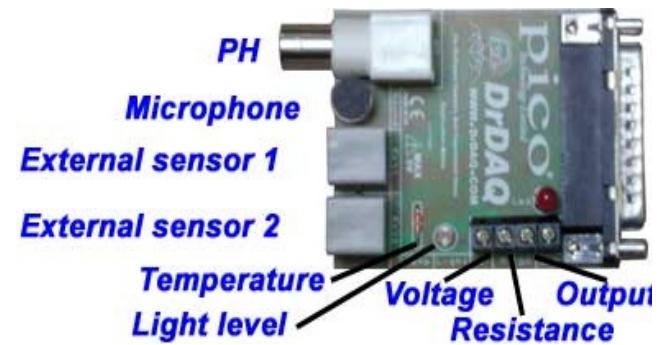
Proactive Threshold:

Low Medium High Proactive off

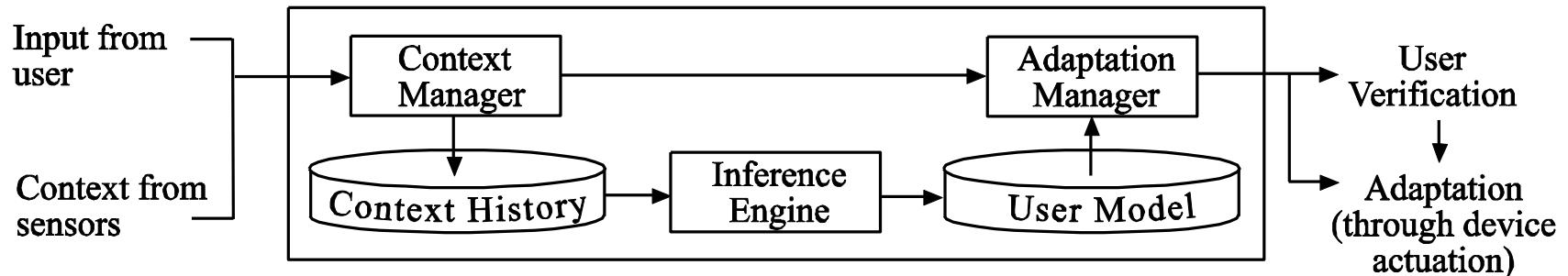
Preferences
Learn Rules
View Context History (raw)
View Context History (sym)
Last Recorded Added: 12/08/04

The contexts considered in the experiment were: temperature, humidity, noise level, light level, the status of window, the status of fan and the location of a user.

How does the owner tend to cool his/her office?



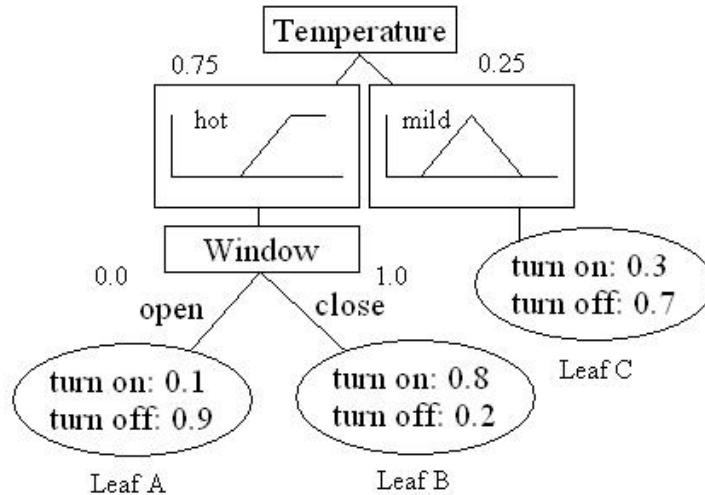
Overall approach...



Date	Time	Temp	Noise Level	Humidity	Light	Window	Fan	Heater	Location
2004-26-11	14:36:01	23	55	30	52	closed	off	off	in
2004-26-11	14:37:01	24	55	30	49	closed	on	off	in
2004-26-11	14:38:01	25	55	30	51	closed	on	off	in
2004-26-11	14:39:01	26	55	30	50	closed	on	off	in
2004-26-11	14:40:01	22	68	30	50	closed	off	off	in
2004-26-11	14:41:01	22	62	30	50	closed	off	off	in
2004-26-11	14:42:01	21	55	30	49	closed	off	on	in
2004-26-11	14:43:01	20	55	30	50	closed	off	on	in
2004-26-11	14:44:01	18	55	30	50	closed	off	on	in
2004-26-11	14:45:01	19	76	30	50	closed	off	on	in

Note that ‘raw’ values would be converted into **symbolic** values, e.g., temperatures below 20°C would be classified as **cold**. Process called *Discretisation*.

(Fuzzy) Decision Trees



So can produce “If ... Then...” rules

When a Rule for Device Actuation is Triggered

- When a suggestion prompt is issued (which occurs if the user has indicated that a prompt rather than automatic action is required) it is displayed on the main control GUI.
 - if the system suggests that the fan should be turned off, then the UI changes to that shown below - the text on the 'OFF' button flashes black and white.

