**Gate reminder [1]:**

This concept centralizes around providing reminders at the moment a user leaves their house. Knowledge about possibly forgotten items is obtained through the use of RFID tags, focusing on a zero user workload interaction. A crucial part in its working is that it is focused on Korean household, where shoes are generally left at the front door, so there is a clearly defined time slot in which all tags can be analyzed. Focus on the study was mostly the actual prototype rather than any smart algorithm.

*Properties:*

* Reminder producing
* Physical prototype
* Transparent interaction
* Object detection

**Decision maker [2]:**

This concept intercepts notifications from all sources and processes them in a “decision maker” prior to actually arriving at the user. Instead, it processes information from sensors and IoT devices within user and environment contexts to decide upon the target device, type of notification and time of notification. This is done using a machine learning approach. Rather than analyzing the actual patterns in decisions on whether to and how to notify, the paper continues by focusing mostly on the speed and accuracy of various machine learning algorithms.

*Properties:*

* Reminder intercepting
* Machine learning
* Environment context aware
* User context aware
* Activity aware
* Habit analysis

**Smart reminder system [3]:**

This concept creates a smart reminder system through three major components: activity recognition, location recognition and prediction. The activity recognition is done through the use of analysis of the hand movements over time and applying machine learning algorithms and fuzzy logic to map this to activities. Location recognition is done through image recognition by camera and neural networks. These two are then combined to analyze coupled activities, two activities that are strongly related. Alongside, predictions are made regarding pending and forgotten activities. As such reminders can be produced when likely to be forgotten activities should occur.

*Properties:*

* Reminder producing
* Location aware
* Activity aware
* Activity coupling
* Specific setup

**Olisto/IFTTT/CybreMinder/CAMP [4]–[7]:**

These apps and concepts allow setting reminders based on various aspects of user and environment contexts. Once the current situation satisfies all conditions in all contexts, the user is automatically notified. Information is retrieved from the user’s (IoT) devices and (online) services. No form of pattern recognition or prediction is done, however.

*Properties:*

* Reminder producing
* User context aware
* Environment context aware
* Location aware
* Time aware

**CogKnow [8]:**

This concept actually touches upon user values, but instead uses them to define the required support. A distinct number of support scenarios are handled and rulesets are defined accordingly. Predominantly the user context is considered rather than anything else. The rulesets are aimed at avoiding interruptions of important activities, but don’t do any further analysis.

*Properties:*

* Reminder producing
* User context aware
* Location aware
* Time aware
* Activity aware

**Fuzzy linguistics [9]:**

This concepts uses fuzzy logic and linguistic variables to analyze the urgency of the reminder and the level of annoyance created by the interruption of the current activity. Resulting from this is a reminder level which determines whether or not the reminder is delayed and/or how the reminder is presented. The urgencies and other levels are all given at design time, however, and are averaged over all users tested prior.

*Properties:*

* Reminder intercepting
* User context aware
* Location aware
* Activity aware

**Goal models [10]:**

This concept does not directly involve itself with reminders, but rather with linking certain activities to achieving certain goals. These activities may have complex relations with one another and may promote or demote a goal. As such, this can be similarly applied to activities aiming to achieve a certain goal where the promotions and demotions are linked to the user values.

*Properties:*

* Activity aware
* Dynamic

**PAIR [11]:**

This is a relatively older paper which describes one of the first, more advance planners. It takes into consideration several rules as prescribed by the user or caregiver and lays them alongside the activities of the user to provide appropriate reminders. However, no dynamic analysis is done, only design time rules are analyzed.

*Properties:*

* Activity aware

**AHCS [12]:**

This concept tries to design a context-aware application which analyses data from various sensors within the user’s house combined with the CASanDRA framework [13] in order to create awareness of the user’s context. The CASanDRA framework is a middleware which provides easily consumable context information and accepts different information inputs which are fused together. THE AHCS concepts uses this combined with a number of predefined rules to provide detailed information on the user to the caregiver and provide reminders when rules are broken.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Concept | RP | RI | SS | Tim | Loc | Act | Env | Dyn | UV | IA | Ref. |
| Gate reminder | x |  | x |  |  |  | x |  |  |  | [1] |
| Decision maker |  | x |  | x | x | x | x | x |  |  | [2] |
| SRS | x |  | x |  | x | x |  | x |  |  | [3] |
| Olisto | x |  |  | x | x | x | x |  |  |  | [4] |
| IFTTT | x |  |  | x | x | x | x |  |  |  | [5] |
| CybeMinder | x |  |  | x | x | x |  |  |  |  | [6] |
| CAMP | x |  |  |  |  |  |  |  |  |  | [7] |
| CogKnow | x |  | x | x | x | x |  |  |  | x | [8] |
| Fuzzy lingustics |  | x |  |  |  | x |  |  |  | x | [9] |
| Goal models |  |  |  |  |  | x |  | x |  |  | [10] |
| PAIR |  | x |  |  |  | x |  |  |  |  | [11] |
| AHCS | x |  |  | x | x | x |  |  |  |  | [12] |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Legend:**

RP: Reminder Producing

RI: Reminder Intercepting

SS: Specific setup

Tim: Time

Loc: Location

Act: Activity

Env: Environment

Dyn: Dynamic

UV: User Values

IA: Interrupt Analysis

**References**

[1] S. W. Kim, M. C. Kim, S. H. Park, Y. K. Jin, and W. S. Choi, “Gate Reminder: A Design Case of a Smart Reminder,” in *Proceedings of the 5th Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, New York, NY, USA, 2004, pp. 81–90.

[2] F. Corno, L. D. Russis, and T. Montanaro, “A context and user aware smart notification system,” in *2015 IEEE 2nd World Forum on Internet of Things (WF-IoT)*, 2015, pp. 645–651.

[3] H. T. Chaminda, V. Klyuev, and K. Naruse, “A smart reminder system for complex human activities,” in *2012 14th International Conference on Advanced Communication Technology (ICACT)*, 2012, pp. 235–240.

[4] “Olisto makes smart thing smarter, according to your rules.,” *Olisto*. [Online]. Available: https://olisto.com/. [Accessed: 19-Apr-2018].

[5] IFTTT, “IFTTT helps your apps and devices work together.” [Online]. Available: https://ifttt.com. [Accessed: 19-Apr-2018].

[6] A. K. Dey and G. D. Abowd, “CybreMinder: A Context-Aware System for Supporting Reminders,” in *Handheld and Ubiquitous Computing*, 2000, pp. 172–186.

[7] S. Vurgun, M. Philipose, and M. Pavel, “A Statistical Reasoning System for Medication Prompting,” in *UbiComp 2007: Ubiquitous Computing*, 2007, pp. 1–18.

[8] D. Zhang, M. Hariz, and M. Mokhtari, “Assisting Elders with Mild Dementia Staying at Home,” in *2008 Sixth Annual IEEE International Conference on Pervasive Computing and Communications (PerCom)*, 2008, pp. 692–697.

[9] S. Zhou, C.-H. Chu, Z. Yu, and J. Kim, “A context-aware reminder system for elders based on fuzzy linguistic approach,” *Expert Syst. Appl.*, vol. 39, no. 10, pp. 9411–9419, Aug. 2012.

[10] P. Giorgini, J. Mylopoulos, E. Nicchiarelli, and R. Sebastiani, “Reasoning with Goal Models,” in *Conceptual Modeling — ER 2002*, 2002, pp. 167–181.

[11] L. S. Shafti, P. A. Haya, M. García-Herranz, and X. Alamán, “Personal Ambient Intelligent Reminder for People with Cognitive Disabilities,” in *Ambient Assisted Living and Home Care*, 2012, pp. 383–390.

[12] A. Hristova, A. M. Bernardos, and J. R. Casar, “Context-aware services for ambient assisted living: A case-study,” in *2008 First International Symposium on Applied Sciences on Biomedical and Communication Technologies*, 2008, pp. 1–5.

[13] A. M. Bernardos, P. Tarrío, and J. R. Casar, “CASanDRA: A Framework to Provide Context Acquisition Services ANd Reasoning Algorithms for Ambient Intelligence Applications,” in *2009 International Conference on Parallel and Distributed Computing, Applications and Technologies*, 2009, pp. 372–377.