AN OPEN AGENT-BASED HOME AUTOMATION SYSTEM

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The need to improve dwelling performance with the aid of home automation systems is growing in our aging society. The older cohort requests housing that enhances their vitality and conserves their independence. Suitable systems of sensors, monitors and follow-up services may assist daily activities and handle emergencies. Unfortunately most systems currently on the market are expensive, not open, and not as flexible as desired. The solution could be found in agents [1] that are autonomous and communicate over a computer network [2] when performing their specific task, such as managing the lighting in the home, or reacting on a fire calamity [3].
In this study we will view the home automation set-up as an open multi-agent system, and test both its technical feasibility and performance.

METHODS

A simple virtual home automation system is designed and built. In order to keep the system both flexible and open, it is allowed to have several agents with the same task. The system can deal with the inevitable task conflicts. Java is taken as the implementation platform and JADE as the framework for the agents of the system.
For test purposes a simulation environment is built in Java on a desk-top PC, consisting of a virtual dwelling built of node points. Occupants can move from one point to another based on an agenda that is randomly generated from a set of user activities with a curtain ratio.
The following tests have been performed: reliability (error sensibility, error handling, and number of errors), latency (delay times in relation to required speed in actual life), and simplicity (logical structure, ease of adding new agents and of debugging). Subsequently simulation results with and without home automation were compared.

RESULTS AND DISCUSSION

To increase flexibility, reliability and eventually reducing costs, each component in the designed system has its own agent or agents. Simulations showed robust agents that functioned with little errors. When errors were installed consciously in one agent, other agents continued to perform, but the performance of the system as a whole reduced dramatically. No large delays were found. This could be caused by the fact that communications of agents was simulated locally on the desktop. Logical structure and suitable simplicity allowed for the easy addition of new agents. Dwelling performance remained satisfactory. The system as a whole did not fail.

CONCLUSION

Technical feasibility and performance of a newly designed, open, agent-based home automation system proved satisfactory. It contained lighting management, access control and both an intelligent intercom system and telephone switch board, but could easily be expanded with other functionalities. Implementing such a system could make feasible the mass introduction of systems to assist daily activities and handle emergencies in dwellings for older adults.

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