

# CARING PLANT: Delivering Intelligent Elderly Care Using Ambient Objects

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## Introduction

The population is aging. As these people become older, many subtle and gradual changes, both physical and cognitive, begin to take place. Today, the assessment and the detection of these changes are done through episodic, out-of-context clinic visits. As medical professionals know, when taken out of their familiar surroundings, an elderly individual may behave quite differently, describing symptoms differently than they normally would when they were at home experiencing them. Additional stress related to a medical exam and a trip to the hospital can also distort the result and lead to less reliable evaluations. With the emergence of ubiquitous sensors, advances in always-on wireless networks, and the availability of miniaturized embedded and wearable devices, continuous health monitoring at home becomes increasingly possible. Besides serving as an emergency tool, this capability allows the observation of the elderly behavior over long periods of time. It reveals subtle trends, personal habits and unusual events, and thus offers much more accurate insights into the individual's health and well-being.

## CARING PLANT: the Concept

The purpose of the CARING PLANT is to engender familiar everyday objects (a house plant, in this case) with ELIZA-like behavior by embedding technologies that will help support and enable better elderly living. Specifically, we integrate a number of sensors that allow the plant to sense the state of its immediate environment, for example, the amount of light, humidity, and temperature in the room. More importantly, the plant is also equipped a speaker, a microphone, and a speech recognition engine which, together, enables the plant to listen as the person in the room talks to himself or someone else—picking up keywords, phrases, or even subtle groans or sighs. The plant tracks recurring ailments and prompts the elderly person by asking questions like, “How is your back feeling today?” While the plant does not understand what “backache” really means, it maintains a list of names for commonly occurred health problems among the elderly. When such a name is mentioned and recognized, it timestamps and remembers it. Sometime later, it may bring up the topic in a new conversation, as shown in the example. By doing so, the plant can create a sense of “trust” and “caring” in the eyes of the elderly person, and thus elicit the individual to talk more about how they feel. For professional health providers as well as family members, the CARING PLANT can provide unobtrusive on-site, round-the-clock monitoring, serving as the eyes—and ears—of caregivers.

## An Example Scenario

An elderly woman walks by a Caring Plant in her house, triggering the plant's motion sensor. As it detects the woman's presence, the plant initiates a conversation. The conversation can fall into one or more of the following categories:

- **Plant asks for care services.** The plant's sensors provide information about humidity, temperature and light. Therefore, the plant can prompt the woman for care, such as watering, adjusting temperature in the house or moving it closer to the window. The woman can benefit from this sense of responsibility.
- **Plant replays stories.** Using natural language and speech technologies, the plant can replay pre-recorded stories about the woman's family, life events from her past or even about the plant itself. Stories are triggered by sensory events, such as high temperature or low activity. These conversations can provide companionship and entertainment for the woman.
- **Plant interacts with person.** The plant can carry out a simple conversation with the woman, designed to elicit statements reflecting her needs and the state of her health. For example, the plant may inquire about back pain that has been mentioned in a previous conversation. These conversations can help care providers by detecting trends in the woman's health.

Through these interactions, the CARING PLANT will collect data and generate reports for care providers, both professional and family members, about the woman's mental and physical condition.

## About the Author

Dadong Wan is a senior researcher and the lead for the Intelligent Healthcare research initiative at Accenture Technology Labs – the R&D group of Accenture, which is fully dedicated to creating innovative applications of technologies 3-5 years into the future. For the past nine years, he has been investigating how emerging technologies, such as ubiquitous computing, can be applied to help create new consumer experiences and business opportunities, especially in healthcare. Dadong is the original inventor of the Magic Medicine Cabinet -- a popular prototype that integrates biometrics, RFID, and health monitoring devices to provide consumers with compliance support, vital monitoring, and personalized health information. He is also the co-organizer of UbiHealth2003 – the 2<sup>nd</sup> International Workshop on Ubiquitous Computing for Pervasive Healthcare Applications, and the co-editor of the upcoming book “Pervasive Computing in Healthcare.” Dr. Wan has presented his research in various academic conferences. His work is widely covered by the media, including Wall Street Journal, Financial Times, Business Week, BBC, CNN, ABC News, and TechTV.