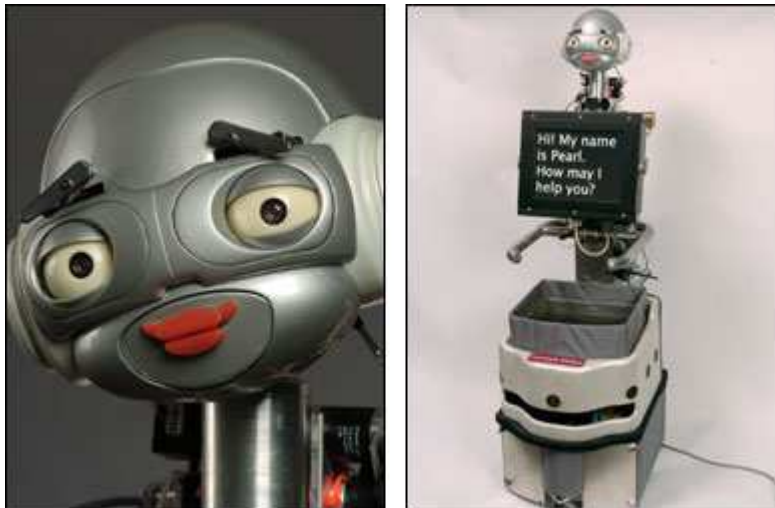


Welcome to Pearl

Pearl is a robot developed by a team of researchers from the universities of Michigan and Pittsburgh, and the Carnegie Mellon University in Pittsburgh. The goal of this robot is be a care giver for the elderly. She has a computer-generated female voice and a touch-screen to communicate reminders and advice. The walker is equipped with sonar detectors, a laser range finder and mapping software to figure out where it's going, even if the person gripping it doesn't know. At her most fundamental, she's already able to guide herself through an area at a pace of up to 50 centimeters a second -- a slow walk, for humans -- while avoiding objects in her path. When her hardware and software are working well, Pearl can verbalize scripted reminders to people, such as it's time to take their medicine. [1] "She tries to figure out if the person has done what she's supposed to do and, if not, remind her to do it," Prof Pollack said. "Another thing she can do is provide navigational guidance. When people are a little bit disorientated and they know they need to go to the cafeteria, but they can't remember how to get to there, she can guide them." [2]



On the software side, Pearl features off-the-shelf autonomous mobile robot navigation systems, speech recognition and speech synthesis software, fast image capture and compression software for online video streaming, and face detection and tracking software.[3] Looking at Brook's robots, one of them has face detection and tracking software and most of his robots are mobile but they only do "explore" tasks based on a whim (or at least a programmed whim). Pearl has a goal and has representation of activities, client preferences, and keeps track of time. The components that allow Pearl to accomplish its care giving goals detailed below.

One component is the Autore minder, that reminds the patient to do required activities. Autominder has three main components: a Plan Manager (PM), which stores the client's plan of daily activities, and is responsible for updating it and identifying any potential conflicts in it; a Client Modeler (CM), which uses information about the client's observable activities to track the execution of the plan; and a Personal Cognitive Orthotic (PCO), which reasons about any disparities between what the client is supposed to do and what she is doing, and makes decisions about when to issue reminders. [3] The caregiver enters the client's daily activities and any constraints or preferences. The client or caregiver can add, modify, or delete activities, the client can execute an activity, or time may cause changes made

to the plan. Sensor information is gathered and sent to the CM where it tries to infer what activities the client is performing. If there is a likelihood that an activity is being executed, the CM updates the PM. So, if the person eats dinner and needs to take medicine no less than two hours after eating, the time for taking that medicine is determined and updated. The PCO creates an initial reminder plan and does a local-search to generate alternate candidates of reminding plans. The system can delete reminders for activities with low importance that are seldom forgotten by the client.



Pearl also helps elderly people navigate their environment. The activities requiring navigation include regular daily events such as meals, appointments, social events, and simply walking for exercise. For walking, Pearl estimates the robot path (similar to the Monte Carlo localization algorithm) and represents people similarly and associates measurement and people using maximum likelihood. The robot's laser range system measures obstacles 18cm above ground. This means its hard to detect people sitting, so to that end the robot tries to avoids densely populated areas. There are slight modifications to the logic for dining areas, which would have increased risk of running into people.

Pearl could use some improvements. Adaptive velocity is area that they are working on. Initial experiments with fixed velocity led almost always to frustration on the people's side, in that the robot was either too slow or too fast. [They] plan to use estimates of a person's walking speed, to adapt the velocity of the robot, and thereby maintain roughly a constant distance to the person. [3] Pearl can't detect people sitting down. The system could be improved with an additional laser or camera to identify obstacles such as people sitting or objects on the ground (similar to what Stanley does).

References:

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[3] Pollack, Brown, Colbry, Orosz, Peintner, Ramakrishman, Engberg, Matthews, Dunbar-Jacob, McCarthy, Thrun, Montemerlo, Pineau, and Roy. AAI Technical Report. 2002. Pearl: A Mobile Robotic Assistant for the Elderly. <http://www.aai.org/Papers/Workshops/2002/WS-02-02/WS02-02-013.pdf>