

Computer avatars play a part in dementia detection

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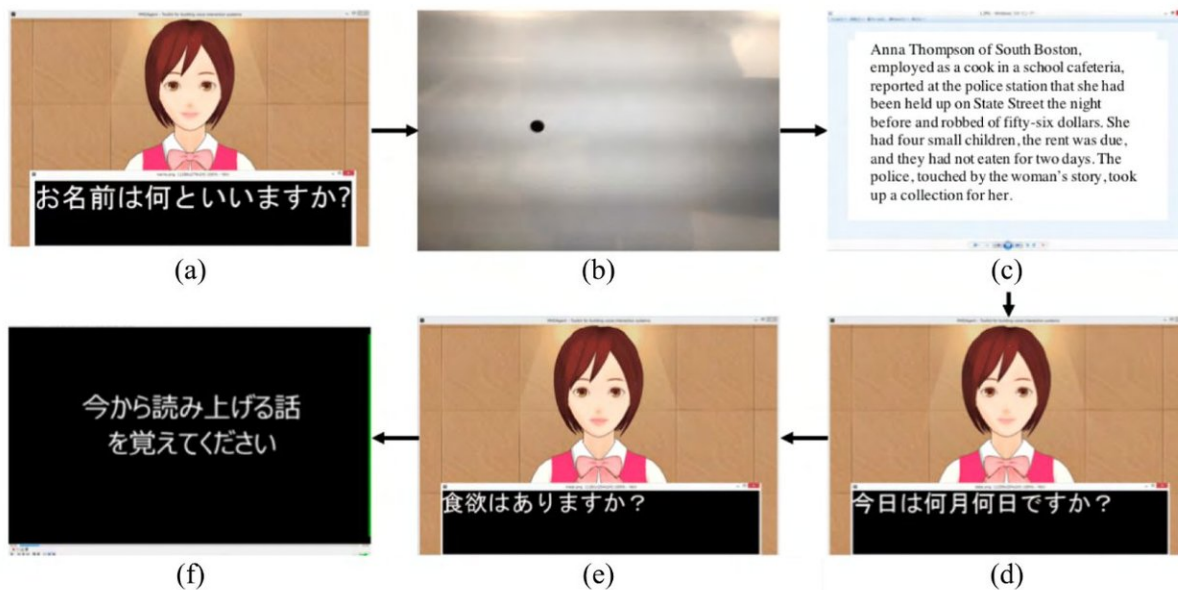


Figure 1. Human-Avatar Dialogue System. Figure 1. Human-Avatar Dialogue System: (a)Introduction “What’s your name?”(b) Gaze measurement(c) Reading test(d) Fixed question “What’s the date today?”(e) Random question “How is your appetite?”(f) Story recall test “Please memorize the story I’m going to read.” Credit: Osaka University

Diagnosis of dementia is made via cognitive function tests such as the Mini-Mental State Examination (MMSE) and medical imaging systems at hospitals, a fairly large system for the purpose. As the population ages,

an increasing number of people are developing dementia. Thus, easy-to-use dementia detection tests are sought after. In previous studies, diagnoses were made mainly using neuropsychological questions, so habituation to the same questions lowered performance in detecting dementia.

A joint group of researchers from Osaka University and Nara Institute of Science and Technology demonstrated that it was possible to detect [dementia](#) from conversations in human-agent interaction. This technique has been realized through machine-learning: a machine learns characteristics of sounds of elderly people who answered easy questions from avatars on a [computer](#).

The researchers proposed machine learning algorithms for detecting signs of dementia in its early stages, developing a dementia detection system using interactive computer avatars. They created a model for machine learning based on features of speech, language, and faces from recorded dialogues with elderly participants. Through [machine learning](#), a computer came to be able to distinguish individuals with dementia from healthy controls at a rate of 90 percent in 6 questions (2-3 minutes per question).

The team prepared fixed questions based on [neuropsychological tests](#) and random questions not based on specific tests, recording interactive data of spoken dialogues with avatars from 12 participants (individuals diagnosed with dementia by a psychiatrist according to the diagnosis criteria Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV) and 12 healthy controls. They extracted speech, language, and image features from the recorded data, creating a model for detecting dementia and enabling a computer to learn for itself to detect dementia.

As a result, the computer was able to distinguish between healthy

controls and individuals with dementia with an accuracy of 92%. It was found that dementia could be distinguished with high accuracy by combining features of dementia, such as delay in response to questions from avatars depending on the content of questions, intonation, articulation rate of the voice, and the percentage of nouns and verbs in utterance.

Senior author Takashi Kudo says, "If this technology is further developed, it will become possible to know whether or not an elderly individual is in the early stages of dementia through conversation with computer avatars at home on a daily basis. It will encourage them to seek medical help, leading to early diagnosis."

More information: Hiroki Tanaka et al. Detecting Dementia Through Interactive Computer Avatars, *IEEE Journal of Translational Engineering in Health and Medicine* (2017). [DOI: 10.1109/JTEHM.2017.2752152](https://doi.org/10.1109/JTEHM.2017.2752152)

Provided by Osaka University

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