

論 文 内 容 の 要 旨

博士論文題目

Adaptive Cognitive Behavior Therapy with a Virtual Agent Considering User's Psychological Distress

ユーザの心理的ストレスを考慮した仮想エージェントによる適応的な認知行動療法

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(論文内容の要旨)

Mental health issues cause large-scale social losses. To address the issues, various products and systems have been developed to support mental healthcare in daily life. One of them is a virtual agent, an interface embodied with CG animation, that provides counseling based on cognitive behavioral therapy (CBT). CBT is an established form of psychotherapy that alleviates psychological distress. In CBT, a therapist guides a user to identify and correct biased thinking that causes psychological distress. Previous research has proposed virtual agents that provide CBT and have shown distress reduction with long-term use. On the other hand, these studies have primarily utilized response selection based on multiple-choice inputs, resulting in a limited capacity for

choosing responses tailored to the user's psychological state. In particular, there has been no research on whether users understand the responses in CBT sufficiently to reduce distress. This study aims to enhance virtual agents' performance in selecting responses during CBT to reduce users' distress effectively. Therefore, this study identifies two research questions: (1) What factors significantly influence the user's psychological state in CBT with a virtual agent?; (2) How can virtual agents adapt to the user's psychological state? To address the first research question, an analysis of interactions with fixed questions showed that the number of questions for correcting thoughts alleviates users' distress. Based on the results and the methodology of CBT, we proposed selecting the number of questions based on real-time detection of psychological distress. To address the second research question, we conducted a comparative experiment between a condition in which the number of questions was adaptively selected based on psychological distress detection and a condition in which the number of questions was selected randomly. The results showed that distress after the experiment was significantly lower in the adapted number condition than in the random number condition. These results indicate the benefits of virtual agents adapting to the user's psychological state.

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(論文審査結果の要旨)

This thesis proposed systems to support mental healthcare by virtual agents embodying computer graphic animation for counseling based on cognitive behavioral therapy (CBT). While previous research has shown distress reduction with virtual agents providing CBT, they often lack tailored response selection. This research aims to improve virtual agents' response selection during CBT to effectively reduce user distress by addressing research questions: factors influencing users' psychological state in CBT with virtual agents and methods for virtual agents to adapt to users' psychological state. Analysis revealed that the number of questions for correcting thoughts alleviates users' distress, leading to the proposal of a real-time selection of questions based on distress detection. A comparative experiment showed significantly lower distress when questions were adaptively selected based on distress detection.

His main contribution is to construct a new system that performs CBT by a virtual agent and analyze the effects influencing users' mood improvement. He newly proposed a depressive tendency estimation model, which was integrated into the CBT system for an adaptive response selection. The candidate successfully assessed the system's effectiveness by comparative study with sufficient participants, including high depressive populations.

A series of his research resulted in two high-quality peer-reviewed international journal papers and two peer-reviewed international conference papers. As a result, the thesis is sufficiently qualified as a doctoral thesis in engineering.