History of Artificial Intelligence

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INTRODUCTION

George Boole was the first to describe a formal language for logic reasoning in 1847. The next milestone in artificial intelligence history was in 1936, when Alan M. Turing described the Turing-machine. Warren McCulloch and Walter Pitts created the model of artificial neurons in 1943, and it was in 1944 when J. Neumann and O. Morgenstern determined the theory of decision, which provided a complete and formal frame for specifying the preferences of agents. In 1949 Donald Hebb presented a value changing rule for the connections of the artificial neurons that provide the chance of learning, and Marvin Minsky and Dean Edmonds created the first neural computer in 1951.

Artificial intelligence (AI) was born in the summer of 1956, when John McCarthy first defined the term. It was the first time the subject caught the attention of researchers, and it was discussed at a conference at Dartmouth. The next year, the first general problem solver was tested, and one year later, McCarty—regarded as the father of AI—announced the LISP language for creating AI software. Lisp, which stands for list processing, is still used regularly today.

Herbert Simon in 1965 stated: “Machines will be capable, within twenty years, of doing any work a man can do.” However, years later scientists realized that creating an algorithm that can do anything a human can do is nearly impossible. Nowadays, AI has a new meaning: creating intelligent agents to help us do our work faster and easier (Russel & Norvig, 2005; McDaniel, 1994; Shirai & Tsujii, 1982; Mitchell, 1996; Schreiber, 1999).

Perceptrons was a demonstration of the limits of simple neural networks published by Marvin Minsky and Seymour Papert in 1968. In 1970, the first International Joint Conference on Artificial Intelligence was held in Washington, DC.

PROLOG, a new language for generating AI systems, was created by Alain Colmerauer in 1972. In 1983, Johnson Laird, Paul Rosenbloom, and Allen Newell completed CMU dissertations on SOAR.

BACKGROUND

In 1950 Alan Turing suggested a definition for deciding whether software is intelligent or not. In his theory the software’s intelligent behavior can be measured like a human intellectual efficiency. The software is intelligent when a human being does not know if he or she is chatting with the software or with another human. That test was called the Turing test, and here is how it works: if the software passes the test, it is called intelligent software—also called intelligent agent—which percepts the environment with sensors and acting with effectors.

The term *embodied conversational agent* (ECA) (Cassel, 2007; Huget, 2003; Cassel, Sullivan, Prevost, & Churchill, 2000) is used for special software or hardware as an extension of an intelligent agent, not just because these are able to communicate with the user via natural language, but also for their emotion system (Benkő & Sik Lányi, 2007). There are many emotional models (Ruebenstrunk, 1998) for creating an embodied conversational agent, including:

- Theory of Ortony, Clore and Collins;
- Theory of Roseman;
- Theory of Scherer;
- Theory of Frijda; and
- Theory of Oatley and Johnson-Laird.

Virtual reality (VR) can be used for designing and testing an ECA because the developing process can be easier and cheaper with VR technology (Ortiz, Oyarzun, Carretero, & Nestor, 2006; Takacs & Kiss, 2003). An avatar is a spatial creature that usually symbolizes or simulates a human being in exterior and in behavior also. The next article describes the VTR, the modeled emotions, and the avatars that were created for a virtual therapy room.

INTELLIGENT AGENTS WITH EMOTIONS

The term *embodied conversational agent* (Cassel et al., 2000) stands for intelligent software with an emotion system that simulates human emotions. Churchill, Cook, Hodgson, Prevost, and Sullivan (2000) described the method of designing ECA using scenarios and storyboards. The levels of description and the embodied agent issues were determined as personality, appearance, communication, and domain expertise. The dimensions of agent embodiment were also described by them.

The method of the communication via conversational dialogs and the aspects of human-computer interaction were discussed by Ball and Breese (2000). Computational models of emotions and the problem of recognizing human emotions were also discussed.

In an ambient intelligent environment, it is important for the user to have a good human-centric computer interface. It is possible to design a more natural interface using the techniques of natural language processing during the development. With such an interface the user is able to communicate with the intelligent environment via natural language. A virtual therapy room (Benkő & Sik Lányi, 2007) was created for aphasic patients. With the VTR the therapist can furnish the room, and the patient can practice at home also. During the therapy, patients can learn to express their emotions in a good way. Therapy is represented by special exercises created for practicing communication. Avatars in a virtual therapy room with the methods of artificial intelligence can answer the user's questions. Emotions can also be expressed by the avatars. The emotion system of an avatar was described as a deterministic finite automaton, and it uses the emotion model of Oatley.

An avatar is the virtual therapist or the virtual patient in the exercise. Usually, there are several virtual patients and only one therapist. They are sitting behind the table. The arrangement can be altered, but it is essential for the patient to think that the user interface is convenient and appropriate to solve exercises. Exercises are appearing on the virtual blackboard. Patients are capable of doing exercises like in a real therapy room.

Oatley assumed a hierarchy of parallel working processing instances, which work on asynchronously different tasks. A central control system—also called an operating system—manages the instances. The control system has a model from the entire system. Two kinds of communication—symbolical and emotional—exist between the modules. The name "Communicative Theory of Emotions" was chosen because it is the task of emotions to convey certain information to all modules of the overall system.

Introverted or extroverted personalities can be created with a push-down automaton-controlled emotion system. The methods of artificial intelligence can be used for creating more intelligent ECAs. The therapist decides the avatars' exterior and interior characteristics based on the type of the therapy and the abilities of the aphasic patients. Generating the ECA's knowledge base is also important in order to make progression in therapy and develop the communication abilities of the patients. VTR can also be used for language teaching because the exercises can be modified by the therapist. Integrating a text-to-speech engine and sound recognition engine provides user friendliness. The emotion model can be improved also.

El-Nasr, Ioerger, and Yen (2000) presented a fuzzy logic adaptive model of emotions. A new computational model of emotions was proposed that can be incorporated into intelligent agents and other complex, interactive software. It uses a fuzzy logic representation to map events and observations to emotional states. The model includes several inductive learning algorithms for learning patterns of events, associations among objects, and expectations. The adaptive components of the model are crucial to users' assessments of the believability of the agent's interactions.

FUTURE TRENDS

Dr. Rodney Brooks, the director of MIT's artificial intelligence laboratory, says that right now, AI is about at the same place as the PC industry was in 1978. Within 30 years, we will have an understanding of how the human brain works that will give us "templates of intelligence" for developing strong AI, and by 2050, our lives will be populated with all kinds of intelligent robots.

"Referring to Spielberg's movie AI in which a company creates a robot that bonds emotionally like a child, Dr. Brooks says: 'A scientist doesn't wake up one day and decide to make a robot with emotions.' Despite the rapid advance of technology, the advent of strong AI will be a gradual process, they say. 'The road from here to there is through thousands of these benign steps,' Mr. Ray Kurzweil says." (BBC News, 2001)

CONCLUSION

Because of the combinatorial explosion, there is no algorithm that can solve all types of problems. Every agent has its own knowledge base, each fit for only a specific field of science. In the early 1980s these types of software were called expert systems because they have special knowledge based on human experiences. Nowadays, expert systems are used in hospitals to help the doctor diagnose a disease or in geology to identify materials. There are many types of expert systems, and they can give very good advice to humans. In the future, expert systems are going to be necessary in our everyday life as well.

However, in addition to expert systems, another form of artificial intelligence aims to understand the operation of how a human brain functions and simulate its emotions. There are several emotion models already in place that can nearly

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