Chapter 2

Artificial Intelligence in Medical Science

ABSTRACT

Applying Artificial Intelligence (AI) for increasing the reliability of medical decision making has been studied for some years, and many researchers have studied in this area. In this chapter, AI is defined and the reason of its importance in medical diagnosis is explained. Various applications of AI in medical diagnosis such as signal processing and image processing are provided. Expert system is defined and it is mentioned that the basic components of an expert system are a "knowledge base" or KB and an "inference engine". The information in the KB is obtained by interviewing people who are experts in the area in question.

1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

The idea of designing an intelligent computer caused that new field of research be started for researchers. They tried to make an artificial brain using computers. In other words, Artificial Intelligence (AI) is a science that tries to make computers more intelligent. It is true to think that AI is an area of study to emulate human intelligence into computer technology.

The first man who worked in the AI area was Alan Mathison Turing. In 1950, Turing introduced the test for computer intelligence that is now known simply as the Turing test. This test composed of three main participants: the computer, a human interrogator, and a human "foil". Two participants ask questions and the interroga-

tor, which is a computer, plays like a human. A keyboard and a screen are used for all communication. In Turing test, questions are asked by the interrogator that are wide-ranging as he or she likes, and computer will give any response to cause wrong identification. For example the computer might answer "No" in response to "Are you a computer?" or might have long pause. The interrogator uses help of the foil to make a true decision about the identification. The role of the interrogator is played by a number of different people. The computer in intelligent if sufficiently many interrogators are unable to distinguish the computer from the human being (Luger, 2002).

Two important goals in AI science are as following: first is to produce an intelligent system that is more intelligent than human being at dealing with the real world problems. Second goal is to produce small simple programs more or less as good as human being in small tasks that require intelligence. Too many AI researchers simply doing these tasks that in human beings require intelligence that is AI. Some of the applications of AI are listed as below (Luger, 2002):

- In computer vision, the systems are capable of face recognition.
- In Robotics, we have been able to make vehicles that are mostly autonomous.
- In natural language processing, we have systems that are capable of simple machine translation.
- Today's expert systems can carry out medical diagnosis in a narrow domain.
- Speech understanding systems are capable of recognizing several thousand words continuous speech.
- Planning and scheduling systems had been employed in scheduling experiments with the Hubble Telescope.
- The Learning systems are capable of doing text categorization into about a 1000 topics.
- In Games, AI systems can play at the Grand Master level in chess (world champion), checkers, etc.

A medical AI system must have the ability to reason with medical knowledge. It has a different role in scientific researches. An intelligent system has the ability to learn and be trained by the expert or even create new medical knowledge. For example, a computer system can be used to analyze large amounts of data, looking for complex patterns within it that suggest previously unexpected associations. Equally, an AI system has the ability to classify the medical symptoms based on various types of disease.

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