

1. Introduction

Even before the developments of the earliest digital computers in the 1940s, mathematicians and logicians had started their theoretical works to formulate the limitation of digital computers in terms of the problems that could be solved (Cutland, 1980). This area of theoretical study is normally called computability by modern scientists. Since modern computers are capable of carrying out some computations significantly faster than human brains, one question that many people may ask is whether computers can be equipped with all the intelligent capabilities that we human beings have. This is a philosophical question that has emerged since the beginning of the artificial intelligence research in the 1950s (Russell & Norvig, 2009), which aims to mimic the intelligent capabilities of human beings on computers.

Some scientists and philosophers advocate the so-called strong AI (Artificial Intelligence) viewpoint (Russell & Norvig, 2009). They believe that we eventually can design a computer equipped with all kinds of intelligent capabilities that human beings possess. Should the advocators of strong AI really succeed in implementing their dream computers, then materialists would claim that minds, consciousnesses, and spirits are just derivatives of material effects and operations. However, there have been scientists who oppose the strong AI arguments since 1950s. In 1959, British philosopher John Lucas presented an article entitled “Minds, Machines and Gödel” to Oxford Philosophical Society, which was then published in *Philosophy*, XXXVI, 1961 (Lucas, 1961). In this article, Lucas (1961) appealed to *Gödel’s incompleteness theorem* and argued that for any algorithmic automaton, there would be some mathematical formula which it could not prove, but which the human mathematician could both see and show to be true. Lucas’s work was followed by his colleague Prof. Roger Penrose of Oxford University. In his book entitled “The Emperor’s New Mind: Concerning Computers, Minds and The Laws of Physics” (Penrose, 1989) and his follow-up book entitled “Shadows of the Mind: A Search for the Missing Science

of Consciousness” (Penrose, 1994), Penrose argued that human consciousnesses are non-algorithmic and therefore cannot be emulated by today’s computers.

Lucas’ and Penrose’s works illustrate that modern computers cannot mimic all kinds of intelligent capabilities that human beings possess. However, there are other types of computers proposed. For example, Professor Richard Feynman of California Institute of Technology proposed the quantum computer in 1982 (Feynman, 1982) and Professor Leonard Adleman of the University of Southern California proposed the DNA computer in 1994 (Adleman, 1994). One may wonder whether these alternative types of computers may be more powerful than today’s computers in terms of computability. In this respect, an investigation on the power of the DNA computer is of particular interest, since the design of the DNA computer has aimed to exploit and/or mimic the operations of DNA molecules to carry out the desired computing. Accordingly, our understanding about the power of the DNA computer can provide us with some clues for accepting or rejecting the viewpoint of strong AI. In this respect, recent studies on computability of the DNA computer show that the DNA computer has the same power as today’s computers (Amos, 2005). Combining this result and the works by Lucas and Penrose, we can conclude that some human beings’ intelligent capabilities cannot be realized by the material effects that have been found occurring in our brains. Logically, this conclusion indicates that some natural effects other than those that have been identified by scientists to be existent in our brains must play important roles in formation of our minds, consciousnesses, and spirits. Regardless of the nature of these effects, it is of scientific interest to study what these effects are and how they operate.

To begin our journey toward obtaining a comprehensive picture about how our minds, consciousnesses, and spirits take shape, we should open our minds and take an unbiased stand in all kinds of possibilities. It is true that the studies of material sciences, including physics and chemistry, have yielded a tremendous amount of knowledge. However, the book entitled “Thinking Beyond the Brain” (Lorimer, 2001), presented number of “supernatural” cases that had successfully passed rigorous scientific verification (Lorimer, 2001). For