Chapter II

Review of Related Literature and Studies

The part of this study will discuss the related literatures and studies. The related literatures and studies intend to give insights and better understanding of the study. This will somehow vary the project with the other existing studies and eventually help the proponents broaden their knowledge regarding the study.

2.1 Review of Related Literature

To further appreciate the significance of this study and eventually give the proponents full determination in completing the study, the proponents quoted some of the present articles that they believed to cover the topics related to the proposed study.

“Should we try to make artificial intelligence by duplicating how humans do it, or instead try to exploit the particular strengths of machines? Humans are slow but exquisitely good at pattern recognition and strategy; computers, on the other hand, are extremely fast and have superb memories but are annoyingly poor at pattern recognition and complex strategy. Kasparov can make roughly two moves per second; Deep Blue has special-purpose hardware that enables it to calculate nearly a quarter of a billion chess positions per second.

Here is an illustration of the difference, taken from chess: Controlled psychological experiments have shown that human chess masters are far more accurate than non-chess players at remembering chess board positions taken from real games, where the placement of pieces arose in strategic play and represented meaningful tactical positions. However, these masters were no better than non-chess players at memorizing random arrangements of pieces. Chess masters remember positions based on certain patterns, alignments and structure whereas, of course, computers have no difficulty remembering – storing – all the games or random arrangements ever made and need no "meaning" in the placements.

There are other differences too, of course. Humans have emotions --- they have pride at winning, shame at a bad loss, satisfaction when extracting revenge; not so computers (well, not yet). Computers don't get tired, and don't have "bad" days – at least so long as the hardware doesn't break down!", (Stork, 1997). Some of the differences between humans and computers in playing chess, stated earlier, clearly show that the proposed study would be significant in the sense that computers have some attributes not present on humans, which are considerable. Though, of course, humans also have attributes not present to computers.

“We present a novel methodology for building human-like artificially intelligent systems. We take as a model the only existing systems which are universally accepted as intelligent: humans. We emphasize building intelligent systems which are not masters of a single domain, but, like humans, are adept at performing a variety of complex tasks in the real world. Using evidence from cognitive science and neuroscience, we suggest four alternative essences of intelligence to those held by classical AI. These are the parallel themes of development, social interaction, embodiment, and integration. Following a methodology based on these themes, we have built a physical humanoid robot. In this paper we present our methodology and the insights it affords for facilitating learning, simplifying the computation underlying rich behavior, and building systems that can scale to more complex tasks in more challenging environments" (Brooks, Ferrell, Irie, Cckemp, Maddog, Scaz, Matt). The proponents quoted this article since artificial intelligence is implemented on human-like systems, which are not designed only for a specific purpose but such of that with humans. It is somehow relevant to the proposed study since it aims to imitate humans, only in playing chess though, but in a more humanly-approach.

The published book, "Artificial Life and Real Robots" by Rodney A. Brooks at MIT Artificial Intelligence Laboratory explores the general issues in using Artificial Life techniques to program actual mobile robots. In particular it explores the difficulties inherent in transferring programs evolved in a simulated environment to run on an actual robot. It examines the dual evolution of organism morphology and nervous systems in biology. It proposes techniques to capture some of the search space pruning that dual evolution offers in the domain of robot programming. It explores the relationship between robot morphology and program structure, and techniques for capturing regularities across this mapping.

2.2 Review of Related Studies

As for related studies, several studies related to the proposed study has been reviewed by the proponents and found them quite essential for the betterment of the present study. The following studies will definitely generate new ideas for the part of the proponents as well as for the future studies related to the said previous studies.

“Deep Blue is an IBM supercomputer that uses scalable parallel processing to solve complex problems. Deep Blue uses 256 processors working together to calculate between 50 and 100 billion chess moves in less than three minutes. Real world applications of computers like Deep Blue include forecasting the weather, drug and genetics research, designing clean-up plans for toxic waste, and powering web servers on the Internet.

Deep Blue is at heart a massively parallel, RS/6000 SP-based computer system that was designed to play chess at the grandmaster level. But the underlying RS/6000 technology is being used to tackle complex "real world" problems like:

- Cleaning up toxic waste sites
- Forecasting the weather

- Modeling financial data
- Designing cars
- Developing innovative drug therapies

In 1996 International Business Machines Corporation (IBM) challenged Garry Kasparov, the reigning world chess champion, to a chess match with supercomputer Deep Blue. Kasparov won the match with three wins, two draws, and one loss. In a 1997 rematch Deep Blue defeated Kasparov, becoming the first computer to win a match against a reigning world chess champion with regulation time controls. Many experts predict these types of parallel processing machines will soon surpass human chess playing ability, and some speculate that massive calculating power will one day replace intelligence. Deep Blue serves as a prototype for future computers that will be required to solve complex problems. At issue, however, is whether a computer can be developed with the ability to learn to solve problems on its own, rather than one programmed to solve a specific set of tasks", (IBM Research, 1997). Even Deep Blue can play chess with humans, still, Deep Blue can't move real chess pieces. The proposed study aims to solve this problem.

"The Chess Playing Robot (CPR) is the result of research and development at Ukrainian State Maritime University (USMTU), Nikolaev, Ukraine. The idea was quite old. It was originated in 1993 by Victor Timoshenko, candidate of science, assistant professor, Department of Hydromechanics of

USMTU. But only in the year 2000 V. Buldyzhov and K. Brezhnev implemented the Chess Robot as their diploma work.

The Robot is a manipulator controlled by a usual PC and control system. Kirill Brezhnev designed the manipulator, composed its mechanical and electrical parts. Vladimir Buldyzhov designed and accomplished the electronic part, performed software maintenance and debugged the robotics complex.

The control software runs under any version of MS-DOS, Windows and Windows NT. It is able to play chess even without real manipulator, using robot emulation mode", (Manevich and Tkachuk, 2000). CPR is somewhat similar to the proposed study but it differs on some matters: CPR uses hydraulics that requires a lot more space and time; CPR can't detect the chess pieces moved by human unless moved in the computer; since, CPR is DOS-based; CPR is not user-friendly.

"Four laboratories in the School of Science & Engineering of Waseda University joined to set up "The Bio-engineering group" which started the WABOT project in 1970. The WABOT-1 was the first fun-scale anthropomorphic robot developed in the world. It consisted of a limb-control system, a vision system and a conversation system. The WABOT-1 was able to communicate-with a person in Japanese and to measure distances and directions to the objects using external receptors, artificial ears and eyes, and an artificial mouth. The WABOT-1 walked with his lower limbs and was able to grip and transport objects with hands that used tactile-sensors. It was estimated that the WABOT-1 has the mental faculty of a one-and-half-year-old child. WABOT-1 consisted of the WAM-4 (as its artificial hands) and the WL-5 (Its artificial legs).

In 1980, our laboratories joined in a joint project again and commenced the WABOT-2 project. Playing a keyboard instrument was set up as an intelligent task that the WABOT-2 aimed to accomplish, since an artistic activity such as playing a keyboard instrument would require human-like intelligence and dexterity. Therefore the WABOT-2 was defined as a "specialist robot" rather than a versatile robot like the WABOT-1.

The robot musician WABOT-2 can converse with a person, read a normal musical score with is eye and play tunes of average difficulty on an electronic organ. The WABOT-2 is also able of accompanying a person while he listens to the person singing. The WABOT-2 was the first milestone in developing a "personal robot"” (Humanoid Robotics Institute, 2000-2004). This also actually shows how robots can imitate humans with great accuracy, in this case, in playing piano.

“In 1986, Honda engineers set out to create a walking robot. Early models (E1, E2, E3) focused on developing legs that could simulate the walk of a human. The next series of models (E4, E5, E6) were focused on walk stabilization and stair climbing. Next, a head, body and arms were added to the robot to improve balance and add functionality. Honda’s first humanoid robot, P1 was rather rugged at 6’ 2” tall, and 386 lbs. P2 improved with a more friendly design, improved walking, stair climbing/descending, and wireless automatic movements. The P3 model was even more compact, standing 5' 2" tall and weighing 287 lbs.

ASIMO is the culmination of nearly two decades of humanoid robotics research by Honda scientists and engineers. ASIMO can walk on uneven slopes and surfaces, turn smoothly, climb stairs, reach for and grasp objects, switch lights on and off, and open and close doors. Now, ASIMO can also comprehend and respond to simple voice commands. ASIMO has the ability to recognize the face of a select group of individuals. Using its camera eyes, ASIMO can map its environment and register stationary objects. ASIMO can also yield to pedestrians in its path until they have cleared its path.

Today, ASIMO serves as a tour guide in museums and as a greeter at high-tech companies in Japan. But in the future, ASIMO may serve as another set of eyes, ears, hands and legs for all kinds of people in need. Someday ASIMO might help with important tasks like assisting the elderly or a person confined to a bed or a wheelchair. ASIMO might also perform certain tasks that are dangerous to humans, such as fighting fires or cleaning up toxic spills", (http://asimo.honda.com). Aside from implementing artificial intelligence on ASIMO, usage of sensors for data inputs will also be used in the proposed study. Though ASIMO's mechanical design is far more complex than that of the proposed study, the latter also exemplify that machines can imitate humans particularly in playing chess.