Real-time strategy (RTS) video games are essentially simplified military simulations where a player controls multiple units from an overhead view in real time to gather resources, build fortification and army to attack and destroy opposition force. These games have real-time constraints, randomness and hidden information like "*fog of war*" which make it different from traditional board games where AI techniques have been applied successfully. RTS games also involve challenges like strategic and tactical decision making, have a vast space of action and game state and large branching factor which present a huge increase in complexity. Because of this reason, the AI techniques that are effective in traditional board games proves ineffective for all but the most restricted sub-problems of AI. Also, RTS games provide a complex and realistic environment for simulation without the overhead of physical equipment, unlike the field of robotics. These factors make RTS games an attractive field to conduct AI research.

The paper "*A review of Real-Time Strategy Game AI*" by Robertson and Watson discussed Artificial Intelligence (AI) techniques used in RTS games. To discuss the RTS AI techniques, the researchers in their aforementioned paper focused especially on the popular RTS game "*StarCraft*". In academia, the different AI techniques being used in RTS games can be grouped into 4 areas of application: a) Strategic Decision Planning (Macro-management) b) Tactical Decision Planning (Micro-management and medium term planning/tactics) c) plan recognition and d) learning. To discuss RTS AI, Robertson and Watson primarily focused on RTS AI researches based on RTS game "*StarCraft*" in these mentioned areas. If in a particular area, research literature based on "*StarCraft*" was lacking – the researchers tried to present particular research on other RTS games (like "*Kohan II: Kings of War*" or "*StarCraft II*") in that Area. Robertson and Watson summarized the research results of applying different AI techniques in the aforementioned 4 areas by other researchers, and identified their limitations where applicable. After reviewing the previous academic research studies in RTS AI, Robertson and Watson presented a comparison between academic RTS AI research and application of RTS AI in the gaming industry. They examined the possible reasons of low cohesion between industry and academia, and tried to identify new areas of RTS AI research that can benefit both academia and gaming industry. They also discussed some open research areas like *multi scale AI* and *cooperation* in real-time strategy game, where they noted the lack of research contributions. Finally, Robertson and Watson concluded their paper by proposing several standardization techniques of the metrics for evaluation methods in RTS AI research, so that different research studies in this area can be compared.

The primary contribution of Robertson and Watson's paper was the attempt to find research areas that can bridge the gap between game industry and academic RTS AI research. Robertson and Watson observed that the rate of adopting academic game AI research in gaming industry is considerably low - academia uses new and complex AI techniques, whereas the games industry usually uses older, simpler and proven techniques like scripting, finite-state machines (FSM), decision-trees and rule based system. They identified two main reason behind this lack of adoption – end goal differences between academic RTS AI research and game industry, and short game development lifecycle length making new and untested RTS AI techniques infeasible to integrate in development phase. By comparing the goals of game industry and academic research, Robertson and Watson proposed developing human-like RTS AI as a new research avenue - possibly benefitting both academia and industry. They suggested that this can be done by creating AI that can work together with allies to some extent (co-operation), or make mistakes like humans that seem plausible in the current game context, or can replicate human play style and skills. The researchers in this paper suggested some direction in creating human-like AI by applying techniques like *Learning by Demonstration*. The researchers acknowledged that human-like RTS AI is not a current focus in their chosen subtopic of *StarCraft* – although it has been explored a little in the context of other RTS games. To test the humanness of a developed human-like StarCraft bot, Robertson and Watson proposed to integrate a Turing test similar to BotPrize for FPS games in competitions like ICCup – where StarCraft tournaments are held. They also presented an alternate proposal of judging humanness of StarCraft bot AI by human analysis of replays of bot vs. human StarCraft matches. Robertson and Watson also identified other research opportunities like developing generalized RTS AI middleware – where games could be more easily linked and tested with multiple academic techniques, and vice versa. Industry feedback indicates that it is presently not a viable option to adapt individual AI techniques to individual games because of game development lifecycle timespan constraint – but it may be a more viable option if the AI techniques could be reused for multiple games reliably. Robertson and Watson postulated that academic research on creating RTS AI that is accessible by the industry will be beneficial to both industry and academia. Another proposed research arena in their paper is working on easily customize complex RTS AI system producing specific behavior, while retaining the learning and reasoning capabilities of the RTS AI.

Another major contribution of this paper is the proposal of standardized metrics and evaluation methods for comparing research results in StarCraft AI field. The researchers in this paper identified that different literature results in StarCraft AI were obtained differently, which make the results of different literatures difficult to compare. For partial systems, Robertson and Watson proposed researching on pluggable common sets of parts that can make the partial systems function as complete systems for testing. They also proposed running a set of common tests against partial systems, and running new systems against representative related systems as some other possible methods for standardization. For Complete system evaluation, the researchers proposed testing the bots against other bots, or testing bots against humans for determining standard results. Considering industry goals, Robertson and Watson also proposed to have standard evaluation methods for goals other than determining optimal winning strategy, like determining the most human-like AI, or AI that is most fun to play with.

While going through the abstract and the paper text, an abnormality was noticed. In the abstract, it is stated that "*Finally, the areas of spatial reasoning, multi-scale AI, and cooperation are found to require future work …".* This indicated that in the section 5, there should have been some discussion that included spatial reasoning, just like multi-scale AI (5.2) and co-operation (5.3). But no reference of spatial reasoning was found in the final section (section 5) of this paper. This paper discusses spatial reasoning under Section 3 (3.8) while discussing Strategic decision planning – where spatial reasoning research in StarCraft and other AI is discussed. The reviewer felt that this was a discrepancy and felt that the *spatial reasoning* in the aforementioned line in abstract should be either removed, or a reference to certain paragraphs in section 3.8 should have been added to section 5.