# Computational Aesthetics and Chess as an Art Form

AZLAN BIN MOHAMED IQBAL
and
MASHURI BIN YAACOLE

Chess is not considered an art form by everyone and there has been much debate in both directions as to why it should or should not qualify as one. In the first place, the term 'art form' is ambiguous especially to those who do not move in art circles which includes most chess players.[1] Nevertheless most people will readily acknowledge the beauty of chess and its aesthetic appeal. In fact, that is one of the main reasons they play. In this article I review some of the arguments that have been presented for and against chess as an art form. I will then demonstrate where the confusion lies and explain why, considering recent computer advances in the area, it is important that chess be universally accepted as such.

## I. Introduction

Chess is an ancient board game that is played in many different forms all over the world. Even though limited mainly to aristocracy in the past it is now just as common in every strata of society.[2] The object of the game like any other is to win or more precisely, checkmate the enemy king. This means to force its capture on the next move. A lot can happen between the start of a game and its end. Won positions can suddenly and unexpectedly be lost and vice-versa. Chess is therefore neither dull nor unchallenging. However, it is a game where simple rules lead to complexity that even the most powerful computers today cannot fathom.[3] It is in this complexity that many players find what they call 'art.'

Art has many definitions that change with time but what matters most is the immediate perception people get about something when it is called 'art.' Looking at just one definition of art; *"the expression or application of creative skill and imagination, especially through a visual medium;"* chess can immediately be seen to qualify.[4] Strangely, it is never demeaning to have something called a work of art but to have it denied that privilege, can be. Does this imply that everything should qualify as a work of art? Certainly not. Who then, should decide whether or not something is an art form? My opinion is that those most knowledgeable of the subject in question know best given that the term, 'art' is not totally ambiguous.

## II. Review

Another definition of art form is *a conventionally established form of artistic composition.*[5] A good example would be the novel. Few would dispute that a novel can be a great work of art seeing how so much creativity and time needs to be invested into one. Some might argue that on the basis of creativity alone, chess can and should be considered an art form since that quality happens to be advantageous during play and is often employed.[6] Others would disagree implying that creativity in chess is little more than promiscuous use of the term.[7] Lord acknowledges the aesthetics of chess in elements like 'surprise moves' and also due to its expressive properties but claims that since it is not *intended* as art, chess is merely an aesthetic object at best. One of many she says (e.g., stamps), that is nothing more than a gerrymandering of the 'art form' concept. She and others who oppose chess as an art form also believe the competitive nature of chess to be a prohibitive factor in the pursuit of whatever we might construe as worthy-of-being-called-art in the game.

Humble writes that chess is at least a minor art form due to its aesthetic values derived from its nature as a contest. He basically argues that the principles of beauty in chess are essentially elements of effective play and therefore beauty is not of secondary importance in the game since the objective is to win. Also, he says that chess games are to be enjoyed as works of art but not necessarily *great* works of art hence the term *minor* art form.[8] This is sensible enough given how it might be considered ludicrous to compare a tournament chess game to a great novel or painting. Even so, a minor art form is still an art form and far from gerrymandering the concept. Both Humble and Lord however, neglect to mention much about composed chess problems.

Ravilious correctly points out that aesthetics—which seems to be a prerequisite for chess to be even be considered as art—is most prevalent not in tournament or over-the-board games but in composed chess problems.[9] He also severs the seemingly inextricable link between aesthetics and competitive chess[10] that he believes Humble had made. This confusion arises from the simple fact that aesthetic play in chess is effective play, but not necessarily the other way around. Ravilious and Humble are actually on the same side in this matter. Both acknowledge chess as art but are simply looking at the issue from different angles.

Rachels on the other hand, likens the struggle in chess to that of the struggle in art and uses some of the arguments made by mathematician and chess player Richard Reti. Rachels also compares chess to other accepted art forms like music and explains how they are not so different with the exception of chess being somewhat more 'limited' given its rules.[11] He is also not alone in seeing a parallel between the aesthetics of chess and beauty in mathematics.[12] As with Humble, Rachels would likely have made a better case by focusing more on composed chess problems. Even so, it is intriguing to note that good arguments can and have be made in favour of chess as art without even resorting to the one area where it probably suits the definition best.

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Lorand likens chess games to art in that both have differing values (e.g., between games or between paintings) but stresses that this does not in fact affect their classification as art, of which it simply either is or is not. Just because some chess games may be less aesthetic than others, it is not grounds enough to question the game's status as an art form, analogous to how some paintings may be *less* appealing than others yet this does not affect its classification as art.

Smuts however, considers video games more of an art form than chess due to stronger support for video games from representational theories of art. Technically he is probably right but I doubt all those who oppose chess as an art form would welcome video games into the fray quite as easily. Also, there is virtually no parallel between chess and video games apart from the broad concept of both being 'games'. Additionally, chess is quite specific in form and nature whereas the concept of a video game is amorphous.

No one (including Lord) really disputes the aesthetic appeal and artistic intentions of composed chess problems but unless competitive chess is also accounted for the game will likely not be accepted as an art form in any real sense. Competitiveness is one of the main issues anyone might have with chess as art. How can a game where the main objective is to win be considered an art form when artistic intention seemingly goes against that aim? The following section explains how beauty, being a prerequisite to acceptance as an 'art form,' is no barrier even when taking into account competitive chess.

### III. Separation of Beauty From Other Aesthetic Factors

Beauty in chess can be viewed as a subset of a larger framework of 'aesthetic principles' or guidelines that may or may not directly translate to a particular aspect of the game (e.g., sequence of moves, entire game, problem composition etc.) being commonly referred to as, 'beautiful.' As an analogy, a painting may be beautiful in the opinion of a lot of people but (looking only at two examples) while both its colours and history are compelling to them, only the former would translate to aesthetic appreciation in the sense of perceived beauty that one would typically get from a painting, per se. The fact that its history may be no less important or adds 'aesthetic appeal' does not negate its creative use of colours that in fact make it beautiful.

In chess compositions for instance, aesthetic factors include but are not limited to things like preferential themes, originality, effects of duals, partial anticipation and penalization of symmetry.[13] These are things, like the history of a painting, are not necessarily related to the perceived *beauty* of a problem yet cannot be entirely separated from the concept of aesthetics in compositions.[14] Even chess composers tend to incorrectly conflate what are more appropriately called 'composition conventions' with the idea of beauty. The inherent 'beauty' of a chess problem, though more prominent in that domain, is actually no different than the beauty in competitive games and this is explained next.

In competitive chess, a fantastic combination made under dire time constraints has an aesthetic quality to it but like the conventions in compositions mentioned above,

'time' does not relate to *beauty* in chess as much as say the move sequence itself that would probably have employed a specific theme, sacrifice and violated chess heuristics. In fact, principles that *do* relate specifically to beauty in chess have been reiterated by master players over the decades and even determined experimentally.[15] This applies to all of chess (compositions and competitive play) as long as the rules of the game are the same.

Margulies derived 8 principles of beauty in chess from the judgement of expert chess players who were shown pairs of chess positions and asked to select the more beautiful solution.[16] The method he used is consistent with experimental aesthetics and was not based on his personal preference.[17] He concluded eight principles of beauty namely *successfully violate heuristics, use the weakest piece possible, use all of the piece's power, give more aesthetic weight to critical pieces, use one giant piece in place of several minor pieces, employ themes, avoid bland stereotypy and that neither strangeness nor difficulty produces beauty.*

You will notice that these principles are mostly related to strategies of play and can easily apply to both composed problems and competitive chess. Even where there is no intention to *create* beauty on the board that does mean it is not there. The question is only to what degree beauty is there. Like Lorand explains, different valuation should not affect classification as art. However, when looking for works of art in chess you are more likely to find it in composed chess problems[18] than in over-the-board games.

The separation of principles of beauty in chess like those derived by Margulies from other aesthetic factors by which chess problems are typically judged (i.e., conventions) and analogous factors in tournaments (e.g., time constraints, identity of the players etc.), is essential to counter the arguments of those who see no relation between the established artistic nature of chess and competitive play.

The most beautiful composition or game may not win a composition tournament or brilliancy prize[19] but one that is not beautiful at all certainly will not.[20] This is all the clarification that was needed between Humble and Ravilious in their support for chess as art.[21] I have not taken into account the concept of 'intellectual beauty' to which chess also qualifies because that only serves to compare it with things like the aesthetic appreciation of equations in mathematics.[22] This would come under the larger framework of aesthetic principles as previously described.

It is also important to note that included in this framework are also goals and intentions in chess that are not entirely independent of their audience.[23] For example, when something is done during a game just to please the audience, it need not necessarily be *beautiful* even though the audience might find it appealing for other reasons. Looking specifically at intentions in competitive play, it is true that in master level tournaments where money is involved, aesthetic considerations are outweighed by the desire to win.

Even so, if we consider that most chess games (with opponents) the world over are played for enjoyment and *outside* any kind of tournament setting, we must concede

that aesthetics, particularly in the form of the principles of beauty as discussed above, is the main motivator. Playing merely to win is simply not enough.[24] To quote even the greatest (and arguably the most competitive) chess player of all time Gary Kasparov who said, *I want to win, I want to beat everyone, but I want to do it in style.* Therefore the competitive nature of chess does not necessarily imply things that might be true for tournaments (such as goals of having to win above all) as also true for (friendly) games outside a tournament setting, which are far greater in number.

The bridge between the accepted artistry of chess problem composition and competitive play should now be established beyond reasonable contestation. Art is simply more prevalent in chess problems but not necessarily absent in competitive play. This has even been proven scientifically.[25] Experiments show that in some cases, aesthetic qualities relating to beauty specifically, are in fact more prominent in tournament games between highly rated players than in some published compositions. Clearly whatever the intentions during competitive play, it should not affect the status of chess as an accepted art form.

## IV. The Importance of Aesthetic Recognition in Chess and its Acceptance as an Art Form

In this section, I will provide reasons why aesthetics in chess is more important than it might seem and why the game itself should be unequivocally recognized as an art form. The first reason is that aesthetics or beauty in chess has a lot to do with peoples' fascination for the game, whether as problem composers or even competitive players. Elevation to the status of an art form would not only greatly please players, advocates and enthusiasts alike but would also permit wider acceptance of the game as a creative and intellectual pastime that is healthy for children and adults.[26] The perception of chess as a 'difficult' and 'thinking' (even worse, that you actually need to be 'smart') game could do well with a new aura of creativity and art that is less intimidating and happens to be true, by the way.

Professional chess is perhaps partly to blame for how the game is perceived contemporarily because touting chess as anything other than a competitive sport (such as hockey or football) would result in less sponsorship for tournaments and players. In contrast drawing, writing or playing a musical instrument has more appeal than chess primarily because of its perceived artistic nature yet in truth they are not very different from the game in that respect. They are also similar to chess in the sense that competitions between artists, authors and musicians are not uncommon. Chess however, has the advantage of possessing logical and mathematical qualities that would make it a viable alternative as an intellectual and creative pastime.[27]

The second reason why aesthetic recognition in chess is important is so more women are attracted to the game. Women it seems, are not as interested as men when it comes to chess because of its perception as nothing more than an 'intellectual sparring'

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contest.[28] For those who doubt this fact, a casual visit to any chess club will clearly show men outnumbering women by a factor as high as 5 to 1. Women are deprived of an artistic and intellectual activity whose benefits are currently being enjoyed mostly by men. This inequality needs to be remedied.

One might wonder then why more women are not drawn to chess composition since that domain is less competitive and more artistic than competitive chess. The reason is probably because problem compositions derive their beauty much less from visual appeal (geometry, lack of clutter etc.) and more from the interactions of the pieces (sacrifices, themes, heuristic violations, economy etc.) in relation to the rules of chess, making it no different from the competitive domain in that respect. The beauty of chess is therefore holistic and unique. As an art form, it should be appreciated on its own terms. One does not look at a painting and expect to hear music. In the same way, one appreciates the beauty of chess not in the same way as one might the beauty of a painting, musical composition or literary work.

Once chess (competitive and composition) is recognized as an art form, it should become more amenable to women in the way that paintings, music and literature are. Men do not dominate these arts as much as they do chess. Some might point out that the mathematical aspect of chess might be the real culprit but unfortunately there is no conclusive scientific basis to assume women are necessarily inferior to men when it comes to mathematics. One study even shows women performing 12% better at math due to the mere absence of men in the room.[29] If anything, this lends credence to the theory that chess is probably intimidating for we can do little to shoo the men away but can certainly do something to make the game more appealing to women.

The third and perhaps most important reason I would like to bring up in this section is that aesthetics presents a new and fertile area of artificial intelligence research *if and only* if chess is recognized as an art form comparable to music and literature. A brief history on the subject is pertinent here. Chess has been a major subject of investigation in artificial intelligence for many decades. Researchers wanted to understand the mechanics of human thinking processes and chess was the perfect subject because they thought, *what else could we be doing in a chess game if not thinking*? Claude Shannon proposed a method of developing a computer program to play chess and essentially, the same technique is still used today.

However, there have been several improvements over the years in search techniques and evaluation functions to make computers play better. The irony is that we are not much closer to learning how *humans* think but instead have developed methods that rely on brute processing to make machines *simulate* thinking. As a result, today even personal computers are able to play grandmaster level chess. John McCarthy (one of the founding fathers of AI) once said that he hoped one day to see machines playing high-level chess on the slowest machines. That would better illustrate effectiveness of technique

(what AI was after all along) than brute force computing. Even so, the research that went into chess has been of considerable benefit to other areas in AI such as tree search, pattern recognition[30] and particularly automated reasoning.[31]

Alas, now that computers are only getting faster and do indeed play better chess than humans, there seems little left to do with the game. This is where aesthetics comes in. Computers may be capable of playing chess near perfectly but they have not an inkling as to what beauty in the game is. Earlier, I explained how much of chess lies in its aesthetic qualities so it is reasonable that research should progress in that direction now. Not only was chess correctly viewed back then (in the 1950s) as a fertile, intellectual activity worthy of scientific investigation but it should also now be seen the same way with regard to aesthetics and creativity, i.e., as an art.[32] The question then arises: why chess?

Firstly, chess is a zero-sum perfect information game[33] within a finite domain (8x8 board) with fixed rules. This makes it an ideal candidate for quantifiable scientific research. Even Margulies who derived the principles of aesthetics in chess (refer Section 3) had his intentions rooted in psychology rather than artificial intelligence or chess itself but saw the game as a good place for experimentation. The finite nature and clear rules of the game seemed like a perfect testing ground for deriving objective principles of beauty that might be applied in *other* areas, he thought.

Second, few other zero-sum perfect information games are known for their aesthetic value and none to the degree that exists in chess. Even in Go, which is technically far more complex to program than chess, there is comparatively very little literature on the aspect of beauty and even less detailing what exactly that means in the game. Go however, is poised to replace chess in traditional AI research because we do not yet have computers that play it as well as humans, unlike chess which has been 'conquered' for all practical purposes. The reason is that the game tree of Go is much too large for the methods employed is computer chess to work as well.

Chung-Jen Tan, manager of the Deep Blue team (the computer that eventually beat world champion chess grandmaster Garry Kasparov) told Scientific American in 1996 they would stop research into chess and move to other areas once the game became 'uninteresting'—that is when they understand enough about the game to derive benefit from it to improve their understanding of parallel processing.[34] The baton is perhaps due to be passed from chess to Go but the former should now detour onto another road, i.e., research into aesthetics because there is hardly a more amenable domain.

This may not happen however, because chess is not yet universally recognized as an art form. Not many researchers see beauty as a tangible or even existent aspect in chess *fundamentally because people do not see chess as art*. Unfortunately, it is quite common for researchers in any field to have to justify themselves to their superiors and research sponsors when the subject of interest is 'nothing more' than a mere game, especially

when it concerns a controversial aspect of said game. This Victorian attitude toward things that often suffer from false perception and compartmentalization has impeded progress for many years. Drawing similarities between different games and judging them equally insignificant is not only illogical but also misleading.

One should clearly be able to treat chess with more respect in terms of artistry or computational amenability than say tic-tac-toe (even though they are both zero-sum perfect information games), much less comparing it to golf or tennis and on such basis dismissing the game as trivial and not worthy of serious consideration in a particular discipline (i.e., aesthetics) for which there are strong grounds. For instance, many cultures over the centuries have immortalized themselves in the various artistic designs of their chess pieces and by changing its rules.[35] Should historical and anthropological research neglect this information because they have to do with *merely* a game or on the basis that by comparison, the design and artistry of golf clubs today might not provide much insight about our culture for future researchers?

To quell any concerns that art itself is perhaps not a serious domain of research, one should consider where researchers are indeed looking. In 1997 a competition was held at Stanford University between a human and a computer to see which could compose music in the style of Bach and the computer actually won.[36] In 1998 a computer called Brutus.1 actually wrote a short story entitled, 'Betrayal.'[37] Computational models for artwork have also been developed that allow computers to automatically generate and evaluate the aesthetics of images.[38] Work into these areas has been progressing considerably over the years and for no other reason than music, literature and images being contemporarily classified as accepted 'art forms.'

In fairness, chess has not been completely overlooked in this respect but the emphasis is always elsewhere. Ben Walls applied chess beauty principles into heuristics of the game to make computers play better of all things; not to identify or generate art on the board as one might expect.[39] Coincidentally, beauty heuristics do indeed reduce computational time in finding the best move under certain conditions. I would rather however, have preferred if the computer could tell me which positions I might find beautiful or aesthetically appealing. It is interesting to note that despite the misplaced emphasis, there are clearly benefits to such research.

According to Chen Zhi Xing, a retired chemistry professor and author of one of the strongest Go playing programs, Handtalk; the key to getting computers to play Go as well as chess is by finding a way for the computer to understand its beauty and 'visual magic.'[40] Currently, computers are particularly poor at Go because, as mentioned earlier, the same serial brute force techniques that work so well for chess do not apply to Go where parallel processing of information for pattern recognition is essential. Could our neglect of the study of aesthetics in chess (because it is not recognized as an art form) somehow contribute to our inadequacy in designing better computer programs not only for Go but

also in the myriad of other applications where it might be beneficial? If other things thought to be art are being vigorously researched by computer scientists, why not chess which is arguably far more amenable to computation?

Even in automatic chess composition where one would expect beauty to be taken into account to do a decent job comparable to human composers, it is not.[41] Researchers simply use heuristics that have very little to do with what is inherently beautiful about chess. Instead they rely on a few quantifiable chess *conventions* and include arbitrary values attributed to selected chess themes.[42] Researchers also passingly admit to being unable to quantify the aspect of beauty in chess problems. I think the problem is rather they are unwilling than unable. Most do not even look at the vast literature on the aesthetics of chess because to think of it as an art form is unconventional.

Douglas Hofstadter, a professor of computer science at Indiana University and author, writes in his Pulitzer Prize winning, *Godel, Escher, Bach: An Eternal Golden Braid* that chess is a creative enterprise with an unrestrained level of excellence that pertains to arts like music and literature.[43] Nearly two decades later in 1996, he said that recent computer gains have persuaded him that chess is not as lofty an intellectual endeavor as music and writing for they require a soul. He also said that, *It (chess) doesn't have deep emotional qualities to it, mortality, resignation, joy, all the things that music deals with. I'd put poetry and literature up there, too. If music or literature were created at an artistic level by a computer, I would feel this is a terrible thing.*[44]

It is puzzling how chess can be viewed as artistic but when computers are suddenly involved, not artistic anymore. I wonder if Professor Hofstadter would say the same thing about music, poetry and literature should computers ever get as good at it as they are at chess. My guess is no for these things are inherently accepted art forms, whilst chess is not-so-accepted.

## V. Conclusion

In this article the main arguments by both sides with regard to whether chess should be considered an art form was reviewed. Clarification between the principles of beauty in chess and aesthetics in general was then presented. It was shown that chess problem composition and competitive play are not mutually exclusive from an artistic standpoint. In fact, the validity of the composed chess problem as at least a minor art form extends naturally to competitive play. This becomes even clearer once competitive chess is properly defined and not limited to the false perception of a tournament setting.

The importance of aesthetics in chess being recognized was also discussed and arbitrary dismissal of this facet of the game was shown to be unjustified. In addition to many other reasons that have already been exhaustively argued by others, I submit that chess is indeed an art form or at least more so than previously thought. Also, this recognition directly influences the perception of researchers to consider chess as a worthy subject matter in their fields, particularly artificial intelligence.

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**Iqbal: Lecturer in Informatics and**

**Yaacole: Vice-Chancellor**

**Tenaga Nasional University**

**Malaysia**