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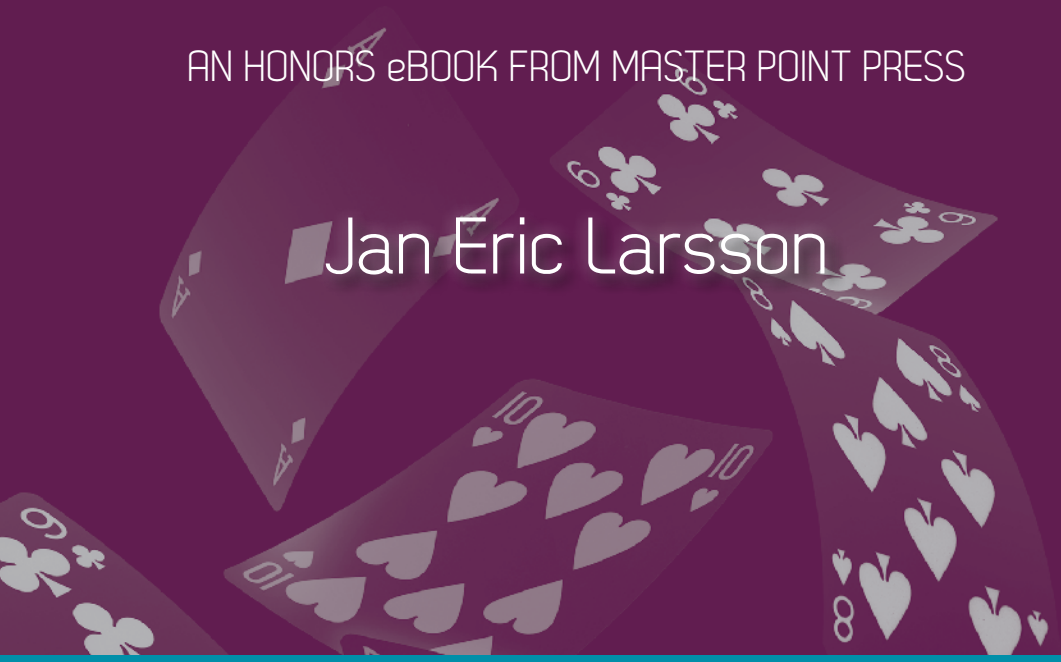
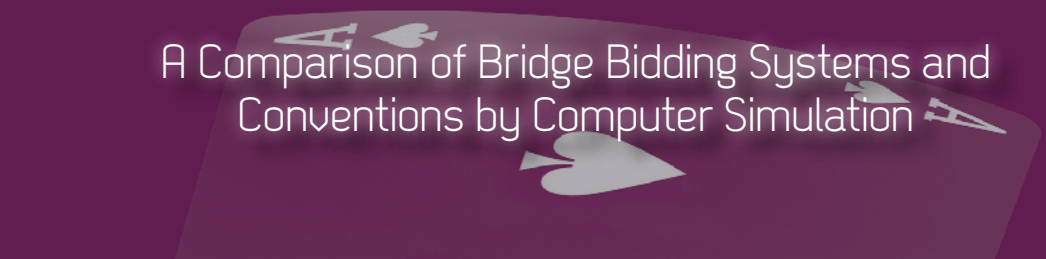
Jan Eric Larsson



Good, Better, Best

A Comparison of Bridge Bidding Systems and Conventions by Computer Simulation



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214 Merton St. Suite 205
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M4S 1A6
(647) 956-4933

info@masterpointpress.com

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Anu Uus and I at the Swedish Bridge Festival in the city of Örebro, Sweden in August 2013. We have played there since 2010. I became a gold-level tournament director in 2011, an elite director (one of ten in Sweden) in 2018, and the head of the Swedish Law Commission in 2019. Photo by Matilda Wik.

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Foreword by Roy Hughes

When Jan Eric wrote to tell me of his plans for a book about the computer evaluation of bridge bidding systems, by having programs using the systems play against each other, I was intrigued. Was such a project feasible? If so, what could it tell us about bidding?

Bidding systems in bridge have been around as long as the game itself. Some have been highly regarded by the bridge-playing public, some less so; in either case a bidding system's reputation has been very much dependent on the opinions of experts. Now I think it is fair to say that experts, as a group, are not inclined to unanimity of opinion. One might prefer the weak notrump, citing its beneficial preemptive effect, and how it makes bidding after an opening suit bid more effective by taking care of the balanced minimum hands. Another would say the weak notrump is too risky, too exposed to a penalty double. Who is to say which factors are more important? I suspect that most, if not all human bridge experts have biases that prevent them from being able to say with certainty what the best bidding methods are.

Computer simulation techniques have been used for years now to study various aspects of our game, noteworthy examples being the evaluation of an opening lead or line of play. *Good, Better, Best* breaks new ground by having robotic teams play a vast number of matches against each other using, for the bidding portion, a machine-readable description of the methods employed. The results of the simulation provide an objective evaluation of the efficacy of the methods.

This approach to bidding system evaluation raises numerous, subtle issues, and these Professor Larsson deals with clearly and carefully. The reader who wants to understand the mathematical underpinnings of the evaluation method has all the pertinent material required; the reader who prefers to cut straight to the bridge, say to see how modern Precision fares against two-over-one, is free to do so.

Computer analysis has led to remarkable insights in another deep game, chess. While many aspects of chess have been solved for centuries, the endgame of king and two bishops versus king and knight defied human understanding until in the 1980's exhaustive computer analysis demonstrated that it was a win for the bishops. It will be interesting to

see what insights about contract bridge can be gained from techniques such as those used in *Good, Better, Best.*

Roy Hughes

Toronto, 2021

Preface

Which bridge bidding system is best?

Is it a natural system with four-card openings? After all, this type of system ruled the bridge world for a long time. Is it a natural system with five-card major openings and three-card minors, as in *Standard American Yellow Card* or *Two-over-One?* Or is it the *5542* system, now growing in popularity across the world? Maybe the best system is not using the old-fashioned "natural" base with wide-range opening bids in one-of-a-suit and a strong two clubs. Maybe the strong club systems are better. Many good players and teams have definitely believed so over the years. Or could it be that the best system actually is quite different from what is normally played, for example, a highly artificial forcing pass system? This book will give the answers.

Contract bridge is one of the few card games that has been played by very many people over a long period in history and has had its own impact in our language and popular culture (just think about the word "cardboard"). There are active competitions and series systems all over the world, and a large bridge literature. Only a few other games, for example, backgammon, chess, poker, and go, have a similar place in human culture.

Part of this success must be found in the properties of the game itself. Contract bridge is complex because it has two phases, the bidding and the play. Thanks to a balanced amount of randomness, in the long run good players are rewarded for their skills while less good players can be lucky and perform well now and then.

In fact, before the bidding and the play, there is another phase of bridge, which also accounts for some of its popularity – the continuous invention and development of bidding systems and conventions. This is certainly the part of bridge which has attracted the smallest fraction of followers, but the discussion about how to bid and which systems and conventions are the best has been going on since the birth of the game.

The discussion about bidding systems is an integral part of bridge history. When Harold S. Vanderbilt put together his version of a mix between auction bridge and plafond, the explicit idea was to enable bidding agreements and conventions. Only the final contract had to be in a playable denomination, while all previous calls could be artificial.

When Culbertson rose to fame, his bidding system had a central role. In essence, it was all about teaching people to play better, based on their using Culbertson's system and (equally important) paying for his books.

When the Italian Blue Team started winning European and World Championships, their bidding systems came into focus. These were not the standard *Culbertson* or *Goren* systems, but artificial club systems with asking bids and many conventional sequences.

The systems' debate has continued ever since. Here is what Greg Matula wrote in the preface to his book on the *Polish Club*, see Matula (1994).

"How can you tell if System A is better than System B and System C is worse than System B? A universally accepted and objective method of measuring the quality of a bidding system does not exist. That can be demonstrated by the simple observation that few of the world's leading pairs use exactly the same system. What is more, almost none of these pairs will claim that their system is the best, regardless of how strong their feelings towards their own bidding methods are."

This has been the situation in the bidding systems discussion from Vanderbilt to present day. There are lots of ideas, opinions, and preferences, but no accepted method to actually measure the quality of bidding systems.

There are two reasons why there are no such methods. First, the game is too complicated to allow for a manual, statistical calculation of optimal bidding. In other games, for example, blackjack, the optimal strategy is known. If we have the specific house rules and the played cards, there is a *known optimal decision* for every hand and dealer card. Books describe the common game rules and computer software is available to calculate the optimal strategies. But this is not the case in bridge, which is a much more advanced game.

Secondly, if we try to test the quality by playing two systems against each other, there are too many other factors that will affect the result. Player skills in hand evaluation, using the bidding system, leading, declaring, signaling, and defending will obscure the effects of the bidding system itself.

However, there is a method of comparing systems in a way that is independent of player skills. Assume that we implement the bidding systems in a program and play them against each other on a computer. If

all software functions are the same, except for the bidding system definitions, we will get an evaluation of bidding system quality, which is independent of the human factors. Of course, this demands that the general quality of the computer bidding is good enough to utilize and evaluate the properties of the systems.

I have been considering this idea for many years, and in the autumn of 2018, I started to work on the software system, which is the basis of this book. It is indeed possible to implement bidding system definitions efficiently, and good bidding algorithms based on these definitions.

Once this effort is done, it is a relatively simple matter of playing different systems against each other and see which one is better, and also *how much better,* for example, by simulating team matches. I decided to measure a system's quality in relation to another by the average imp gain in a 24-deal match. This is a simple measure and also gives the reader a good feeling for how much a system or convention will contribute to practical results.

My aim is that this book will prove Greg Matula, and all others who state that there are no objective answers, wrong. The computer simulations will find out the relative qualities of the bidding systems that I have had the strength to implement. But it will also answer several long-standing discussion questions. For example, which is better, four- or five-card majors, natural or strong club systems, weak or strong notrump, solid or wild weak two openings? We will test Stayman and transfers against double Stayman, and delayed Stayman against XY-notrump and XYZ-notrump. We will find out whether Gazzilli is better than no Gazzilli, and whether the strong pass systems of the seventies and eighties were superior or earned their results mainly by confusing the opponents. We will even find out whether the systems of the Blue Team actually were better than the American ones, or vice versa.

Finally, this is the work of a single programmer and author, with good but humanly limited skills in both programming and bridge. All results have been extensively tested, but my experience as a programmer means that I *know* that there are remaining errors in the system definitions and bugs in the program code. These errors should have relatively small effects on the results, but it is possible that the results could be improved and made more reliable. However, now the genie is out of the bottle, and I am looking forward to others presenting competing results.

About the Author

I learned to play bridge in the early seventies and started to play competitive bridge as a junior in Sweden in the late seventies, participating in regional junior championships and playing regularly at local bridge clubs. Together with Sören Romare, I developed a strong club system, called the *Tangerine Club*, where the one level openings showed 10-14 hcp and one club 15+ followed by control-showing responses and asking bids in *Blue Club* and *Super Precision* fashion. After a year, we changed this into a *Swedish Club* where one club was 8-9 or 15+. This was at the same time as Max Ödlund was developing the idea, and we corresponded about how to design a good response system after a *Swedish Club* opening. Together with Håkan Wolgé, I started playing *Major*, one of the Polish strong pass systems. The *Major* system is special in that it describes the holding in both majors in every single opening bid, except pass and one diamond.

After a break of almost ten years, I came back to bridge again. Together with my bridge and life partner Anu Uus, I developed a strong club system, called the *Cottontail Club,* with the old base of 10-14, but now the responses to one club were suit-showing transfers, the notrump was variable, and the one level openings used canapé. With another partner, Anders Freij, I play a Precision-style strong club, with a natural four-card diamond opening. My best achievement so far is place 70 in the Swedish open pairs 2019, largely thanks to Mr. Freij.

In addition to playing bridge, I am one of the ten elite tournament directors in Sweden. I translated the new laws of contract bridge 2017 to Swedish, and since 2019 I am the chairman of the Swedish Bridge Laws Commission.

In civilian life, I am professor of artificial intelligence at Lund University, Lund, Sweden, and CEO and co-founder of the spin-off company GoalArt, which makes AI-based systems for monitoring and diagnosis of complex technical systems. I am familiar with many programming languages, but as Richard Stallman said when he once visited Lund University, “What’s wrong with C and Lisp?”

Acknowledgments

Most of the work in this project has been performed by the author in isolation. In fact, I told only a few individuals about the project while it was going on. Nonetheless, I have had valuable help from several people.

My bridge partner Anders Freij has helped in discussions during the project and also checked many of the results. His skill and judgements have been invaluable.

Anders' other partner and wife, Karin Brundell-Freij, also read the manuscript and has provided a large amount of deep and relevant questions and comments. They have improved the book enormously.

Håkan Wolgé was my partner in the eighties and we played several wild, artificial systems. He is a great software expert and a good friend. He has given me lots of good comments.

Roy Hughes has written the most interesting bridge book I have read. Thus, he was a great inspiration for my writing. I just took a chance and asked whether he would like to help me with the book and became very happy over how open-minded and helpful he has been.

Lars-Åke Larsson at the bridge club of Lund gave me access to the data from all their competitions since 2003. These are the deals that have been used for the team matches and the pair competition simulations, and they have been essential for the project.

I would also like to thank Richard Pavlicek for his collection of test deals available on his excellent web site.

I have received help and inspiration from many people on the Internet. For example, Richard Willey, Larry Lowell, and others have provided information about *Moscito* and the "Swatting the Moscitos" event on Bridge Base Online.

This work rests on the shoulders of all those bridge writers who have described bidding systems in books, articles, and system notes. I will mention them when we reach the system or convention in question, but they all deserve great thanks.

Since this is one of the few official opportunities to thank people in general, I would like to give my thanks to all the bridge players I have come across, partners, teammates, opponents, friends, local club

members, international contacts, organizers, and tournament directors. Bridge is a wonderful game, and apart from the bidding systems, it is the people in it that make it great.

I would also like to thank Ray Lee and Sally Sparrow at Master Point Press. They run the world's leading bridge publishing company but are totally personal, relaxed, positive, and helpful at the same time.

Martin Cantor has been the proofreader and made great contributions both linguistically and to the bridge contents. Talk about helpful advice. I could simply steal his suggestions and improve my text a lot.

Finally, my partner in bridge, life and love, Anu Uus, has worked with me in developing and playing our system and given me invaluable mental support during the entire project. She has not only inspired me both in programming and writing and been an excellent reader of the book, but also provided us with a great life outside of this bridge project.

Thank you all very much!

Now only the details remain.

1. Introduction

Until now, almost all of the testing of bidding systems has been done by human players in live play across the table. But this is not a reliable way of testing systems against each other. First of all, a prolific human player may play a few hundred deals a month, and most play considerably fewer than that. As we will see that amount is far from enough to draw any conclusions. Also, most of these deals are not analyzed afterwards in order to find out specifically whether the bidding system played any positive or negative role in the result.

Secondly, results at the table depend on many different factors, and the bidding system is only one small part. The players' skills in hand evaluation, using the system and its conventions, bidding situation analysis, leading, declaring, defending, table presence, and luck all affect the results, and it is quite difficult to dissect the advantages specifically gained by the bidding system from these other factors.

In bridge history, there have been many attempts to arrange matches with the intent of testing if one bidding system was better than another one. However, they were all inconclusive, mainly because it was impossible to separate the effects of the bidding system from the other factors mentioned above.

In this book, I will present another way of comparing bidding systems, by having computer implementations of different systems playing each other. The systems will be described in a way that allows a computer program to read the definitions and let the systems meet. We will use a large amount of previously played deals and set up the simulations in the exact same way as standard matches between human teams. Each bidding system will have its own team in the bidding, and the play will be decided by double-dummy analysis. The system that ends up with more imps than its opponents is the better one.

The advantage of this method is that we will actually be testing the properties of the bidding system itself, and not the other factors. Since the same algorithms are used for all systems and play, the only differences will come from the bidding systems' internal properties and give a truer evaluation of their intrinsic strength.

If we want this to be a useful comparison, the level of hand evaluation and bidding action must be reasonably high, preferably as high as that of

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Bridge players constantly argue about the 'best' bidding systems and conventions. Strong Club or Natural? With or without relays? Standard or 2/1? Weak or strong notrump? Was the Blue Club system really better than the natural systems in the 1950s and 1960s? Is two-way Stayman as good as Stayman and transfers? Disciplined or undisciplined weak twos — which work better? And many, many more…

Well, now we have the answer to those questions, provided by exhaustive analysis and the results of computer simulations. And not only which is better, but also by how much, typically tested in thousands of 24-board IMP matches.

Playing the same deals via the same AI software eliminates the variable of player skill, and bidding methods are judged solely on their own merits. It is as objective a test as modern technology can provide.

And the results may not be what you would expect.

JAN ERIC LARSSON (SWEDEN) is a professor in artificial intelligence at Lund University in southern Sweden, and manager of a small software company that delivers intelligent monitoring and diagnosis systems for national power grids. He is also one of Sweden's top ten tournament directors and the chairman of the Swedish Bridge Laws Commission.

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