Rock, Paper, Scissors – Design Notes

Bill Rubin

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- **Language:** Visual C# 2010, in trial version of Visual Studio 2010 "launched" by Microsoft on April 12, 2010 – the very day I decided to use it. See *Synchronization* below.
- **Structure:** Each player has a strategy specific to the player, and a list of the gestures this player has thrown since the beginning of the match. To simplify threading, this list is fixed size (1000). That way, the list of *previous* gestures can be shared with other threads without any special interlocking. Each player also has a list of all the other players, used to compute the player's score on this round, and also potentially usable for his strategy.
- **Strategies:** Five dumb strategies have been implemented: Always throw rock, always throw paper, always throw scissors, throw randomly (probably the best strategy), and cycle among rock, paper, scissors in that order. None of these strategies depend upon what other players have thrown in the past, but this is easy to add.
- **Playing the match:** Each player (thread) begins by throwing a gesture, based on his own strategy. He then waits until all other players are also waiting. Once all players are in wait state, each player computes his score for the previous round, and increments his total score by that amount. If 1000 rounds have not yet been completed, each player throws his next gesture, and waits again for all the other players. Otherwise (1000 rounds have been completed), he stops playing. (If he's a worker thread, this means ending the thread. Otherwise (main thread), this means waiting for all worker threads to terminate, and then displaying the results of the match.
- **Synchronization:** Waiting for all players to throw gesture is implemented using a C# Barrier class, available in .NET 4.0 and Visual C# 2010, but not in previous versions of these products. Because the Barrier contains a count of "phases", it is also used to end the match. The Barrier class avoids a lot of messy, error-prone programming.
- **Performance:** Run time is 0.1 second with 5 or fewer players, but degrades markedly with additional players. With 6 players it's about a second! With 100 players, it's around 90 seconds. It's all wait time; processor time is essentially zero. This happens even if all players use Paper strategy. Very strange!

Although no strategies are effective in computer simulations of the rock, paper, scissors game, I was amused to learn from web sources that various strategies are quite helpful against human players. The weakness of humans is that they tend to be incapable of random play.

Many thanks to Frank Wallingford for discovering my blunder in the original version.