3 Player Games and Beyond ...

1 Introduction

Games depending on pure skill and little or no dependency on pure luck tend to be two player games. Chess, Draughts, Reversi, etc are all based on a simple paradigm – a player's gains are the other player's losses. The concept of allowing the other player to win for future advantage is immediately lost.

Games involving more than two players add a new dimension to the game. An obvious psychological change is that a player, if given the choice, may prefer one of the other players rather than the other to win. This may give rise of aliances forming – probably by the weaker players against the best player. An obvious extension would be to play the game iteratively. This would give rise to other predjudices not simply psychological. The player at the head of the score board will obviously prefer the player at the tail to win, rather than anybody else (except himself). Thus, if a game would appear to be extremely advantegeous to the player in the second position, he would obviously prefer to provide the last player with a winning move. Instructing a machine to do this, will probably be extremely difficult: finding the fine balance when to help another player and when to persevere with winning tactics is certainly a non-trivial task. One may also have to rate the last player, as to whether he is good enough to use the advantage you have provided him with.

Obviously, games involving more than two players have their own inherent disadvantages. One such problem which arises is whether a 3+ player game can be defined such that it is not chaotic. The term chaotic is being used in the sense that a minor change in a player's move may provide a nearly unpredictable position until it is that player's turn again.

This short report describes some attempts at creating a 3+ player game which is interesting and yet not too complicated. An attempt has also been made to include interactions between players so as to give the game a more 'human' feel. The basic idea on which the following game variations are built is that of *aliances*. The game forces temporary aliances – but at the same time, nearly imposes working against some other player, who is continually changing. Automizing the move creation is probably very difficult, due to the

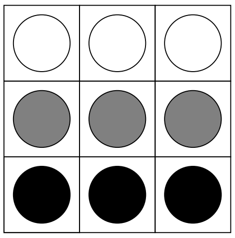

Figure 1: Initial Position

interaction involved. However, a move analyser which just remarks as to whether a particular move makes any sense is possible.

2 The Basic Game

This section introduces the basic concept on which the rest of the report builds. The game we start off with is quite simple. However, even at this basic stage, there are variations on the game, some of which change the gameplay altogether. The way the games will be introduced, is by first presenting the simple basic format, followed by a list of possible variations. This section will just introduce a basic three player game, while the following sections define further refinements to this idea.

2.1 The Board

The game is played on a 3 by 3 board. Each of the three players have three similarly coloured counters. The starting position is shown in figure 1. One of the players whose players are on the edge starts, followed by the other player owning the pieces at the other edge and finally the player owning the middle row. In the shown board the order of play is *white*, *black*, *grey* or *black*, *white*, *grey*. For convenience we will take the first order of play. The reason behind this unnatural order of play is that the center row player probably has a more advantageous position with respect to the other two players – which is countered by playing last.

2.2 Gameplay

A player's turn is divided into the following phases:

1. The current player proposes a swap to each of the two other players. A swap involves exchanging the two mentioned pieces – one belonging to the current player and the other to the player to whom the move is proposed.

2. The two other players consider the proposed swaps and answer whether they accept the swap. They may discuss their decisions before actually answering.
3. If only one player accepts the proposed move, the pieces involved are swapped. If both players accept, the current player gets to choose between the two moves. The case where both the players do not accept the move, is discussed later.

If, at the end of a move, one or more players have three pieces in a row, this player wins. Obviously this does not include when the game has just started and a player has not yet moved any of his pieces. The current player also wins if the other two players do not accept his proposed moves. If nobody has won, play continues with the next player.

2.3 Some Observations

- Since the game involves the players to reach a decision, it may be necessary to impose a time limit for the two players' response. However, since the game needs some thought, the best way to organise play is to let both players do the thinking, after which they are given a fixed amount of time (30 seconds to 1 minute) to discuss their answers.
- Note that the games imposes no restrictions on how players may come to a decision! Players may bribe, fight, etc to reach a decision. This starts making more sense in an iterated game as described below.
- Various different strategies may evolve – one particularly interesting one is to offer one of the players a winning move, forcing the other player to accept your move. One may adopt different attitudes whether to allow the current player to say things like: 'I propose player X this move, *which obviously allows him to win in the next move*'. It is probably better not to – thus introducing an element of risk, when a dumb player is playing. Note that this strategy does not necessarily work in an iterated game environment. More about this later.
- Multiple player wins are impossible with this variation of the game. Note that if two players win simultaneously, they must do so on two different rows or columns in just one swap. Hence the other player will have already won.
- The number of different board positions is quite limited. It may be possible that the current player to play can always force the next player out of a winning move. If this is so, it follows by induction that the game will never finish in a finite interval of time. It will also mean that the game has no strategy – your move can only stop the next player from winning;

no matter how deep you think, your move will never aid or hinder you on your next turn.