Introduction to Computational Game Theory

CMPT 882

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Iterated Weak Dominance

The IWD procedure

In our discussion of trembling-hand equilibrium, we encountered the idea that players should avoid weakly dominated strategies. This can be used as an alternative solution concept to Nash equilibrium via an **iterated elimination algorithm**.

1. Start with a game G; we'll assume it's a 2-player game for now.

2. For both player 1 and 2, simultaneously eliminate all weakly dominated strategies. We now have a smaller game G'.

3. Repeat step 1 with G', until we arrive at a submatrix G^* of G such that no strategy is weakly dominated in G^*.

4. Return G^*.

Note The text also considers dominance by mixed strategies. For now we will neglect this possibility for the sake of simplicity.

Iterated Dominance: Example

What's the result of applying iterated dominance to the game below?

	Column		
Row	L	C	R
T	4, 2	6, 1	6, 0
M	3, 0	5, 3	9, 2
B	3, 0	5, 2	3, 4

First, we look for dominated strategies. For the row player, T and M both dominate B (T strictly and M weakly). For the column player, there is no dominance. So in round 1, we eliminate B for Row. With B gone, C dominates R for Column, so we eliminate R. With R gone, T dominates M for Row, so we eliminate M. Now L dominates C for Column, so we are left with (T,L) as the only pair of strategies surviving iterated dominance. Thus we predict that Row will play T and Column will play L.

Iterated Dominance: Exercise

	Defense		
Offense	Counter Run	Counter Pass	Blitz
Run	3	7	15
Pass	9	8	10

Outcomes are “expected yard gains for offense”

Iterated Dominance: Exercise

Two players make a guess, “1”, “2” or “3”. The player whose guess is closest to the average wins. In case of a tie, the pie goes to the player with the lower guess, if there is one; otherwise the pie is split equally between the two. The pie is worth $2.

	Column		
Row	1	2	3
1	$1, $1	$2, 0	$2, 0
2	0, $2	$1, $1	$2, 0
3	0, $2	0, $2	$1, $1