444 Lecture 2.6 - Iterated Deletion

Brian Weatherson

To describe the strategy of solving games by iteratively deleting strategies.

Bonanno, section 2.5

- If an option is strongly dominated, it shouldn't be chosen.

- If an option is strongly dominated, it shouldn't be chosen.
- In the simple case, if all options but one are strongly dominated, that one should be chosen.

Initial Idea

- If an option is strongly dominated, it shouldn't be chosen.
- In the simple case, if all options but one are strongly dominated, that one should be chosen.
- But we can say more than this.

- If an option is strongly dominated, it shouldn't be chosen.
- In the simple case, if all options but one are strongly dominated, that one should be chosen.
- But we can say more than this.
- If a strategy only makes sense if the other player plays a dominated strategy, then it doesn't make sense.

- If an option is strongly dominated, it shouldn't be chosen.
- In the simple case, if all options but one are strongly dominated, that one should be chosen.
- But we can say more than this.
- If a strategy only makes sense if the other player plays a dominated strategy, then it doesn't make sense.
- Let's work through some examples to see how this works in practice.

	Left	Right
Up	4, 1	2, 2
Down	3, 3	1, 4

We can solve this using just domination.

- Up dominates Down, so Row should play Up.

	Left	Right
Up	4, 1	2, 2
Down	3, 3	1, 4

We can solve this using just domination.

- Up dominates Down, so Row should play Up.
- Right dominates Left, so Column should play Right.

	Left	Right
Up	4, 1	2, 2
Down	3, 3	1, 4

We can solve this using just domination.

- Up dominates Down, so Row should play Up.
- Right dominates Left, so Column should play Right.
- So the solution is Up/Right.

	Left	Right
Up	4, 0	2, 1
Down	3, 1	1, 0

Now Column doesn't have a dominating option, but that doesn't stop us.

- Up dominates Down, so Row should play Up.

	Left	Right
Up	4, 0	2, 1
Down	3, 1	1, 0

Now Column doesn't have a dominating option, but that doesn't stop us.

- Up dominates Down, so Row should play Up.
- If Row is playing Up, Right is better than Left (1 beats 0).

Only Slightly Harder Example

	Left	Right
Up	4, 0	2, 1
Down	3, 1	1, 0

Now Column doesn't have a dominating option, but that doesn't stop us.

- Up dominates Down, so Row should play Up.
- If Row is playing Up, Right is better than Left (1 beats 0).
- So since Row is playing Up, Column should play Right.

Only Slightly Harder Example

	Left	Right
Up	4, 0	2, 1
Down	3, 1	1, 0

Now Column doesn't have a dominating option, but that doesn't stop us.

- Up dominates Down, so Row should play Up.
- If Row is playing Up, Right is better than Left (1 beats 0).
- So since Row is playing Up, Column should play Right.
- So the solution (again) is Up/Right.

	Left	Center	Right
Up	4, 2	3, 1	0, 0
Middle	3, 0	2, 2	1, 1
Down	2, 0	1, 0	0, 3

We can't immediately solve this with dominance, but we can in a few steps.

	Left	Center	Right
Up	4, 2	3, 1	0, 0
Middle	3, 0	2, 2	1, 1
Down	2, 0	1, 0	0, 3

- Note first that Middle dominates Down.
- So Down should not be played.
- In fact, we might even act as if it is not there.

	Left	Center	Right
Up	4, 2	3, 1	0, 0
Middle	3, 0	2, 2	1, 1

- Here's what happens if we **delete** the dominated option Down.
- Now Center dominates Right.
- It didn't a minute ago – Right is a better response to Down than Center is – but Down is deleted.
- So Right is out, and we'll delete it too.

Iterated Dominance

	Left	Center
Up	4, 2	3, 1
Middle	3, 0	2, 2

- In this game, Up dominates Middle.
- So Middle has to go.

	Left	Center
Up	4, 2	3, 1

- And in this game, Left dominates Center.
- So the solution to the game is Up/Left.

- Start deleting dominated strategies.
- Then see if some strategies are dominated in the new version of the game.
- If you're lucky, the result will be that just one option for each player is left.
- If so, we'll call that the solution of the game.

- We'll see some complications that arise when we delete weakly dominated strategies.