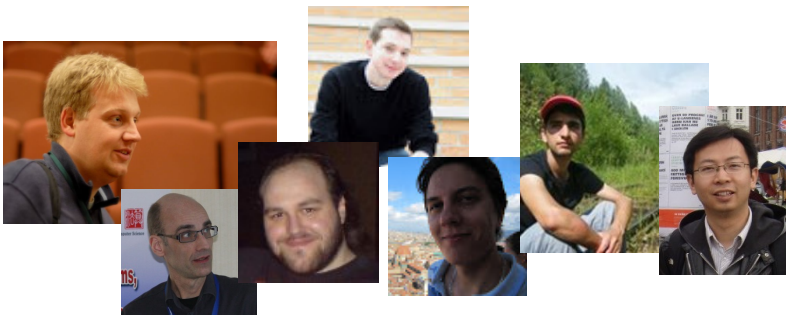


A dictatorship theorem for cake cutting

Simina Brânzei and Peter Bro Miltersen



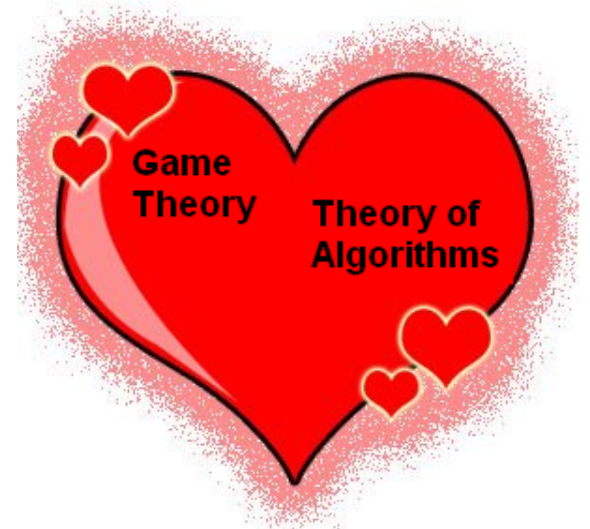
Mathematical Computer Science Group



← The other members of the MCS group were not involved in this particular research, but they did all sorts of other really cool stuff!

Theorem

Every discrete, non-invasive, strategy-proof algorithm for cake cutting for hungry agents is a dictatorship.



Alice and Bob want to split a cake...



Alice



Bob



I-cut-you-choose algorithm

- Alice *cuts* the cake in two pieces that she considers equally “good”.



- Bob chooses the piece he likes best.



- Alice receives the remaining piece.



Envy-freeness

- *I-cut-you-choose* is *envy-free*.
 - If Alice follows the protocol, she is not going to like Bob's piece better than her own piece.
 - If Bob follows the protocol, he is not going to like Alice's piece better than his own piece.

Everyone happy?

Bob seems much better off. I know I'll only receive 50% of the total worth. Bob *might* receive more. Also, my task is harder!



Alice



Bob



Everyone happy?

Hm. I don't care much for red licorice. But Bob absolutely loves it!!



Alice



Bob

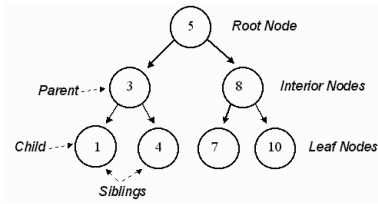






Strategy-proofness

- *I-cut-you-choose* is not **strategy-proof**.
 - Alice might hope to gain from *deviating* from the prescribed behavior in the protocol.
- **Question:** Is there a “reasonable” cake cutting algorithm, “along the lines” of *I-cut-you-choose* that *is* strategy-proof?



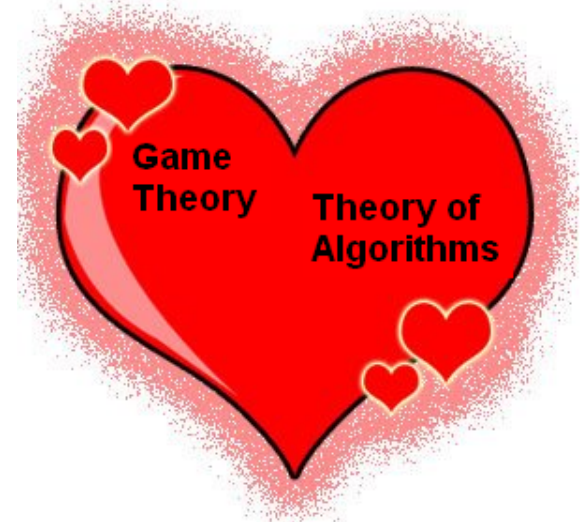
Theorem

Computer science flavored *Model of Computation*

Every discrete, non-invasive, strategy-proof algorithm for cake cutting for hungry agents is a dictatorship.

The entire cake is given to a predetermined player

No puke on cake



Thank you!

- Absolutely no time for questions that have interesting answers!!

