

## Dynamics of Conflict: Mathematical Model of the Interactions Between Two Actors

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We developed a nonlinear model of the interactions between two actors in a conflict which could represent two people, two groups, or two nations. The state of each actor depends on its own state in isolation, its previous state in time, its inertia to change, and the feedback from the other actor. We determined the dynamics of this system both analytically and numerically. When the feedback is small, less than the inertia, then both actors evolve to a neutral state, as if there was no feedback between them. When the feedback exceeds this threshold, then their behavior changes dramatically. For positive-positive feedback, both evolve towards either a positive or a negative state. For negative-negative feedback, one evolves to a positive state and the other to a negative state. For positive-negative feedback, the states of both actors oscillate but ultimately reach a neutral state. There are no limit cycles in this system. Judicious switches of feedback, of one of actor alone, can change the outcome of a conflict. If the loser in a negative-negative feedback conflict temporarily switches to positive feedback, the state of both actors will oscillate. If that actor then switches back to negative feedback at a time when that actor is more positive and the other actor more negative, the roles of loser and winner will be reversed. The model predicts that for this strategy to work the duration of the switch should be inversely proportional to feedback and we are now testing this prediction in laboratory experiments.