Analysing the Cafeteria Dilemma

looking at data from Rysensteen Gymnasium

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Intro

The Canteen Dilemma is an experiment which intends to show what happens when people try to coordinate their actions when there is 'common knowledge' but no 'Common knowledge'. The experiment uses a narrative of two collegues going to work. Every morning they arrive at their workplace between 8:30 am and 9:10 am. And they always arrive at either exactly the same time (1/3 chance), or 5 minutes apart from each other (2/3 chance). If both arrive before 9:00 am, they have time to meet in the canteen for a cup of coffee. If not, they have to go directly to their offices.

The problem here is that even if they know the latest possible arrival time of each other (+ 5 minutes), they don't have Common Knowledge (CK). The Canteen Dilemma shows that without CK you eventually must conclude that you can never meet in the canteen! At least if you do not want to lose any payoffs.

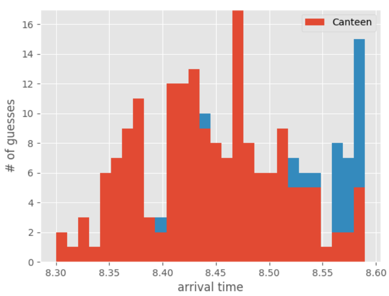
The game was played three times consecutively with 12 groups of random partners for 10 rounds. Payoffs were +1 for both going to the canteen, +.5 for both going to the office, and -2 for uncoordinated responses.

First look

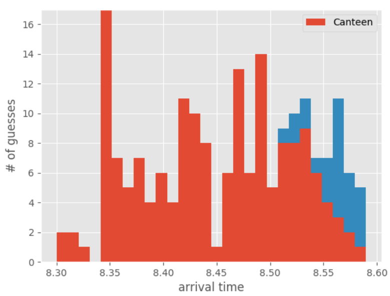
First lets make a python script which can fetch the data and make some initial plots:

We can start by looking at the distribution of guesses for all three games as a function of their arrival time:

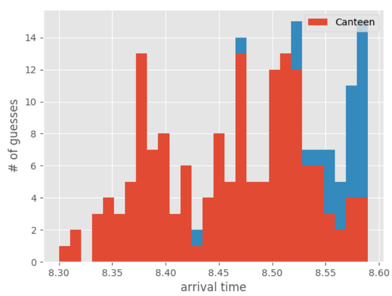
Game 1



Game 2

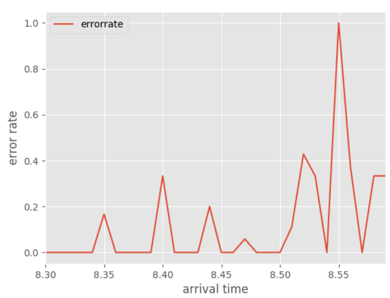
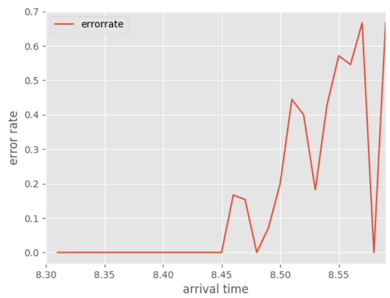
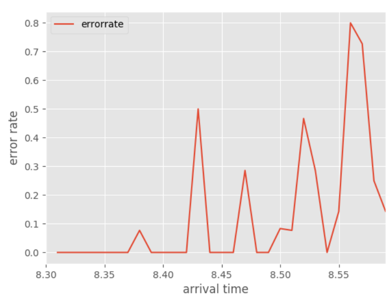


Game 3



The histograms show that a majority only starts to go to the office well after 8:55, contrary to our expectations that the phase transition would happen between 8:53 and 8:55. In fact, the overall error rate (defined as the fraction of uncoordinated choices to the total number of responses which is 120) increased from 10% in game 1 to 19% in game 2 and 18% in game 3.

Breaking down theses numbers a bit further shows that the majority of errors in game 1 occurred at time 8.55 (see graphs below), quite naturally for a level 2 ToM where a player is thinking about what the other players time can be maximally. But when looking at game 2 the maximum error rate moved to 8:57 and 8:59. And in game 3 back to 8:56. This shows that players were willing to gamble more in game 2 than in game 1, and only got partially more careful in game 3.

Game 1	**Game 2**	**Game 3**
		

This behaviour is odd considering that we expected the opposite. The reason is probably the payoff structure. The planned payoff struture was an automatic participation fee of $0.50, a bonus of $0.06 for both going to the canteen before 9am and a bonus of $0.04 for both going to the office (any time) with the caveat that failed coordination would wipe out all bonuses and participants would go home with the participation fee only. Instead we implemented a payoff pennalizing failed coordination with only -2 point, giving them an incentive to speculate on probabilities: If winning +1 has a 2/3 chance to occur due to the rules, and loosing has a 1/3 chance to occur, those numbers cancel each other, and it effectively becomes a matter of gambling only 0.5 poins (the payoff for both going to the office).

One can say that it probably seemed rational to decide upon a cut-off point around 8:56 or 8:57 even though all arrival times from 8:55 to 8:59 yield the same probabilities.

Measures of certainty

blablab…

The clash of strategies

blablab…