

## **The Zebra Crossing Game – a game theoretic model to explain counter-rule interaction between cars and cyclists**

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### **ABSTRACT**

In Norway, bicyclists are allowed to cycle on the pavements and cyclists and pedestrians also share dedicated and common tracks for walking and cycling. Crossings between such tracks and the roadway are normally marked with zebra crossings. When cyclists cross the road either from a pavement or from a cycle (and walking) track, they are supposed to yield to crossing traffic on the road. However, when pedestrians cross over the zebra crossings the cars must yield according to the law.

In such crossing situations, the cyclists have three options. They can (a) yield to the cars, (b) cycle over the zebra crossing (and risk a collision), or (c) jump off their bicycle and walk over the zebra crossing, and thus force the car drivers to yield. The drivers have two choices, either to drive (x) or to yield (y). According to the rules the solution is a/x or c/y. However, it can be shown that neither of these solutions are in equilibrium, and the game theoretic solution to the game is in fact b/y, i.e. that the cyclists cycle over the zebra crossing and the cars yield, contrary to what the traffic rule prescribes. Thus, according to game theoretic reasoning one should expect the normal solution in road traffic would be that drivers yield to cyclists in zebra crossings.

In order to test the hypothesis, empirical observations of crossing behaviour was conducted in two crossing situations in Oslo, Norway, one crossing situation where cyclists approached from the pavement and another situation where cyclists came from a crossing cycle and walking track. The results reveal that actual crossing behaviour follows the expectation from the game theoretic model and not the traffic rules.

The results show that game theoretic modelling can be a valuable tool to understand road user interaction [1][2].

**Keywords:** cyclists, cars, interaction, game theory.

### **REFERENCES**

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