Mathematische Modellierung: Project Proposal

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For our project in Mathematische Modellierung, we want to examine strategies for managing table-space and customers in a restaurant. Thus, the basic system we're interested in is the restaurant itself.

There are some number and sizes of tables available (and restricted space of course), so a limited possibility to assign customers to seats. On the other hand, customers may enter the restaurant from outside (like a "birth process" if we consider the restaurant's interior as some population of customers), get served inside and finally leave (the accompanying "death process").

However, customers usually come in groups of different sizes (alone, in pairs or even larger chunks); but in any case, the waiters must not divide a group upon seperate tables. Similarly, it is also not a good idea to join more than one group on the same table. Depending on how "well" customers are served (how long they have to wait for a table, if they have to share it with another group and the like) they pay tips for the waiters.

The fundamental question that arises and should be the goal (or one of the main goals, should we find other interesting points during the course of the project) is how the waiters should behave in order to maximize their win (and improve customer service). Possible decisions to be made that influence "the game" are whether to join two smaller tables for a large group or save them for a larger group that may come soon, whether to put two groups at the same table or whether to put, for instance, two people at a free table suited for four and waste the two places or whether to send them away and hope a four-people-group will come shortly.

For analysing these situations, we will build a stochastic model and describe the system with probabilities of certain groups entering (which may themselves depend on the time of day!), some distribution of the time needed to serve a group (depending on the number of customers present?) and some measure to define, how tips are distributed depending on service facts.

The model worked out that way can then be put to test using computer simulation based on the assumptions made about probabilities to check our strategies really produce a good fall-out on tips and to compare different possible strategies. In addition, we will try to find statistics to back our assumptions about customer flow and service times to get a realistic image of the associated real-world situation.