TITLE: Fuzzy Systems Design **AUTHOR**: Giacomo Garbarino **DATE**: 31/05/2022

HOMEWORK DESCRIPTION

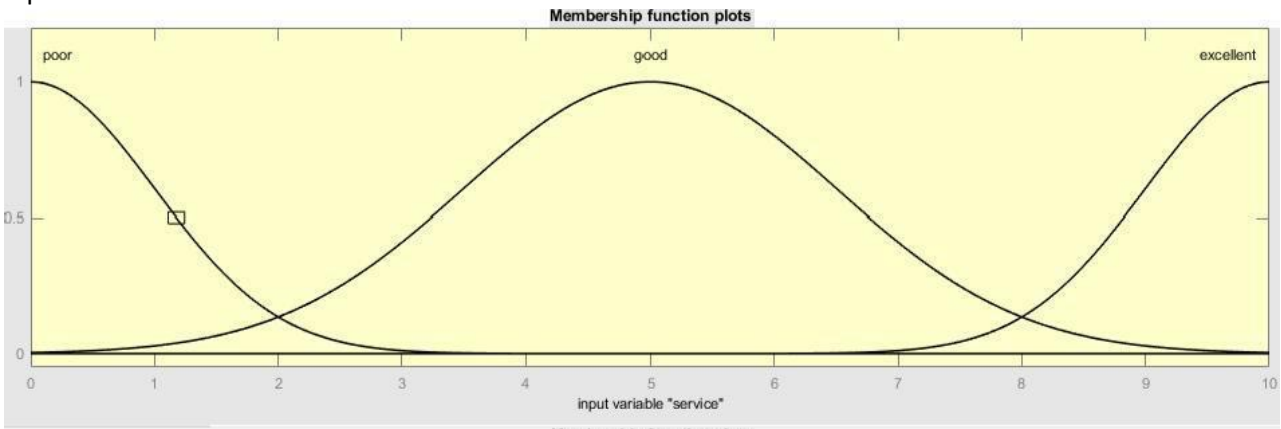
This homework consist of three tasks: designing the tip calculator of the tutorial provided by Matlab with some changes, designing an air conditioner and designing a mental state model.

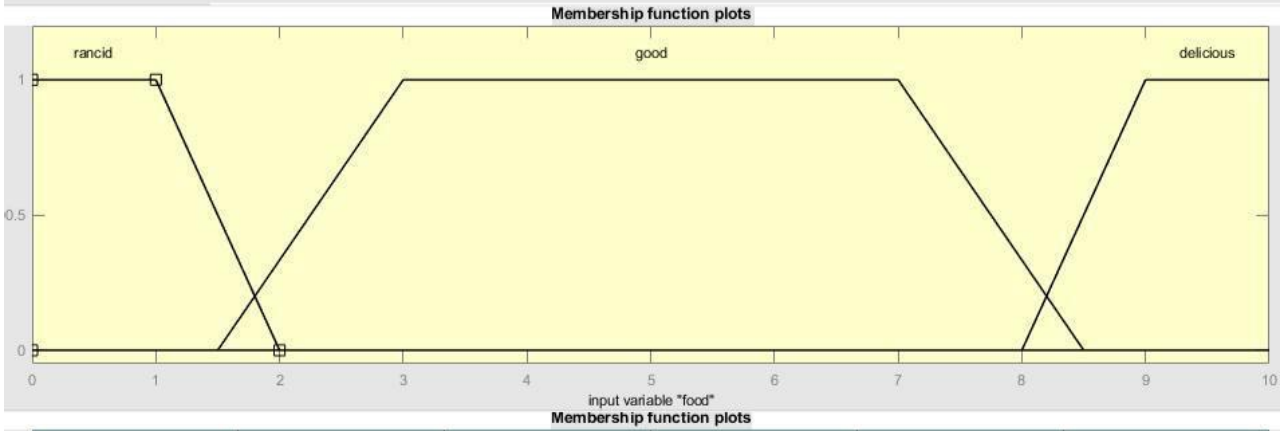
HOMEWORK APPROACH

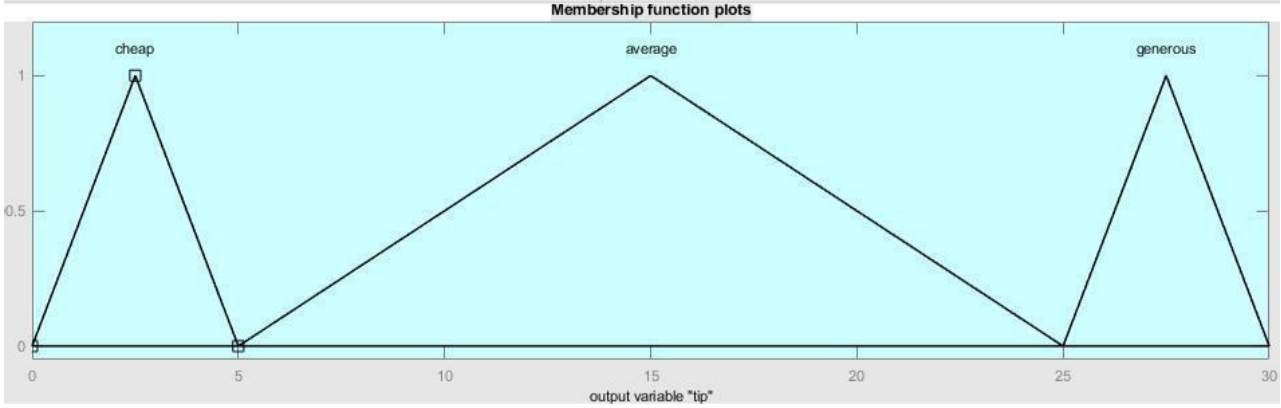
The tip calculator has been implemented following the tutorials of Matlab, but with some little changes of the values of the membership functions and the food input variable has three membership functions instead of two: it has been added the “Good” membership function, so the tip has an average value when the service is good or the food is good. The air conditioner and the mental state model have been implemented in the same way of the tip calculator but with different values and types of membership functions and according to reasonable considerations.

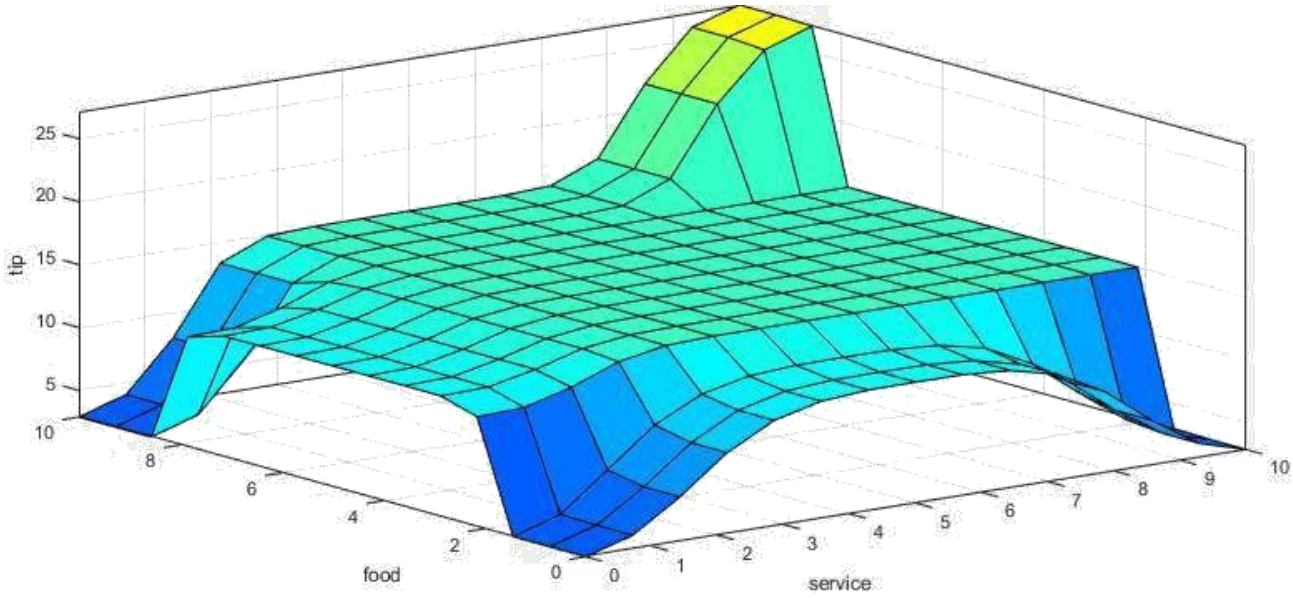
GRAPHS

Tip calculator model:

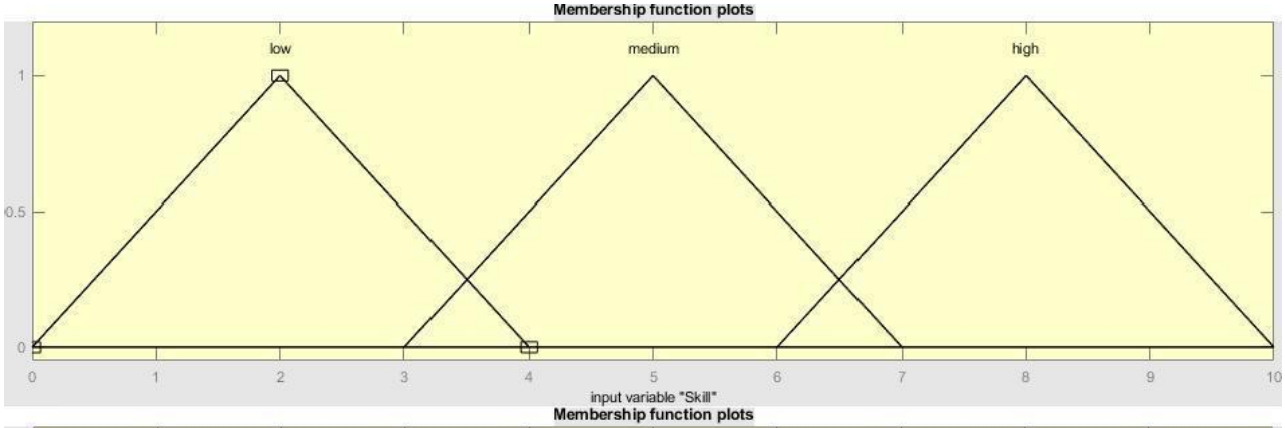


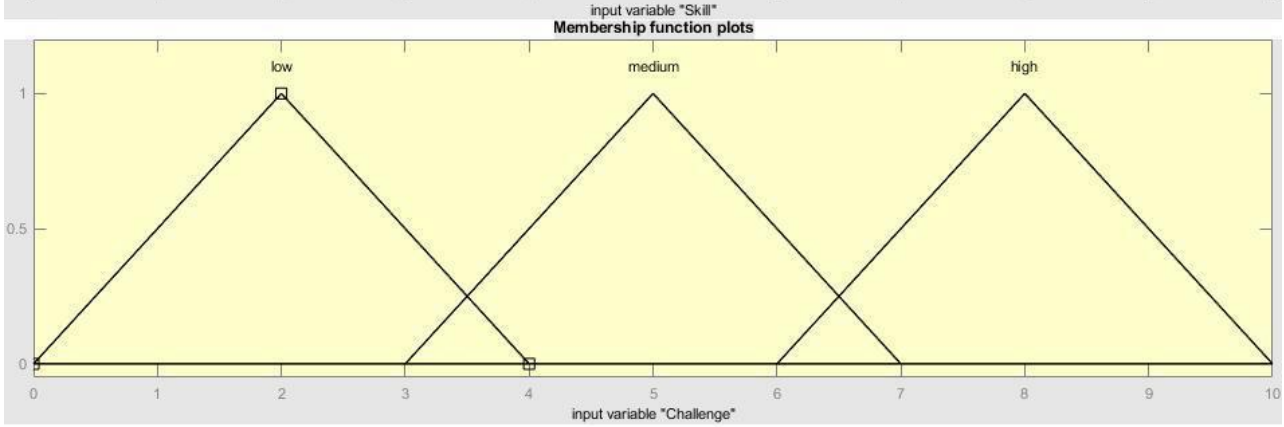


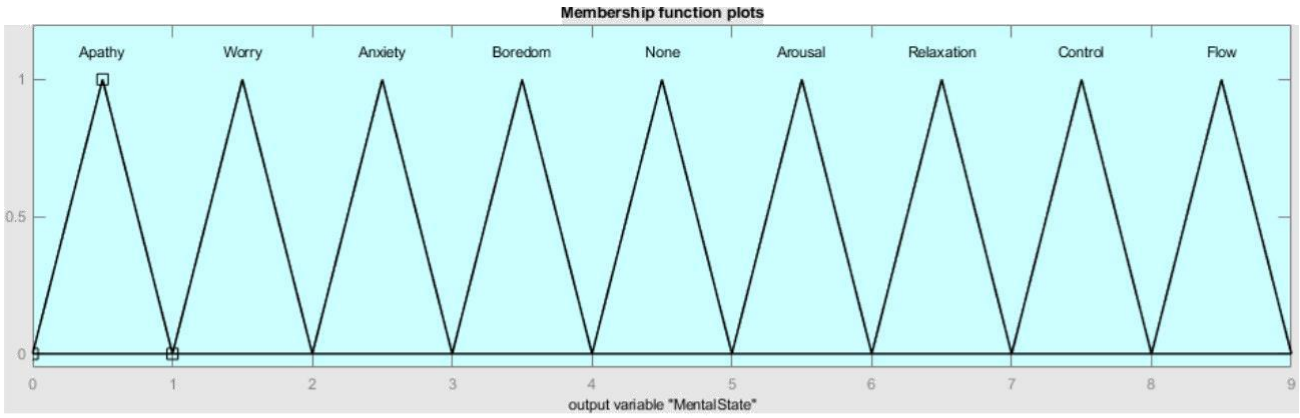


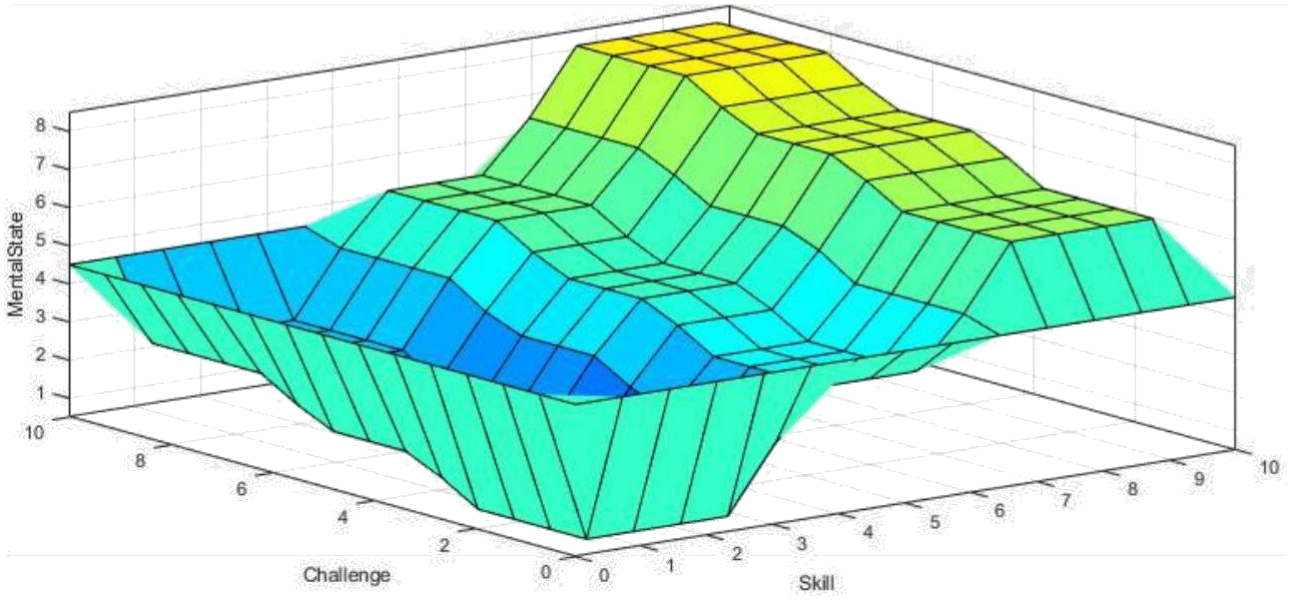


Since in general it's difficult to estimate if a dish is rancid or excellent due to people's tastes and since they're extreme judgments, the good membership function covers a wide range, while the rancid and excellent membership functions cover a very short range, so the resulting surface is almost flat as expected. Driving flow model:

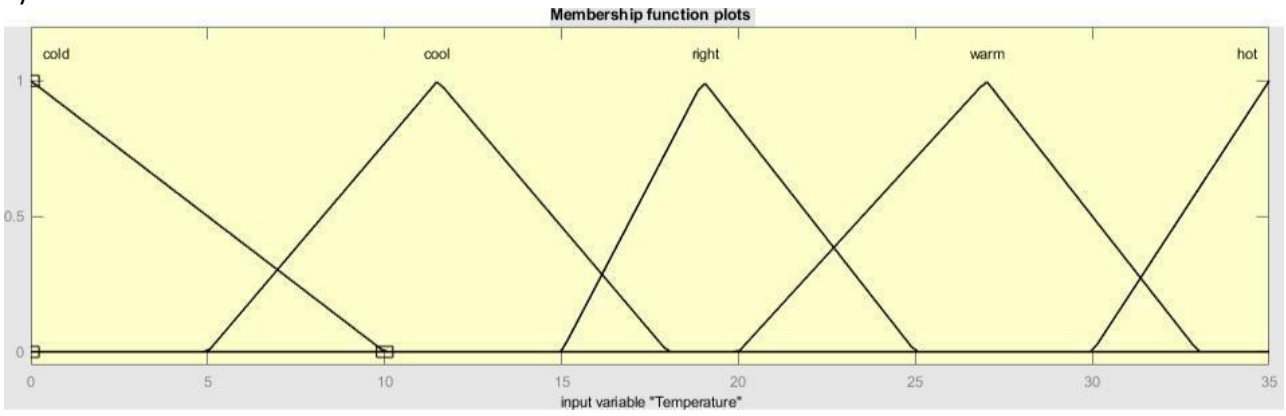


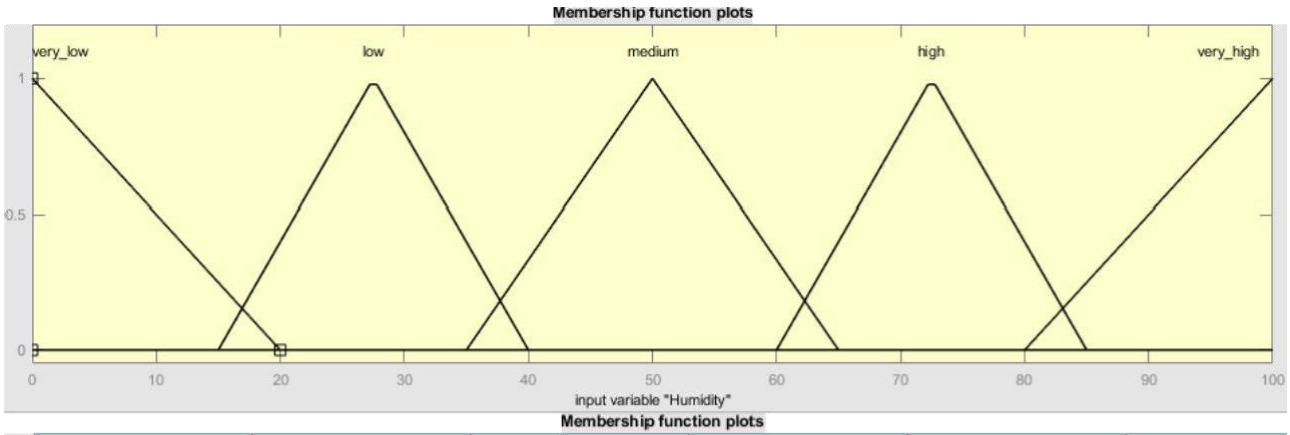


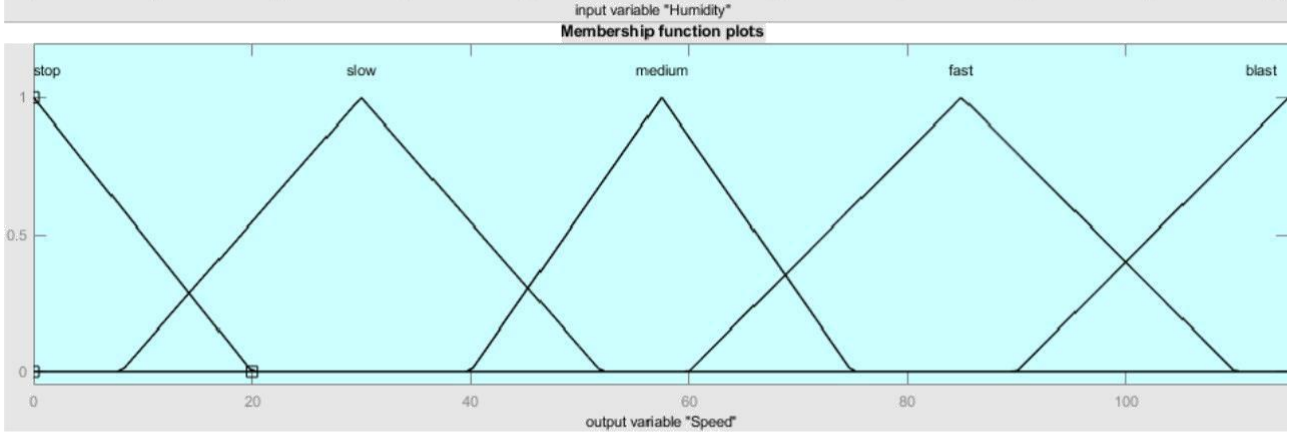


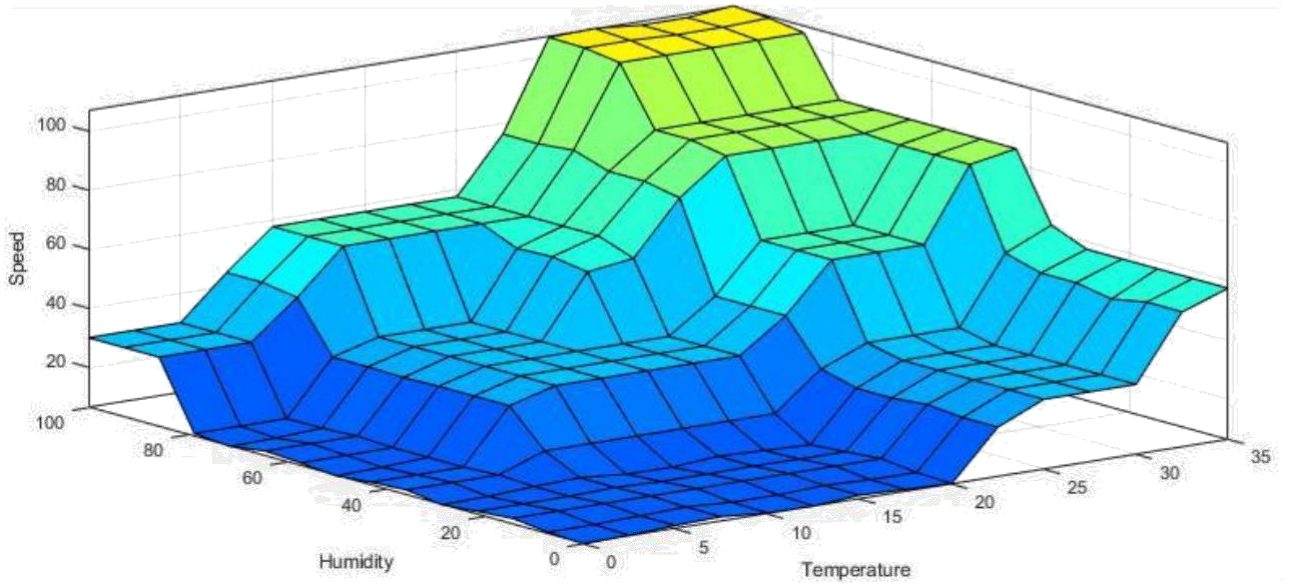


In this context, it's too difficult to quantify the ranges of the membership functions relatives to these adjectives, so the most reasonable way is treating them equally. As expected, the resulting surface is symmetric. Air conditioner model:









According to the evaluation of the temperature by common people and humidity's percentages in the real words, the ranges of the membership functions are quite similar to each other. Since an air conditioner should stop when the temperature is quite low regardless of the humidity, the resulting surface threedimensionally increases in height quickly.