Common Sense Addition Explained by Hurwicz Optimism-Pessimism Criterion

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Common sense addition. Suppose that we have two factors that affect the accuracy of a measuring instrument. One factor leads to errors $\pm 10\%$ – meaning that the resulting error component can take any value from -10% to $+10\%$. The second factor leads to errors of $\pm 0.1\%$. What is the overall error?

From the purely mathematical viewpoint, the largest possible error is 10.1%. However, from the common sense viewpoint, an engineer would say: 10%.

A similar common sense addition occurs in other situations as well. For example, if we have a car that weight 1 ton, and we place a coke can that weighs 0.35 kg in the car, what will be now the weight of the car? Mathematics says 1,000.35 kg, but common sense clearly says: still 1 ton.

How can we explain this common sense addition?

Hurwicz optimism-pessimism criterion. In many practical situations, we do not know the value of a quantity, we only know the interval of its possible values, are ubiquitous. In such situations, decision theory recommends using *Hurwicz criterion*: selecting the value $\alpha \cdot \underline{\Delta}_(1-\alpha) \cdot \overline{\Delta}$ for some $\alpha \in [0,1]$. A usual recommendation is to use $\alpha = 0.5$.

What we do. In this talk, we show that by using Hurwicz optimism-pessimism criterion explains, we can explain the commonsense addition phenomenon.