Fuzzy Controller Class

This class implements a fuzzy controller containing the rules and membership functions depicted in fuzzy_settings.pdf. If you don't know how a fuzzy controller works, check Fuzzy.pdf for more information. To summarize, it works by replacing a PID to control a system, receiving the error as the input and outputting the control signal. For this controller, it receives a ratio to quantify the position of the robot and its angle, and outputs the left and right wheel velocity in percentage. To understand how the ratio is calculated, let b_R and b_L be the right and left model's intercept, respectively. Let $b_{max} = max(|b_R|,|b_L|)$ and $b_{min} = min(|b_R|,|b_L|)$, this way we can calculate the ratio by doing $r = \dfrac{b_{min}}{b_{max}} - 1$ and multiply by -1 if $|b_R| < |b_L|$. This class utilizes the open library fuzzylite, for more information go to https://fuzzylite.com/.

Public Methods

◆ FuzzyController ( )

FuzzyController::FuzzyController
(
    fl::Tnorm* AndMethod = new fl::Minimum,
    fl::Snorm* OrMethod = new fl::Maximum,
    fl::Tnorm* ImplicationMethod = new fl::AlgebraicProduct,
    fl::Snorm* AggregationMethod = new fl::Maximum,
    fl::Defuzzifier* defuzzMethod = new fl::Centroid(100)
)

Default constructor that assigns default operators to the fuzzy controller, adding the possibility of changing

Parameters
    AndMethod is the and / conjunction operator
    OrMethod is the or / disjunction operator
    ImplicationMethod is the implication operator
    AggregationMethod is the aggregation operator
    defuzzMethod is the defuzzification operator

◆ friend operator << ( )

std::ostream & operator << (std::ostream & out, const FuzzyController & fz)

Print fuzzy controller object

Parameters
    out is where to print, normally terminal
    fz is the object to be printed