**ALGORITHM (FUZZY CONTROLLER) DOCUMENTATION GUIDE**

Provide the required details using the following guide.

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| **Components** | **Details** | **Intructions** |
| Inputs | X = A \* theta + B \* theta\_dot  Y = C \* x + D \* x\_dot  A=3,B=0.4, C=4.5, D=4; | Specify all the inputs, including the coefficients (constants). Note: This assignment requires implementing Yamakawa’s fuzzy controller design. |
| Fuzzy Rules | X(angle): NL Y(x): PL out: NM X(angle): NL Y(x): PS out: NS X(angle): NL Y(x): ZE out: NL X(angle): NL Y(x): NS out: NS X(angle): NL Y(x): NL out: NVL X(angle): NS Y(x): PL out: NS X(angle): NS Y(x): PS out: NM X(angle): NS Y(x): ZE out: NS X(angle): NS Y(x): NS out: NL X(angle): NS Y(x): NL out: NS X(angle): ZE Y(x): PL out: NM X(angle): ZE Y(x): PS out: NS X(angle): ZE Y(x): ZE out: ZE X(angle): ZE Y(x): NS out: NS X(angle): ZE Y(x): NL out: PM X(angle): PS Y(x): PL out: PS X(angle): PS Y(x): PS out: PL X(angle): PS Y(x): ZE out: PS X(angle): PS Y(x): NS out: PM X(angle): PS Y(x): NL out: PS X(angle): PL Y(x): PL out: PVL X(angle): PL Y(x): PS out: PS X(angle): PL Y(x): ZE out: PL X(angle): PL Y(x): NS out: PS X(angle): PL Y(x): NL out: PM | Specify the fuzzy rules used in your system. |
| Fuzzy Membership functions | NL(X):  a = 0, b = 0 ,c = -30, d = -9  NS(X):  a = -10, b = -8, c = -3, d = 0  ZE(X):  a = -0.5, b = -0, c = 0, d =0.5  PS(X):  A = 0, b = 3, c = 8, d = 10  PL(X):  a = 9, b =30, c = 0, d = 0    NL(Y):  a = 0, b = 0 ,c = -2.1, d = -1.3  NS(Y):  a = -2.1, b = -1.3, c = -1.0, d = 0  ZE(Y):  a = -1.0, b = -0.5, c = 0.5, d =1.0  PS(Y):  A = 0, b = 1.0, c = 1.3, d = 2.1  PL(Y):  a = 1.3, b =2.1, c = 0, d = 0 | Specify the parameters of all membership functions used for each of the inputs. (e.g. input, type, fuzzy set name, a=?, b=?, c=?, d=?)  Use the Fuzzy Sets Viewer Excel file to generate a diagram. |
| Defuzzification Method | centroid defuzzification method. | Specify the method used. |