#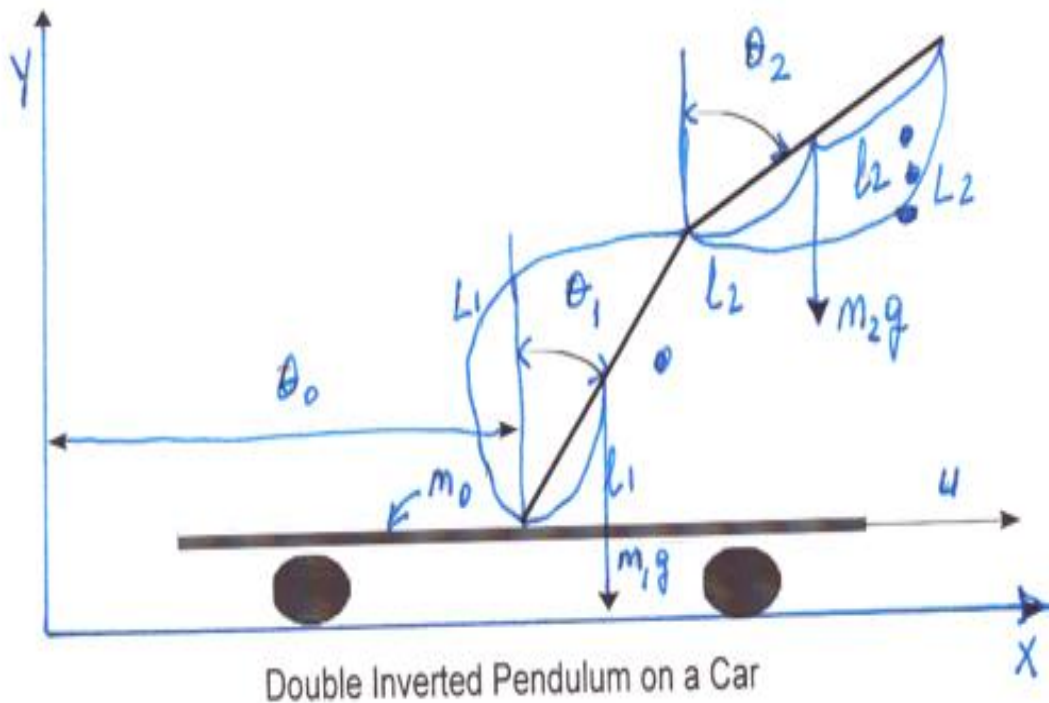 YILDIZ TECHNICAL UNIVERSITY, FACULTY OF ELECTRICAL AND ELECTRONICS ENGINEERING, FALL TERM OF KOM 5114 FUZZY LOGIC CONTROL(INSTITUTE OF SCIENCES)HOMEWORK FOR MIDTERM AND FALL EXAM

Double Inverted Pendulum on a Car

Subscripts 0,1,2 used with the aforementioned parameters refer to the cart, first (bottom) pendulum and second (top) pendulum correspondingly.

Parameter value m_0=1,5 kg, m_1=0,5 kg, m_2= 0,75 kg, L1= 0,5 m, L2= 0,75 m.

Where θ_1 and θ_2 denotes the angle(in radians) of the pendulum from the vertical, $d\theta_1/dt$ and $d\theta_2/dt$ are angular velocities. G=9,8 m/s^2 is the gravity constant. m_0 is mass of the cart, m_1 is mass of the first

pendulum link, m_2 is mass of the second pendulum link. L_1 is length of the first pendulum link, L2 is the second pendulum link. You will solve this double link inverted pendulum using Takagi-Sugeno Method. Firstly, You will find the Dynamic Equations of this system. Finding the premise variables you will design Fuzzy rules with consequent terms which is called State Equations. After that you will design system Matrices, Input(Control) Matrices, Output Matrices. There will be Midterm exam homework. Up to this point, the next ones will be Final homework, After Solving the state equations of each rule in MATLAB program, you will draw the curves of each state variables in MATLAB and interpret them.

EVERY ONE WİLL DO THEIR HOMEWORKS. BE AWARE THAT IF THERE ARE THE LEAST SIMILAR HOMEWORK, BOTH OR MORE STUDENTS WILL GET ZERO.

DO NOT FORGET TO WRITE YOUR NAME, SURNAME AND NUMBER AT THE TOP OF YOUR HOMEWORK PAPER. AFTER SOLVING THESE HOMEWORK, Documents must be uploaded into the UZEM HOMEWORK Unit. At same time YOU WILL SEND ME IT ON 27 DEC 2021 MONDAY between 13:00-19:00 hours. (e-mail: galip.cansever@altinbas.edu.tr)

Galip CANSEVER