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A Comparative Study on Trajectory Tracking of Robotic Arm

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Abstract

Earlier Literature present are the paper based on soft computing technique, soft computing is easily deployed technique which used in design of controller. There are so many application areas such as mechatronic field etc. In mechatronic trajectory controller is of great use. To control the trajectory closeness of trajectory points is very important and all projects are stick to the basics of coordinate system. The target of all the projects is entirely focused on reducing the error between the estimated values to the actual one. So far this concept is working but if the noises are introduced the refinement is required. Surveyed paper's methodologies are worked out with fuzzy logic and neural network. There are lot of things to be consider when comes to the trajectory tracking comes into the picture such as torque, angular rotation etc. This survey paper brings all the aspects and problems of trajectory tracking and solution to that problem.

Keywords*:* MSC Adams, Fuzzy logic, MATLAB, Normalization, Neural Network, Fractional order control, Sliding mode control, Soft Computing

Introduction

Present age is the age of technology, so to walk parallel with that advancement new ideas are required. And the new ideas were also launched to serve the human kind. Mechatronic is also one of the interesting fields, especially the robotic arm system prototype. There are lots of talking is going on but duly the result are producing is good not excellent especially the tracking of the trajectory of robotic arm. For this, length of arm, sampling of points, closeness of sampling points, noise and surroundings plays a vital role in stability of system.

Shape improvement is a component of the sphere of best management theory. The standard downside is to seek out the form that is perfect in this it minimizes a particular value useful whereas satisfying given constraints. In several cases, the useful being resolved depends on the answer of a given partial equation outlined on the variable domain form improvement strategies add a set of allowable shapes that have mounted topological properties, like having mounted range of holes in them.

Below there are three figures showing Figure-1 shows the original shape of the robotic arm which is unoptimized. Figure-2 shows that the proposed or estimated shape of the robotic arm. And final Figure-3 shows the optimized arm which is optimized by engineering tool or software.

Optimization of the robotic arm of prototype is very important because optimized arm have good angular movement. Shape optimized things always give better result than unoptimized arm. Paper organization are as follows second section is literature survey, third section is problem definition in this problems are discussed, fourth section methodology of references, fifth section is result discussion and sixth section is conclusion and future will discussed.

Literature Survey

In literature we tend to found that the paper centered on the applying and therefore the usage of sentimental computing technique. Soft-computing technique ways area unit with success deployed in wide field of mechatronic and robotic system management. It's potential to get wonderful leads to terms of performance and stability[1]. Supported theoretical assumption, modelling and simulation ways, a good approach to the management of method with sturdy and indefinable uncertainties is meant. Despite the actual fact there are a unit still several unsolved theoretical problems associated with the matter uncertainty formal logic has been applied with success in this areas e.g. knowledgeable system, information acquisition and merging call support, info retrieval etc.[2].

In the literature the neural network arm controller is predicated on easy multi-layer feed-forward neural network and act as compensator i.e. forward controller while not feedback. This sort of system configuration naturally cannot be as precise the same feedback system. sigmoid operate used for somatic cell activation is same for all neurons and thought of that normalization as linear scale transformation and so the minimum to that the network converges must always be a similar[3,4].

Problem Defination: When we come across the point problem definition it is very obvious to define what is the existing problem and what was the past one. It is also very important know whether the existing problem is existing alone or it is influenced by the past one. As the days are passing solution is emerging with the help of literatures, formulae and statistics.

The journey of trajectory point tracking comes to halt or require some extra efforts when there issue of closeness of sampling trajectory point arises because if the trajectory points are not in the surround of the reference point. Then the system or prototype is going to verge of instability or might be the system or prototype becomes unstable.

So sampling of trajectory points with variable sampling or fixed sampling closeness of trajectory points should be there in order to make the system stable.

Methodology

First reference paper presents a fuzzy controller style procedure which might be employed in the system of linear or non-linear kind. There is no need of system identification i.e. it is not necessary to explain the controlled system by any of the standard forms (continuous or separate transfer operate, state house model, differential equation). Trajectory sampling algorithm is used by taking n^{th} point with 2 dimension space coordinates in selected horizon.

The combination sampling algorithmic rule supported the space to the initial purpose and sampling algorithmic rule supported the amendment of the mechanical phenomenon direction area unit used[5].

Co-simulation by master's degree Adams and MATLAB-Simulink is completed. Cooperation of Adams and MATLAB software system environments is predicated on kinematic-dynamic model created in Adams co-simulation is initialized running simulation in MATLAB-Simulink . However obvious impact of co-simulation in increasing complexness of calculation. Knowledge transfer in Adams is accomplished by variables allotted to inputs and outputs MIMO controller is employed. Output of controller is force that lead to movement of robotic arm via Adams[1].

Second reference paper presents the possibilities to control the mechatronic system. The main preference of mathematical logic to explain the mechatronic system is ability to mathematically describe data expressed in words. The management algorithmic rule supported mathematical logic are used for management of following mechatronic system. In simulation a simplified automotive model contains four wheels, spring struts on every wheel and sphere body representing the middle of mass. Here the MSC Adams is used to simulate this environment and co-simulation is done by MATLAB-Simulink.

All four wheels of automobile have a similar distance from center of mass. The current case was the motion flight on coordinate axis elite as output variable or controlled variable respective the front wheels as input. Due to practical reasons a discrete filter is placed used of this filter is that to loop with time derivation of the management deviation to induce within the fuzzy controller acceptable values of the input variable control deviation is difference between feedback and reference variable[2].

Third paper proposed the stereovision object chase system used this method robotic arm controller supported the neural network. Methodology of standardization of input and output knowledge is employed to coach the neural network controller for controlling the robotic arm the inner kinematic parameters is directly in coordinate measurement[3].

In order to check stereovision trailing application a fanatical controller is meant to manage the motion of the arm of the golem. For this purpose multilayer feed-forward neural network with 3 inputs and 3 outputs and 2 hidden layer every consisting of 4 new neurons is employed. Output of the neural network is that the values of the triplet of the motor positions.

In this paper focus is on rationalization of the importance of coaching information standardization method of normalization and optimization. Neural network is used for three degree of freedom.

Fourth paper discusses an incomplete integration theme for FSMC (fuzzy slippery mode control). Thanks to its constant quantity redundancy the ANFIS (Neuro-fuzzy abstract thought system) structure is employed because the controller. Paper basically focused on the parameter adjustment to improve fuzzy sliding-mode control to make it robust with the help of ANFIS.

Fuzzy logic is employed to get AN accommodative physical phenomenon[5]. Palm presents the extension of the physical phenomenon style. By mistreatment the opaqueness for reducing the adverse effects of chattering in robotic dynamics[6].

In order to attain smart exactness its FSMC frame work has been applied to estimate the non-linear terms within the dynamics of an automaton[7]. Generally structure of a fuzzy logical thinking system is that the crisp input square measure fuzzified through the computation of membership functions. This much maps the input area to a feature area characterized by fuzzy sets.

Within the logical thinking engine, computed membership values for every rule square measure regenerate into a firing strength that indicates the activation level of the rule. A defuzzifier maps the feature vector to a scalar output price that is crisp. Paper provides AN edge for the hit time and parallel to the claims for adaption them necessary target the standard of neural network coaching for adaption scheme.

Comparative Results

On comparing fuzzy controller output the reference variable and simulated variable have deviation and this deviation is not a constant deviation and varying all the time due to the looping of fuzzy controller the error becomes small not zero. Table-1 shows the deviation[1].

With this table we referred that deviation is not constant same with ANFS because in normalization of parameter the parameter somehow not constant due to offset or other reason. So refinement is required to make this constant or zero.

Table-1
Deviation from Reference Variable to Simulated variable

Time (in secs)	Reference variable (required velocity)	Simulated variable (reached velocity)	Deviation
0	0	0	0
1	0	0.3	-0.3
2	5.1	4	2
4	10.9	10.7	0.2
6	10.9	10.6	0.3
8	10.9	10.9	0
10	10.9	10.6	0.3

Figure-1
Unoptimized shape (original)

Figure-2
Proposed optimized shape

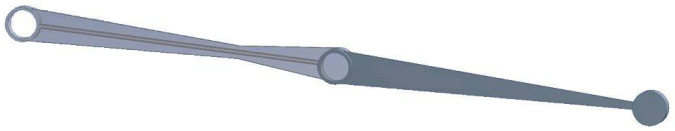

Figure-3
Final optimized shape

Conclusion

In all we find that there is lots of area which is lacking behind to the actual. The main point is that the optimized system is needed and if there is small deviation in coordinates then there are great changes in angle deviation which could take the system to the verge of instability. To solve the inverse kinematic drawback victimization complicated system of multiple standard neural network typically need sophisticated learning algorithms and protracted implementation. There is also lacking the proof for bounded evolution of adjustable normalized parameter. In order to realize smart exactness its necessary specialize in the standard of neural network coaching. All this literature is related to somehow the coordinate system i.e. the basic for all so basic and foremost improvement is to be done in that area. So coordinate tracking is one of the prospects which will the future scope of that paper.

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