

A WALL CRAFT BOT- WITH PID CONTROLLER

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ABSTRACT

The purpose of this paper is to eliminate the manual control for pick and place system. The robot arm is designed with three joints, two links and three Dc motors. Arduino microcontroller is used to generate the required angular position of the robot joints. In this research, the link length of the robot arm is calculated to enable carrying the desire object weight. The position of the robot arm end effector is calculated with kinematic modeling method which include forward and inverse kinematic. Robotic tool box is used to task the position of the robot arm using forward and inverse kinematic. PID control method is used for accurate position of the end effector. In this research the gain of the PID controller is tuned by using the Ziegler-Nichol method. To solve the strong nonlinearity and coupling problems in robot manipulator control, two novel robust adaptive PID control schemes are proposed in this paper with known or unknown upper bound of the external disturbances controllers.

Keywords: PID Controller, Brick Laying Robotic Arm, Servo Motor Etc.

I. INTRODUCTION

PID control is the most widespread technique for the control of industrial robot arms. However, the adoption of PID control is not adequately supported by a theoretical basis, since the results presented in the literature are of dubious interpretation and difficult, when not impossible, to verify. Motivated by this lack of theoretical support, this paper presents a novel proof for the stability of rigid robot arms controlled by PID algorithms: the proof is based on a model of the robot where the nominal decoupled linear part is emphasized. The main result consists in a simple condition between the exponential stability degree of the nominal closed loop system and the parameters of a bound on the nonlinear terms in the dynamic model of the mechanical manipulator. Some considerations are also worked out on the relations between the eigenvalues of the nominal system and the extension of the stability region. The theoretical results are finally verified on a simple two DOF example. The interest in robotic arms has been increasing during the course of the years at a vertiginous speed. The futuristic air that surrounds them has aroused the curiosity of many companies, which have made great investments on their development. Their coordinated and smooth movements define these devices as dynamic machines. And their great precision is only compared to its overwhelming accuracy. It can be stated that these robotic structures are a superb engineering work. More exactly, the engineering branches that participate in their design are the mechanical, electronics and control ones, working together so as to have a mechatronic design. In this paper, the main elements are the robotic arm and its control. Therefore, a literature review along the robotic arms is made. Besides, their applications and importance for the industries are also discussed. Additionally, the significant need of a controller in the system to ensure a high efficiency is mentioned too. And for achieving a great control of the process, the PID controller is recommended. Consequently, the different ways of calculating the parameters of the PID controllers are also shown. After completing the literature review and consequently, learning the basis of robotic arms, everything leads to apply this knowledge into a real one.

II. METHODOLOGY

The methodology employed by this paper starts with a deep research on the robotic arms world. It is important to understand every single thing related to these arms, so before starting the project, it has been looked for as much information as possible. Besides, this information is contrasted to check if there is any error or

misleading data among the sources. 1. Robotic Arm – A robotic arm is a programmable mechanical arm that is very similar to a real human arm. This is because among its structure, it is possible to identify a shoulder, an elbow and a wrist. Moreover, most of them have a robotic hand or a gripper that work as an end effector, which is the part of the robotic arm that is in contact with the environment. They manage to move autonomously, and actually they already have more applications and capability than a human arm. This is due to although they have fewer degrees of freedom, their joints can move through greater angles, reaching more spots than the human one. Also, if the robotic arm is told to hold an object in the air, it will be able to do it indefinitely, while the human being would get exhausted after some time. Therefore, the importance of the robotic arms has been increasing more and more through the pass of the years.

1. PID Controller - A PID controller is an instrument used to drive systems towards its target positions. They use a closed-loop control feedback to maintain the actual output of a system as close to the desired output as possible. For doing these, they have to work directly with the error signal, which is the difference between the set point and the actual output.
2. The PID controller is composed of three different actions, the proportional (P) action, the integral (I) action and the derivative (D) action. Each action has a different functionality that can help the process to improve its performance. And depending on the system requirements, a certain combination of these actions is used.

III. RESULT AND DISCUSSION

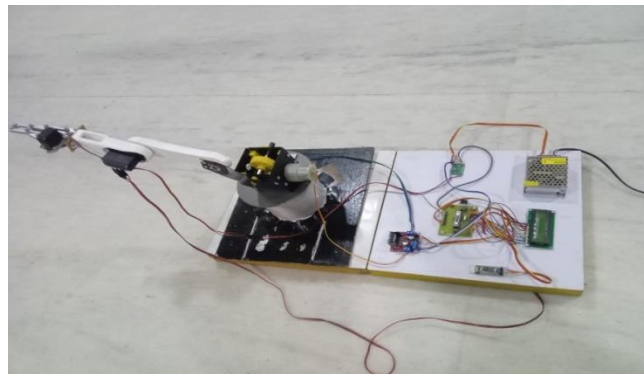


Figure 2:

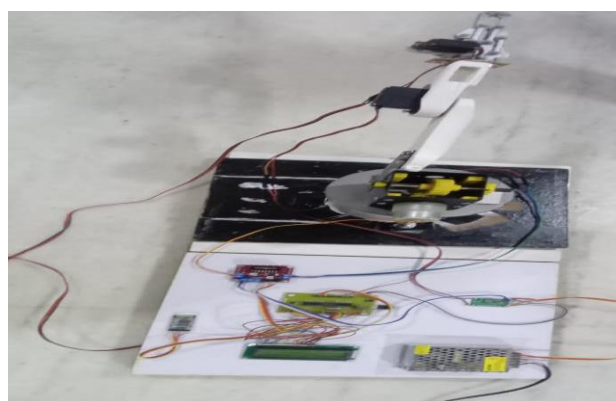


Figure 3:

IV. CONCLUSION

This paper has been useful to approach people who did not know anything about robotic arms to a more than a basic knowledge on these manipulators. It has walked along a pathway in which the history of the robotic arms has been introduced prior to a presentation of a real design. Firstly, an overview has started the project putting forward the main topic and its motivations. And then, the methodology has defined the strategy in which the goals of the project have been followed. After that, the literature review has started talking about the robotic arms and their importance through the history. This introduction has been linked to the essential need of a controller in order to get a proper efficiency. Moreover, it has been suggested that the best controllers are the

PID ones and also, different methods of designing these PID controllers have been shown.

V. REFERENCES

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