FINAL YEAR PROJECT REPORT

"DESIGN AND IMPLEMENTATION OF AN INVERTED PENDULUM CONTROLLER USING STATE SPACE ANALYSIS"

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“Design and Implementation of an Inverted Pendulum CONTROLLER Using State Space Analysis”

This Project Report is submitted to the Department of Electrical Engineering, School of Engineering, University of Management and Technology as a necessary part of our project for the completion of degree of Bachelor of Science in Electrical Engineering.

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ABSTRACT

Typical inverted pendulum controller system is always quite interesting because it can be resolved through a variety of systems and different ways. This is familiar as anyone tries to stabilize a stick. Basically our project is for those firms and companies who are interested in the design of the system, control system theory, and simple problems solving to develop a feasible operating system. For our project, the inspiration is to design our models mathematically developed in control system course in real-time project implementations.

The designation procedure for our project needed a great hard work for distribution of arranging and understanding before the finalization of our final hardware PCB Design because we found a lot of alternatives but we have to select the one suitable for us. The designation can be divided into many further subsystems which are deeply interconnected. The real implementation procedure for each subsystem is a repetitious procedure for the verification and working of each and every component used and then finally selecting the optimized circuit and implementation. The optimal solution is actually the most efficient solution for designing and implementing our inverted pendulum and mainly it concerns with the balancing of our pendulum.

In designation of our project hardware we faced many problems. When we eliminated our first DC motor, a torque was produced because the first one DC motor installed was too slow to react our stability level. The schematic diagram is finalized on the basis of mathematical analysis of our whole mechanical system including our DC motors. Required parameters of the model are utilized from the experimentation in real time on our inverted pendulum. Our software model was implemented keeping in mind the highly nonlinear behavior of our system. Our system was linearized using the basic principle of system and obviously by the friction introduced internally in our system. So our model at start is behaving like a highly nonlinear system. We started linearizing the system and continuously linearized model was attained at the end. The PIC microcontroller was introduced which was already introduced in recent experimentation procedures as well.

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