PRACTICAL STUDY OF A POWER-SAVING MAGNETIC LEVITATION SYSTEM

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ABSTRACT

THIS THESIS PRESENTS A SINGLE-DEGREE-OF-FREEDOM ELECTROMAGNETIC SUSPENSION SYSTEM CONTROL BY USING THE PID CONTROLLER AND GAIN SCHEDULING CONTROLLER, RESPECTIVELY. THE CHARACTERISTICS OF THESE TWO CONTROLLERS ARE COMPARED. WE USE THE TRADITIONAL CONSTANT GAP METHOD TO DESIGN THE CONTROLLER. FIRST, WHEN LOAD INCREASE, THE ELECTROMAGNET COIL CURRENT ALSO INCREASE TO RAISE MAGNETIC FORCE, IN ORDER TO KEEP THE CARRIER STILL LEVITATE ON THE SAME GAP, BUT THIS METHOD CONSUME A LOT OF ENERGY. SECONDLY WE TRY THE "ZERO POWER" METHOD, THIS METHOD UTILIZE AN INTEGRATING COMPENSATOR FOR ELECTROMAGNET COIL CURRENT DURING THE LEVITATION STAGE, THEN THE CARRIER WILL AUTOMATICALLY ADJUST THE EQUILIBRIUM POINT TO THE POSITION WHICH THE WEIGHT OF THE CARRIER IS EQUAL TO THE FORCE OF THE HYBRID MAGNET, WHEN THE LOAD IS CHANGED, THIS METHOD CAN SUPPORT LOW POWER CONSUMPTION AND GET THE BETTER STEADY LEVITATION. TO OBTAIN THE COMFORTABLE AND SAFETY OF THE TRANSPORTATION SYSTEM, WE DESIGN A SMOOTH TRAJECTORY. TO KEEP THE CARRIER GENTLE TAKEOFF AND SMOOTH LANDING. EXPERIMENTAL RESULTS SHOWS THAT THE CONTROLLERS WE DESIGNED ARE REALLY WORK.

Keywords : PID CONTROLLER, GAIN SCHEDULING CONTROLLER, ELECTROMAGNETIC SUSPENSION SYSTEM, ZERO POWER.

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