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Choosing An Article

For my three articles I researched three major areas of my interests: biomedical control systems, transportation control systems, and robotic control systems. With respect to the biomedical control systems, I believe that the application of control theory could have a significant impact on human recovery time. Dr. Freeman presents an approach to implementing a feedback control system that helps individuals who have suffered a stroke to recover more quickly. However, during my first pass of the article I could tell that the material was highly complex and outside my sphere of knowledge, so I decided to continue on to my next paper concerning transportation control systems. Dr. Xiaohua focuses on several different modeling and control system approaches to large freight trains carrying several tons of materials. From my first pass at the paper, I gathered that the paper was too simple and uninteresting for me to research any further, because the paper was concerned with top level problems like how many controls for the locomotives and braking systems for the wagons should be included, rather than an intricate design of a control system.

Lastly, I reviewed Dr. Marconi's paper on the control of aerial robots. I found this paper particularly fascinating because of the legislation that is being discussed about commercial drone piloting. UAVs are rapidly gaining support in states such as California for the license to buy and operate these craft for various reasons, whether that be intelligence gathering, search and rescue, or (as this paper focuses on), service robots that are no longer constrained to the ground. This idea has profound impacts on both commercial and personal interests. In addition to the multiple benefits of creating an effective control system for a UAV, the research going on is on the cutting edge. For these reasons, the first pass at the article convinced me to chose it for my summary.

Literary Analysis

This paper is primarily concerned with the implementation of a control system for a ducted fan to pilot a UAV so that it may physically interact with an unknown environment. There are multiple economic and scientific benefits behind creating such a system, namely the ability for a robot to perform any number of services in the air for individuals. To begin with, the author briefly discusses force feedback for robotic systems. However, to understand the forces involved in this particular robot, the author goes into

detail about the mechanisms of a ducted fan. The author frames the problem by going into an in depth discussion describing the forces involved when the robot interacts with environment, followed by his solution involving a hybrid force and position control feedback system. Lastly, the author backs up his hypothesis with data from simulation results. He concludes with his firm belief that his system is dependable, as well as ideas for future work.

This paper is concerned with a subset of Control Theory that has to do with forces and position control. This paper is similar to the papers published in the area of UAV automated systems. Although he does not include an analysis of a full output feedback system (he suggests this as further work), his model of interaction between the robot and its unknown environment is correct and extremely thorough. The analytical model of forces and of the ducted fan with regards to UAV capabilities and the system he describes for the UAV to "explore" its surroundings are the main contributions from this paper. I have to admit that while reading this paper, I did not understand all of the math behind it even after a significant number of hours invested into reading it. However, the principles underlying this system were easily extracted from the paper, and I believe that the author did an excellent job of communicating them. In this system, the UAV is allowed to slide vertically while applying a certain force. The resulting offsets are then recorded and used to drive a control system through the method of zero dynamics.

Citations

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[2] Xiaohua Xia; Jiangfeng Zhang, "Modeling and Control of Heavy-Haul Trains [Applications of Control]," *Control Systems, IEEE* , vol.31, no.4, pp.18,31, Aug. 2011
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