Mathematical Modeling of Physiological Control Systems

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Physiological control modelling, as you all know, has been critical for the development of many improved medical diagnostic techniques and new technological therapeutic innovations in recent times. Because of its importance, the study of physiological control systems is required to develop mathematical models.

Mathematical models are needed when quantitative relationships are required to represent the detailed behaviour of the output of a feedback system for a given input or inputs. The development of a mathematical model is usually based on principles from the physical, biological, social, or information sciences. Depending upon an application area and type of control system, the complexity of such models varies widely.

In physiological control systems You need to know physiology (Signal) has relationship in anatomy (system). Anatomy (structure/ construction and shape of the body parts and their relationships to one another) and physiology (the study of how the body and its parts work or function). How anatomy and physiology are related? The body parts form a well –organized unit, and each of those parts has a job to do to make the body operate as a whole. Like heart and lungs. Heart muscular chambers can pump the blood and lungs cannot, but can exchange gases and provide oxygen to the body.

Level of structural organization that make up the human body and how they are related –cell(the smallest units of all living things),tissues (consist of groups of similar cells that have a common function), organs (composed of two or more tissue types and perform a specific function for the body), organ system.Name the organ system of the body and the functions of each system.List functions that humans must perform to maintain life. Homeostasis (set point in the control system) and its importance. Negative and positive feedback and their role in maintaining homeostasis.

Control mechanisms provide the basis for the maintenance of homeostasis at all levels of organization in the hierarchy of living systems. As such, one's knowledge of the workings of a given the biological system is incomplete unless one can arrive at some understanding of the regulatory processes that contribute to its natural operating characteristics.

The primary goal here is to highlight the basic techniques employed in control theory, systems analysis, and model identification and to give the biomedical engineering student an appreciation of how these principles can be applied to better understand the processes involved in physiological regulation.This may also prove to be a useful resource for all participants working in mathematical modelling of various processes especially in physiological systems with classical control theory and its application to physiological systems.

I hope you all will be benefitted from this talk and this can provide you a better insight into research directions.