Combining Dynamics and Control with Philosophy

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Introduction
Philosophy is the pursuit of knowledge by rational inquiry. The original Greek *philosophia* means 'love of wisdom'. As an intellectual activity, philosophy is the most broad-ranging of the academic disciplines, since it addresses a wide range of interlinked questions about the cause and nature of things, the principles governing existence, logic, causality, the material universe, perception of physical phenomena, and human behavior. Many of these questions also occur in the various other sciences. Dynamics and control technology is the science of modelling and measuring dynamic behavior and the improvement of performance by design optimization and/or the application of control. More general it is the science that deals with objects in motion and influencing the course of events. Within this framework questions arise about causality, the nature of movement, sensing and actuation, and the description of physical phenomena.

Philosophy within DCT
Perhaps the most fundamental characteristic of an academic is his or her capability to be amazed. This amazement inspires the true academic to ask difficult questions that he or she tries to answer by rational reasoning. The recently published academic criteria for Bachelor and Master curricula [1], although implicitly, endorses the importance of this capability. It is evident that this characteristic, which is inextricably bound up with philosophic activity [2], should be trained, utilized, and developed. This necessity is justified further by the current progress in communication, nano- and biotechnology. [3] Next to the numerous technological challenges, these developments and their impacts give rise to some social and ethical issues of great importance. From the presented definitions it can be concluded that philosophy and dynamics and control technology are interconnected. In both disciplines similar problems arise. Therefore it seems useful to investigate to what extend methods from one discipline can be utilized to answer questions that arise in the other and vice versa. Next to the possible scientific results, it gives the DCT group an opportunity to train, utilize, and develop the fundamental characteristic of its academia.

A case study on philosophy and DCT
To extend the foundation of our arguments, a case study is suggested that demonstrates the possible relations between philosophy and dynamics and control technology. The example provides a starting point for an attempt to cast Aristotle's virtue ethics into a dynamics and control technology framework.

Aristotle's virtue ethics
In his work on virtue ethics, Aristotle tries to answer the questions what the goal of human existence is, and how one can obtain this goal. An important assumption that Aristotle makes is that there can only be one final goal, because when each goal would lead to a new one—this could go on towards infinity—human desire would be futile. Via inductive reasoning Aristotle finally defines this final goal or good of man as *happiness*, which lies in "the active exercise of his soul's faculties in conformity with excellence or virtue, or if there be several human excellences or virtues, in conformity with the best and most perfect among them." [4] The term *excellence* or *virtue* are further specified by Aristotle in the remainder of his work. Basically it implies an attitude that is the *center* with respect to an excess and a deficit. For example, the virtue 'valour' is the center between cowardice and foolhardiness, and a 'generous' person stands midway between a niggard and a squanderer. Aristotle states that a human can obtain these attitudes or habits by training and refining its behavior.

Virtue ethics and DCT
Aristotle's virtue ethics contain several elements that can also be found within the dynamics and control framework. First Aristotle defines happiness as an active exercise, implying movement or dynamics. The actions and results are then compared with an ideal situation (virtues which are centered between an excess and a deficit), implying some sort of feedback. An interesting step therefore would be to try to use the language from dynamics and control technology (block diagrams, dynamic models) to translate the problem of obtaining the virtues that Aristotle described.

Conclusions
The relation and similarity between philosophy and dynamics and control technology deserves attention from both disciplines. Via discussions and concrete studies we should try to exploit the strengths and weaknesses of each disciplines. These activities should serve the mutual desire to acquire knowledge and insight and they should do justice to the characteristics and education of academics, both within and outside the institution.

References: