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Title: Control Engineering Challenges and Results
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Abstract

Application of model-based control strategies for physiological control problems, like tumor therapy, may greatly improve the efficiency of clinical treatments. As a part of our research towards taming cancer, our aim is to design a positive path tracking controller for a minimal model of tumor growth under angiogenic inhibition with bevacizumab treatment using modern control methods. We extend the dynamics of the system to ensure the positivity of the input, and design path tracking controller after exact linearization is carried out for the extended system. We carry out simulations for different reference signals for the path tracking controllers, and confirm that the tumor can be eliminated using bevacizumab therapy with physiologically feasible input signals. The resulting inputs are positive, and their maximal values are in physiologically feasible regions, thus the results may be applicable in clinical practice. Thus, we have a method that can be used to give physiologically feasible solutions even for nonlinear systems.

Short bio

Dániel András Drexler received his MSc degrees in electrical engineering (2009), biomedical engineering (2011) and applied mathematics (2014) from the Budapest University of Technology and Economics (BME), Hungary. He started his PhD studies at BME, Department of Control Engineering and Information Technology in 2009, and defended his PhD thesis with summa cum laude in 2015 under the supervision of Dr. István Harmati. His research interests are physiological control, nonlinear control, control of chemical reactions, robot kinematics, and singularities in robotics. He is an IEEE member from 2016, member of the Robotics and Automation Society (RAS) and the Systems, Man, and Cybernetics Society (SMC) and Membership Development Officer of the IEEE Hungary Section from 2017. From 2016 he is senior lecturer of John von Neumann Faculty of Informatics of Óbuda University, and employed researcher of the ERC StG Grant No 679681 of the Physiological Controls Research Center.