On Using Fuzzy Reinforcement Learning to Control the Cancer Cells

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Abstract

Today to prevent the growth of cancer cells, the use of synthetic drugs and radiation therapy procedures have been used increasingly as a significant barrier for accelerating the growth of these cells. Recently, extensive research has been done on various cancer control methods. In these studies, classical and modern controllers are applied on mathematical models that show the growth of cancer cells. In the present simulations on these models, they can also be seen successful results. However, modeling the growth of cancer cells is a complex issue and therefore certainly a complete and perfect model cannot be introduced to simulate the all of cancer cell aspects. In this paper we introduce reinforcement learning, as a method which is not based on any particular model to examine the treatment of cancers. Afterwards, Blood cancer control by adjusting the amount of chemical drugs and also breast cancer treatment by controlling the flux of laser device is proposed. Reinforcement learning is an approach in which the agent or agents with respect to the series of positive or negative rewards do a suboptimal action. This technique proves its usefulness as a system which its model normally is not available. In this way it can be considered as a bypass method for other controlled methods. One disadvantage of this approach is to use discrete actions. This is despite the fact that many continuous systems will not be successful using this proceeding. To solve this problem, different approaches, such as fuzzy logic has been proposed for continuous operations. In this case, the rules set in fuzzy controller are created by reinforcement learning as an expert machine and therefore a continuous operation can be produced.

Keywords: Reinforcement Learning, Fuzzy Logic, Cancer Cells Control, Hyperthermia, Cancer Cell Model

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