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On the continuity of the value function in reinforcement learning and optimal control

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The value function plays a crucial role as a measure for the cumulative future reward an agent receives in both reinforcement learning and optimal control. It is therefore of interest to study how similar the values of neighboring states are, i.e. to investigate the continuity of the value function. We do so by providing and verifying upper bounds on the value function's modulus of continuity. Additionally, we show that the value function is always Hölder continuous under relatively weak assumptions on the underlying system.

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