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BIOREMEDIATION OF WATER RESOURCES: AN OPTIMAL CONTROL APPROACH

This talk deals with the bioremediation, in minimal time, of a water resource (such as lakes, reservoirs, etc.) using a single continuous bioreactor. The bioreactor is connected to the reservoir through several pumps. Typically, one pump extracts polluted water and other one injects back sufficiently clean water with the same flow rate. However, we also analyze more complex pumps configurations. So, we state minimal-time optimal control problems where the control variables are related to the inflow rates of the pumps. For those problems, we analyze the existence of their solutions as well as their optimal synthesis (via Pontryaguin's Principle). We also obtain, for some configurations, explicit bounds on their value functions via Hamilton–Jacobi–Bellman techniques.