A Measure Approach to the Impulse Control of Brownian Motion

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Only finitely many actions will occur in any bounded interval of time for control problems in which each action incurs a positive cost. Typically these problems are formulated so that the decision-maker selects sequences of stopping times $\tau := \{\tau_k : k \in \mathbb{N}\}$ and jump amounts $Y := \{Y_k : k \in \mathbb{N}\}$ such that at time τ_k the state process X instantaneously jumps from $X(\tau_k-)$ to $X(\tau_k) = X(\tau_k-) + Y_k$. The paired sequeneces (τ, Y) form an impulse control policy. A criterion is then used to compare the efficacy of the policies.

This talk examines the impulse control for Brownian motion under both long-term average and discounted criteria. It shows how to reformulate the control problems in terms of expected occupation measures, resulting in imbeddings in infinite-dimensional linear programs. Analysis of auxiliary linear programs having fewer constraints determines the optimal values and identifies optimal impulse control policies.

This talk is based on joint work with K. Helmes and Chao Zhu.