Periodic Homogenization for Integro-Differential Equations

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We establish periodic homogenization for Hamilton- Jacobi-Bellman (HJB) equations, associated to nonlocal operators of integro-differential type. We consider the case when the fractional diffusion has the same order as the drift term, and is weakly elliptic. The difficulties, and the outcomes, are two-fold. One one hand, we provide Lipschitz regularity results for weakly elliptic nonlocal HJB, extending the results previously. On the other hand, we establish a convergence result, based on half relaxed limits and a comparison principle for the effective problem. The latter strongly relies on the regularity and the ellipticity properties of the effective Hamiltonian, for which a fine Lipschitz estimate of the corrector plays a crucial role.