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A Computational Framework for Cavity Mediated Energy Transfer in Nanostructures ANDREW BACZEWSKI, NICHOLAS MILLER, DANIEL DAULT, CARLO PIERMAROCCHI, BALASUBRAMANIAM SHANKER, Michigan State University — Cavity mediated energy transfer is vital to numerous technologies, such as systems that harvest/generate light, quantum information, and platforms for studying strongly coupled cavity QED. In these processes, the density of photonic states through which a donor and acceptor complex exchange energy is dramatically modified by a resonant structure such as a photonic crystal or a distributed Bragg reflector. The design and optimization of new systems of this nature is greatly facilitated by the development of high fidelity numerical methods for resolving the fields in structures not amenable to analytical methods. This is increasingly relevant at the nanoscale, wherein optically dense geometric features exist at or below the scale of the free space wavelength. To this end, we have implemented a nodal Discontinuous Galerkin discretization of the curl-curl Maxwell eigenproblem for the resolution of the spectrum of photonic modes in nanostructures. This framework delivers a high accuracy representation of light-matter coupling constants and optical eigenfrequencies that can be fed into quantum mechanical models of energy transfer. Details of our framework, implementation/validation, and applications germane to energy transfer between cavity-confined quantum dots will be presented.

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