EFFICIENT AND ACCURATE BOUNDARY METHODS FOR COMPUTATIONAL OPTICS

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The Multiple Multipole Program (MMP) is an advanced boundary method for computational electromagnetics and optics. Its closeness to analytical methods allows one to obtain highly accurate and reliable results. After a short introduction of the fundamentals of MMP, additional techniques are introduced that allow one to drastically improve the performance for various applications. This includes 1) a special consideration of ill-conditioned matrices, 2) the so-called connection concept, 3) an advanced eigenvalue solver with a special eigenvalue tracing procedure, and 4) the Parameter Estimation Technique (PET). Special attention is paid to the error estimation and validation of the results. In a second section, the most recent MMP version of the MaX-1 software with its advanced modeling, visualization, and animation features is presented and it is demonstrated how this software is used for handling complicated projects. Thereafter, some typical applications of computational optics with a focus on photonic bandgap computations and photonic crystal structures are presented.