TITLE: Component-Averaged Domain Decomposition Techniques

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ABSTRACT:

Component-Averaged Domain Decomposition (CADD) was introduced by Gordon and Gordon through the CARP algorithm and its CG acceleration CARP-CG. In CADD, external grid points of a subdomain are "cloned" (copied) into the subdomain, and the clones are updated by the subdomain solver together with the subdomain's internal points. The final values of all boundary points are taken as the average of their updated values and their clones in neighboring subdomains; this differs from standard DD methods. In CARP and CARP-CG, Kaczmarz row projections are performed in each subdomain, and then the results from the different subdomains are merged by the CADD method. CARP-CG is extremely robust and efficient on stiff elliptic PDE problems. It also produced excellent results in electron tomography, and it has shown a good potential for CFD problems with unstructured grids. The robustness of CARP-CG on grids of varying sizes indicates its potential usefulness for multilevel applications.