

Two Grid Algorithm

- 1: Presets: $u_h^0, r_h^0 = f_h - Au_h^0$
- 2: $u_h^{\text{prs}} = S(u_h^0, b, A, n_0)$ {Presmoothing}
- 3: $r_H = R_{Hh}r_h$
- 4: Solve $A_H c_H = r_H$
- 5: $u_h^{\text{cgc}} = u_h^{\text{p}} + P_{hH}c_H$ {Coarse Grid Correction}
- 6: $u_h^{\text{pos}} = S(u_h^{\text{cgc}}, b, A, n_1)$ {Postsmoothing}

MGRRecursive ($A_\ell, r_\ell, c_\ell, \ell$)

if $\ell < p - 1$ then

$c_\ell = S(0, r_\ell, A_\ell, n_0)$ {Presmoothing}

$r_{\ell+1} = R_\ell(r_\ell - A_\ell c_\ell)$ {Calculate coarse grid residual}

$A_{\ell+1} = R_\ell A_\ell P_{\ell+1}$ {Calculate coarse grid matrix}

call MGRRecursive ($A_{\ell+1}, r_{\ell+1}, c_{\ell+1}, \ell + 1$)

$c_\ell = c_\ell + P_{\ell+1} c_{\ell+1}$ {Coarse grid correction}

$c_\ell = S(c_\ell, r_\ell, A_\ell, n_1)$ {Posts smoothing}

else

Solve $A_{p-1} c_{p-1} = r_{p-1}$ {Direct solution on coarsest level}

end if