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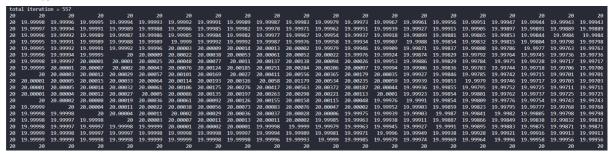
Homework 5

00957016 高敬庭

Solution

• Epsilon = 0.0001, grid-resolution = 21 * 21, BC = 20, derivative val = 0, source val = 10

 \circ w = 1.0



 \circ w = 1.2

Different Boundary conditions

• **w = 1.0**, Epsilon = 0.0001, grid-resolution = 21 * 21, derivative val = 0, source val = 10

• w = 1.2, Epsilon = 0.0001, grid-resolution = 21 * 21, derivative val = 0, source val = 10

從上表可看出,在其他條件相同的情況下,Boundary Condition越小計算所需的Iteration次數也越少。

Different Source terms

• w = 1.0, BC = 20, Epsilon = 0.0001, grid-resolution = 21 * 21, derivative val = 0

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	SRC = 10	SRC = 20	SRC = 30	SRC = 40	SRC = 50
iteration	557	557	557	557	557
T[1][1]	19.99998	20.00006	20.00013	20.00021	20.00028

• w = 1.2, BC = 20, Epsilon = 0.0001, grid-resolution = 21 * 21, derivative val = 0

	SRC = 10	SRC = 20	SRC = 30	SRC = 40	SRC = 50
iteration	387	387	387	387	387
T[1][1]	20.00001	20.00008	20.00016	20.00023	20.00031

從上表可看出,在其他條件相同的情況下,Source term的大小並不影響收斂速度,但是計算出來的結果會隨著 Source term變大而隨之增加(以T[1][1]為例)。

Different w for SOR Method

• 表格內數字代表需多少iteration才收斂

w\gridSize	11*11	21*21	31*31	41*41	51*51
1.0	164	557	1130	1855	2715
1.05	149	509	1035	1701	2492
1.1	136	465	947	1559	2286
1.15	123	424	866	1427	2094
1.2	112	387	790	1304	1916
1.25	101	351	719	1189	1749
1.3	91	318	653	1081	1592
1.35	81	287	591	979	1444
1.4	72	258	532	883	1304
1.45	63	230	476	792	1171
1.5	54	203	423	706	1044
1.55	45	178	372	623	924
1.6	35	153	324	544	808
1.65	32	129	277	467	697
1.7	41	105	232	394	589
1.75	45	80	187	321	484
1.8	61	63	141	250	381
1.85	81	82	89	176	276

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w\gridSize	11*11	21*21	31*31	41*41	51*51
1.9	121	122	125	134	159
1.95	243	244	242	243	251

可以看到從1.0開始慢慢往上增加w的數值確實可以降低所需要的iteration,但是一旦超過最佳w後又會升高。

Best w for each resolution

	11*11	21*21	31*31	41*41	51*51
best w	1.65	1.8	1.85	1.9	1.9