An Exploration of Multigrid Methods

Numerical Methods for PDEs 4301

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Part 1: First, you are provided *only* with the temperature data and the days on which the apparatus was not working. You are asked to find an estimate of the temperature on the missing days.

a)

b)

Day	Temp.	Day	Temp.
22	48.6544	91	32.6699
80	29.9413	92	32.7286
81	30.3790	224	80.9063
82	30.7736	225	81.5233
83	31.1268	226	82.1234
84	31.4403	228	83.2654
85	31.7158	229	83.8043
86	31.9551	230	84.3201
87	32.1600	231	84.8117
88	32.3322	232	85.2780
89	32.4734	233	85.7178
90	32.5854	300	88.8952

Part 2:

a)

Day	Temp.	Error(±)	Day	Temp.	Error(±)
22	48.6544	0.0093	91	32.6699	22.4093
80	29.9413	22.4093	92	32.7286	22.4093
81	30.3790	22.4093	224	80.9063	0.1493
82	30.7736	22.4093	225	81.5233	0.1493
83	31.1268	22.4093	226	82.1234	0.1493
84	31.4403	22.4093	228	83.2654	1.4006
85	31.7158	22.4093	229	83.8043	1.4006
86	31.9551	22.4093	230	84.3201	1.4006
87	32.1600	22.4093	231	84.8117	1.4006
88	32.3322	22.4093	232	85.2780	1.4006
89	32.4734	22.4093	233	85.7178	1.4006
90	32.5854	22.4093	300	88.8952	0.0093

Part 3:

a)

b)

Part 4:

a) 1.

b) Show *quantitatively* why you expect your new choice of interpolation scheme to be an improvement on the original one.

The error estimates for the two interpolation schemes provide us with quantitative reason to think Hermite interpolation has an advantage:

c)

Day	Temp.	Error(±)	Day	Temp.	Error(±)
22	48.6545	0.0001	91	32.6703	0.0590
80	29.9417	0.0808	92	32.7288	0.0115
81	30.3798	0.2558	224	80.9063	0.0031
82	30.7748	0.4465	225	81.5233	0.0049
83	31.1283	0.6013	226	82.1233	0.0025
84	31.4420	0.6919	228	83.2659	0.0086
85	31.7177	0.7085	229	83.8053	0.0205
86	31.9570	0.6563	230	84.3214	0.0246
87	32.1617	0.6563	231	84.8130	0.0197
88	32.3337	0.4151	232	85.2789	0.0103
89	32.4746	0.2733	233	85.7182	0.0025
90	32.5862	0.1488	300	88.8952	0.0001

Part 5:

a)

b)

Part 6:

a)