

**Gebze Technical University
Computer Engineering**

CSE 344 - 2021 Spring

HOMEWORK 2 REPORT

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1 INTRODUCTION

1.1 Problem Definition

Reading file with multiple process, calculating Lagrange polynomial interpolation and writing into the file and comparing results using signal synchronization.

1.2 System Requirements

Any computer with Ubuntu 14.04 LTS 32-bit Operating System.

2 METHOD

2.1 Problem Solution Approach

Firstly, my program reads the parameter and opens the file. Then, creates 8 child process. While it is creating processes, the newly created children is waiting to end creating processes stage. When all children is created, the parent process send SIGUSR1 signal to wake up children. Children read the file one-by-one (using fcntl file locking) and calculate Lagrange interpolation for round 1. Then they write the result in corresponding row of the file and send signal to parent process in order to wake up. When all children are done, the parent reads the file and calculates average error. Then, send SIGUSR2 signal to start round 2. Children calculate Lagrange interpolation and write the file again. When all children are ended, the parent reads the file again and print the average error. Finally, the program terminates.

NOTE: WSL1 (Windows subsystem for Linux) is not working due to the file locking system.

3 RESULT

3.1 Test Cases

I used the example file in the .zip archive and checked the CTRL+C signal.

The output is recommended to write a file due to the length of text.

3.2 Running Results

```
1 Parent:6179
2 ROUND 1
3 SIGUSR1 recieved.
4 Children:6185
5 Reading Row:6.0,8.0,1.0,12.0,5.0,5.0,9.0,7.0,8.0,2.0,7.0,4.0,4.0,6.0,5.5,2
6 x[0]:6.0, y[0]:8.0
7 x[1]:1.0, y[1]:12.0
8 x[2]:5.0, y[2]:5.0
9 x[3]:9.0, y[3]:7.0
10 x[4]:8.0, y[4]:2.0
11 x[5]:7.0, y[5]:4.0
12 x[6]:4.0, y[6]:6.0
13 x[7]:5.5, y[7]:2.0
14 Coefficient 0: 0.984375
15 Coefficient 1: -0.000488
16 Coefficient 2: 0.307617
17 Coefficient 3: -0.021973
18 Coefficient 4: 0.140625
19 Coefficient 5: -0.410156
20 Interpolation of x[5.5] is 7.9.
21 SIGUSR1 recieved.
22 SIGUSR1 recieved.
23 Children:6184
24 Reading Row:4.0,9.0,6.0,3.0,2.0,9.0,7.0,3.0,9.0,2.0,1.0,6.0,8.0,7.0,5.8,4.
25 x[0]:4.0, y[0]:9.0
26 x[1]:6.0, y[1]:3.0
27 x[2]:2.0, y[2]:9.0
28 x[3]:7.0, y[3]:3.0
29 x[4]:9.0, y[4]:2.0
30 x[5]:1.0, y[5]:6.0
31 x[6]:8.0, y[6]:7.0
32 x[7]:5.8, y[7]:4.0
33 Coefficient 0: 0.077824
34 Coefficient 1: 1.050624
35 Coefficient 2: -0.023698
36 Coefficient 3: -0.023698
37 Coefficient 4: 0.071429
38 Coefficient 5: 0.900000
39 Coefficient 6: -0.400000
40 Coefficient 7: 0.500000
41 Coefficient 8: 0.028571
42 Coefficient 9: -0.100000
43 Interpolation of x[6.0] is 4.8.
44 SIGUSR1 recieved.
45 SIGUSR1 recieved.
46 Children:6183
47 Reading Row:1.0,1.0,3.0,4.0,5.0,8.0,7.0,3.0,15.0,1.0,4.0,4.0,8.0,10.0,9.0,
48 x[0]:1.0, y[0]:1.0
49 x[1]:3.0, y[1]:4.0
50 x[2]:5.0, y[2]:8.0
51 x[3]:7.0, y[3]:3.0
52 x[4]:15.0, y[4]:1.0
53 x[5]:4.0, y[5]:4.0
54 x[6]:8.0, y[6]:10.0
55 x[7]:9.0, y[7]:7.0
56 Coefficient 0: 0.714286
57 Coefficient 1: -10.000000
58 Coefficient 2: -18.000000
59 Coefficient 3: 5.000000
60 Coefficient 4: 0.012987
61 Coefficient 5: 23.272727
62 Interpolation of x[9.0] is -75.2.
63 SIGUSR1 recieved.
64 SIGUSR1 recieved.
65 Children:6182
66 Reading Row:8.0,7.0,1.0,0.0,18.0,8.0,2.0,9.0,4.0,4.0,3.0,6.0,6.0,8.0,10.0,
67 x[0]:8.0, y[0]:7.0
68 x[1]:1.0, y[1]:0.0
69 x[2]:18.0, y[2]:8.0
70 Coefficient 0: 0.008355
71 Coefficient 1: 0.417752
72 Coefficient 2: 0.668403
73 Coefficient 3: -0.003798
74 Coefficient 4: -0.133681
75 Coefficient 5: 0.059679
76 Interpolation of x[3.5] is 3.6.
77 SIGUSR1 recieved.
78 Absolute error of row 0 is:-5.9
79 Absolute error of row 1 is:0.7
80 Absolute error of row 2 is:1.1
81 Absolute error of row 3 is:2.2
82 Absolute error of row 4 is:82.2
83 Absolute error of row 5 is:91.8
84 Absolute error of row 6 is:2.1
85 Absolute error of row 7 is:-0.6
86 ROUND 2
87 SIGUSR2 recieved.
88 Coefficient 0: 0.131836
89 Coefficient 1: 1.181250
90 Coefficient 2: -0.020312
91 Coefficient 3: -0.600000
92 Coefficient 4: 0.263672
93 Coefficient 5: -0.000195
94 Coefficient 6: 0.843750
95 Interpolation of x[8.0] is 6.9.
96 Coefficient 2: -0.023698
97 Coefficient 3: -0.116736
98 Coefficient 4: 0.004690
99 Coefficient 5: 0.007296
100 Interpolation of x[5.0] is 3.3.
101 SIGUSR1 recieved.
102 SIGUSR1 recieved.
103 Children:6186
104 Reading Row:1.0,8.0,7.0,7.0,5.0,9.0,2.0,3.0,9.0,1.0,17.0,0.0,3.0,3.0,8.0,5
105 x[0]:1.0, y[0]:8.0
106 x[1]:7.0, y[1]:7.0
107 x[2]:5.0, y[2]:9.0
108 x[3]:2.0, y[3]:3.0
109 x[4]:9.0, y[4]:1.0
110 x[5]:17.0, y[5]:0.0
111 x[6]:3.0, y[6]:3.0
112 x[7]:8.0, y[7]:5.0
113 Coefficient 0: -0.052734
114 Coefficient 1: 0.945000
115 Coefficient 2: -0.328125
116 Coefficient 3: 0.120000
117 Coefficient 4: 0.316406
118 Coefficient 5: -0.000547
119 Interpolation of x[8.0] is 3.9.
120 SIGUSR1 recieved.
121 SIGUSR1 recieved.
122 Children:6187
123 Reading Row:9.0,10.0,7.0,7.0,8.0,9.0,5.0,3.0,2.0,1.0,3.0,1.0,4.0,8.0,6.0,7
124 x[0]:9.0, y[0]:10.0
125 x[1]:7.0, y[1]:7.0
126 x[2]:8.0, y[2]:9.0
127 x[3]:5.0, y[3]:3.0
128 x[4]:2.0, y[4]:1.0
129 x[5]:3.0, y[5]:1.0
130 x[6]:4.0, y[6]:8.0
131 x[3]:2.0, y[3]:9.0
132 x[4]:4.0, y[4]:4.0
133 x[5]:3.0, y[5]:6.0
134 x[6]:6.0, y[6]:8.0
135 x[7]:10.0, y[7]:9.0
136 Coefficient 0: 2.880000
137 Coefficient 1: 7.529412
138 Coefficient 2: 0.010588
139 Coefficient 3: -31.500000
140 Coefficient 4: -24.000000
141 Coefficient 5: 46.000000
142 Interpolation of x[10.0] is -82.8.
143 SIGUSR1 recieved.
144 SIGUSR1 recieved.
145 Children:6181
146 Reading Row:5.0,8.0,8.0,3.0,7.0,7.0,3.0,2.0,15.0,1.0,10.0,6.0,6.0,6.0,4.1,
147 x[0]:5.0, y[0]:8.0
148 x[1]:8.0, y[1]:3.0
149 x[2]:7.0, y[2]:7.0
150 x[3]:3.0, y[3]:2.0
151 x[4]:15.0, y[4]:1.0
152 x[5]:10.0, y[5]:6.0
153 x[6]:6.0, y[6]:6.0
154 x[7]:4.1, y[7]:6.0
155 Coefficient 0: 1.333468
156 Coefficient 1: 0.079210
157 Coefficient 2: -1.203234
158 Coefficient 3: 0.194825
159 Coefficient 4: 0.001966
160 Coefficient 5: -0.116234
161 Interpolation of x[4.1] is 3.9.
162 SIGUSR1 recieved.
163 SIGUSR1 recieved.
164 Children:6180
165 Reading Row:1.0,9.0,3.0,3.0,4.0,4.0,9.0,4.0,6.0,2.0,7.0,1.0,5.0,3.0,3.5,3.
166 Interpolation of x[8.0] is 0.9.
167 EXITING CHILDREN 6186...
168 SIGUSR2 recieved.
169 Coefficient 0: 0.042803
170 Coefficient 1: 1.155686
171 Coefficient 2: -0.008689
172 Coefficient 3: -0.256819
173 Coefficient 4: -0.010319
174 Coefficient 5: 0.002293
175 Coefficient 6: 0.075045
176 Interpolation of x[5.8] is 6.9.
177 EXITING CHILDREN 6184...
178 SIGUSR2 recieved.
179 Coefficient 0: 0.738261
180 Coefficient 1: 0.000244
181 Coefficient 2: 0.461426
182 Coefficient 3: -0.006592
183 Coefficient 4: 0.052734
184 Coefficient 5: -0.205078
185 Coefficient 6: -0.041016
186 Interpolation of x[5.5] is 15.1.
187 EXITING CHILDREN 6185...
188 SIGUSR2 recieved.
189 Coefficient 0: 0.028571
190 Coefficient 1: 0.600000
191 Coefficient 2: -0.200000
192 Coefficient 3: 1.000000
193 Coefficient 4: -0.028571
194 Coefficient 5: 0.200000
195 Coefficient 6: -0.600000
196 Interpolation of x[6.0] is 5.9.
197 EXITING CHILDREN 6187...
198 SIGUSR2 recieved.
199 Coefficient 0: -0.102041
200 Coefficient 1: 2.000000
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206 Coefficient 1: 2.000000
207 Coefficient 2: 6.000000
208 Coefficient 3: -5.000000
209 Coefficient 4: 0.001855
210 Coefficient 5: -5.818182
211 Coefficient 6: 3.918367
212 Interpolation of x[9.0] is -18.4.
213 EXITING CHILDREN 6183...
214 SIGUSR2 recieved.
215 Coefficient 0: 5.760000
216 Coefficient 1: -6.023529
217 Coefficient 2: 0.003529
218 Coefficient 3: 31.500000
219 Coefficient 4: 48.000000
220 Coefficient 5: -61.440000
221 Coefficient 6: -16.800000
222 Interpolation of x[10.0] is -70.0.
223 EXITING CHILDREN 6182...
224 SIGUSR2 recieved.
225 SIGUSR2 recieved.
226 Coefficient 0: 2.533589
227 Coefficient 1: -0.835249
228 Coefficient 2: 2.457144
229 Coefficient 3: 0.123389
230 Coefficient 4: -0.000415
231 Coefficient 5: 0.055211
232 Coefficient 6: -3.333670
233 Interpolation of x[4.1] is 19.5.
234 EXITING CHILDREN 6181...
235 SIGUSR2 recieved.
236 SIGUSR2 recieved.
237 Coefficient 0: -0.003133
238 Coefficient 1: 0.313314
239 Coefficient 2: 1.002604
240 Coefficient 3: 0.001424
241 Coefficient 4: 0.200521
242 Coefficient 5: -0.044759
243 Coefficient 6: -0.409971
244 Interpolation of x[3.5] is 7.5.
245 EXITING CHILDREN 6180...
246 SIGUSR2 recieved.
247 Absolute error of row 0 is:-1.5
248 Absolute error of row 1 is:-3.2
249 Absolute error of row 2 is:2.1
250 Absolute error of row 3 is:5.9
251 Absolute error of row 4 is:-49.8
252 Absolute error of row 5 is:-3.8
253 Absolute error of row 6 is:-9.5
254 Absolute error of row 7 is:-0.9
255 EXITING PARENT...
256
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