Assignment 2

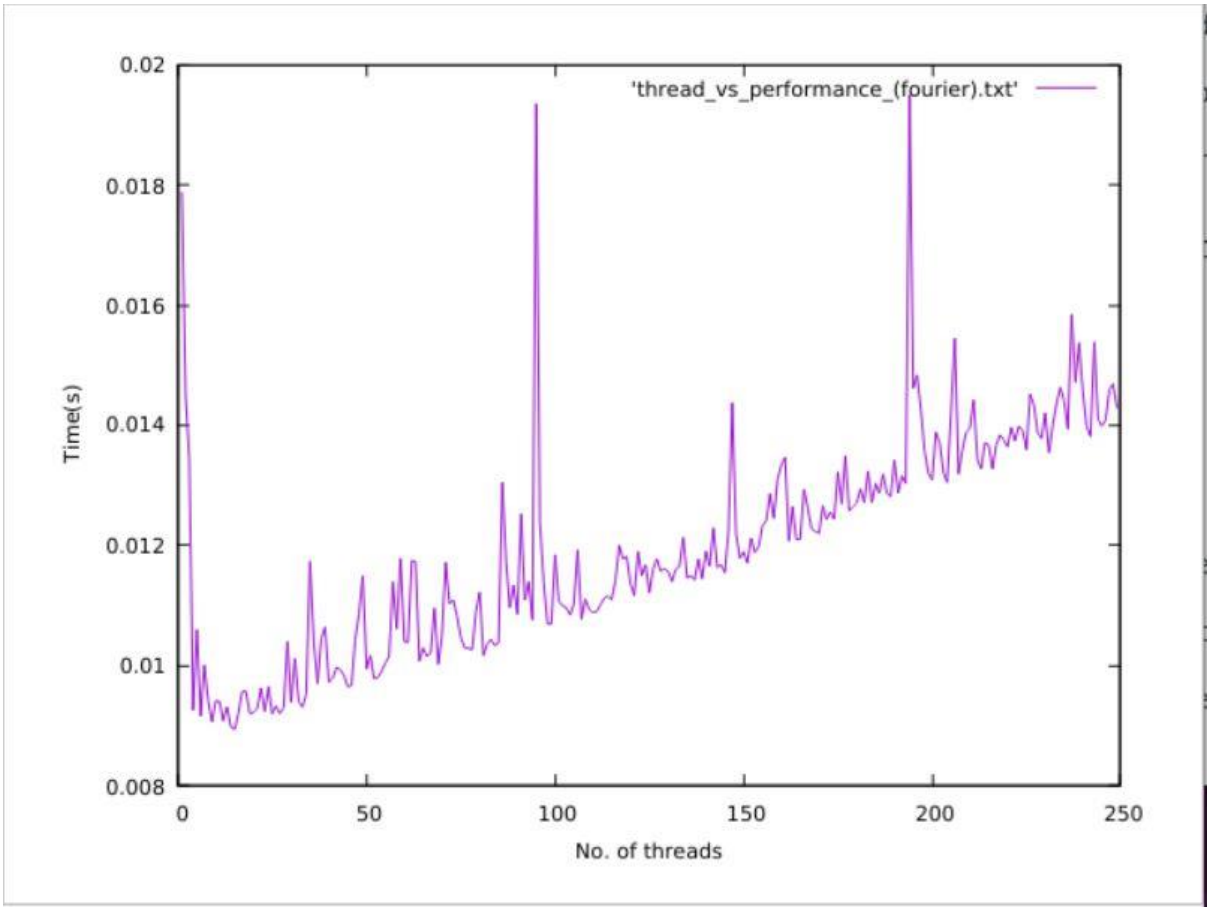
- Methods implemented to calculate the value of pi
  - **Fourier Series Method**
  - **Wallis' Method**

- **Fourier Series Method**
  - This is a slow converging series and for experimental purposes it can show clear change in value of pi at high number of iterations because a fast converging series at high iterations would be almost stagnant.
  - Fourier Series could be used to implement value
    - f(x)=a/2 + Summation (A)cos(nx)+ Summation (B)sin(nx)
    - Here we use f(x)=|x| for -pi<x<pi
    - Hence we get:
      - $f(x)=\pi 2-4\pi(\cos x+13 2\cos 3x+15 2\cos 5x+\cdots),-\pi<x<\pi$
      - Substituting $x=0$
      - We get
        $\pi/8=1+1/3 2+1/5 2+\cdots=\sum_{n=1}^{\infty}1/(2n-1)2$
    - Then computing on general term
    - $\pi 2/8=1/2+\sum_{n=1}^{\infty}2/((2n-1)2(2n+1))$

- **Wallis Method**
  - This method provides an easy general nth term which can be computed parallelly.
  - General term is not in pipeline fashion.
  - It makes use of wallis integral integral(sin(n)x cos(m)x) over pi/2
  - It is equivalent to (m-1)(n-1)(m-3)(n-3)……./(m+n-2)(m+n)(m+n-4)…….*pi/2;

Graphs

Thread vs performance for fourier Series



No. of Threads	Time(s)
1	0.017880
2	0.014495
3	0.013436
4	0.009264
5	0.010605
6	0.009167
7	0.010015
8	0.009425
9	0.009071
10	0.009419
11	0.009410
12	0.009089
13	0.009322
14	0.008985
15	0.008945
16	0.009204
17	0.009573
18	0.009583
19	0.009215
20	0.009227

21	**0.009288**
22	**0.009634**
23	**0.009243**
24	**0.009656**
25	**0.009204**
26	**0.009336**
27	**0.009205**
28	**0.009305**
29	**0.010403**
30	**0.009396**
31	**0.010123**
32	**0.009407**
33	**0.009316**
34	**0.009520**
35	**0.011737**
36	**0.010405**
37	**0.009706**
38	**0.010454**
39	**0.010646**
40	**0.009731**
41	**0.009791**
42	**0.009974**
43	**0.009943**
44	**0.009846**
45	**0.009654**
46	**0.009676**
47	**0.010436**
48	**0.010865**
49	**0.011504**
50	**0.009949**
51	**0.010172**
52	**0.009791**
53	**0.009809**
54	**0.009914**
55	**0.010049**
56	**0.010163**
57	**0.011396**
58	**0.010616**
59	**0.011789**
60	**0.010406**
61	**0.010388**
62	**0.011754**
63	**0.011729**
64	**0.010082**
65	**0.010300**
66	**0.010159**

67	**0.010214**
68	**0.010962**
69	**0.010025**
70	**0.010499**
71	**0.011726**
72	**0.011031**
73	**0.011097**
74	**0.010830**
75	**0.010479**
76	**0.010304**
77	**0.010294**
78	**0.010271**
79	**0.010894**
80	**0.011227**
81	**0.010175**
82	**0.010364**
83	**0.010443**
84	**0.010337**
85	**0.010380**
86	**0.013053**
87	**0.011722**
88	**0.010968**
89	**0.011344**
90	**0.010857**
91	**0.012532**
92	**0.011093**
93	**0.011400**
94	**0.010766**
95	**0.019348**
96	**0.012377**
97	**0.011388**
98	**0.010699**
99	**0.010697**
100	**0.011848**
101	**0.011074**
102	**0.011000**
103	**0.010969**
104	**0.010845**
105	**0.011030**
106	**0.011928**
107	**0.010779**
108	**0.011110**
109	**0.010940**
110	**0.010893**
111	**0.010900**
112	**0.011012**

113	**0.011125**
114	**0.011161**
115	**0.011099**
116	**0.011413**
117	**0.012008**
118	**0.011779**
119	**0.011819**
120	**0.011370**
121	**0.011170**
122	**0.011905**
123	**0.011498**
124	**0.011687**
125	**0.011216**
126	**0.011619**
127	**0.011780**
128	**0.011574**
129	**0.011616**
130	**0.011575**
131	**0.011403**
132	**0.011604**
133	**0.011654**
134	**0.012135**
135	**0.011464**
136	**0.011499**
137	**0.011428**
138	**0.011779**
139	**0.011451**
140	**0.011908**
141	**0.011659**
142	**0.012295**
143	**0.011641**
144	**0.011684**
145	**0.011551**
146	**0.012242**
147	**0.014375**
148	**0.012193**
149	**0.011791**
150	**0.011899**
151	**0.011711**
152	**0.012124**
153	**0.011889**
154	**0.011990**
155	**0.012332**
156	**0.012408**
157	**0.012862**
158	**0.012452**

159	**0.013097**
160	**0.013340**
161	**0.013470**
162	**0.012077**
163	**0.012651**
164	**0.012106**
165	**0.012106**
166	**0.012936**
167	**0.012633**
168	**0.012282**
169	**0.012236**
170	**0.012205**
171	**0.012664**
172	**0.012433**
173	**0.012563**
174	**0.012438**
175	**0.013224**
176	**0.012696**
177	**0.013496**
178	**0.012579**
179	**0.012646**
180	**0.012710**
181	**0.012944**
182	**0.012711**
183	**0.013237**
184	**0.012712**
185	**0.013035**
186	**0.012867**
187	**0.013191**
188	**0.012865**
189	**0.012817**
190	**0.013426**
191	**0.012869**
192	**0.013161**
193	**0.013035**
194	**0.019494**
195	**0.014613**
196	**0.014835**
197	**0.014270**
198	**0.013571**
199	**0.013209**
200	**0.013096**
201	**0.013886**
202	**0.013714**
203	**0.013209**
204	**0.013049**

205	**0.014204**
206	**0.015445**
207	**0.013193**
208	**0.013572**
209	**0.013881**
210	**0.013943**
211	**0.014422**
212	**0.013428**
213	**0.013275**
214	**0.013711**
215	**0.013674**
216	**0.013273**
217	**0.013668**
218	**0.013839**
219	**0.013756**
220	**0.013643**
221	**0.013966**
222	**0.013739**
223	**0.013991**
224	**0.013913**
225	**0.013592**
226	**0.014522**
227	**0.014341**
228	**0.013874**
229	**0.013779**
230	**0.014205**
231	**0.013546**
232	**0.014004**
233	**0.014366**
234	**0.014629**
235	**0.014413**
236	**0.013941**
237	**0.015842**
238	**0.014714**
239	**0.015371**
240	**0.014551**
241	**0.013970**
242	**0.013817**
243	**0.015381**
244	**0.014106**
245	**0.013983**
246	**0.014087**
247	**0.014592**
248	**0.014689**
249	**0.014302**

Thread vs performance for wallis