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1 /*** A. LANGUASCO & A. ZACCAGNINI ***/
2 /*** Implementation of Pintz-Ruzsa's method paper ***/
3 /*** (as described in their paper paper on Acta Arith. 109,(2003)) ***/
4
5 -----
6 -----
7 Results PRmethodfinal:
8 -----
9
10 -----
11 4/5 on a quad core pc
12 -----
13 [languasc@labsrv0 ~]$ nice /usr/local/Gruppi/PariGP/bin/gp2c-run -pmy_ -g -W PRmethodfinal.gp
14 PRmethodfinal.gp.c: In function `my_PintzRuzsa':
15 PRmethodfinal.gp.c:94: warning: unused variable `my_j'
16 PRmethodfinal.gp.c:94: warning: unused variable `my_l'
17 PRmethodfinal.gp.c:94: warning: unused variable `my_i'
18         GP/PARI CALCULATOR Version 2.3.2 (released)
19         amd64 running linux (x86-64/GMP-4.2.2 kernel) 64-bit version
20         compiled: Nov 30 2007, gcc-3.4.3 20041212 (Red Hat 3.4.3-9.EL4)
21         (readline v4.3 enabled, extended help available)
22
23         Copyright (C) 2000-2006 The PARI Group
24
25 PARI/GP is free software, covered by the GNU General Public License, and comes
26 WITHOUT ANY WARRANTY WHATSOEVER.
27
28 Type ? for help, \q to quit.
29 Type ?12 for how to get moral (and possibly technical) support.
30
31 parisize = 8000000, primelimit = 500000
32
33 -----
34 10 digits
35 -----
36
37 ? PintzRuzsa_psiapprox(4/5+10^(-20),13,10)
38 The expected number of correct decimal digits is = 10
39 Approximation for the minimal lambda is = 10^(-10)
40 Needed matrix exponent for this precision is = 2^39
41 Number of iterations in the dyadic procedure = 162
42 The approximated final values are:
43 max-upper-matrix = 0.9123781030527322323638
```

```
44 min-upper-matrix = 0.9123781030521349899098
45 max-lower-matrix = 0.9123781030527020894117
46 min-lower-matrix = 0.9123781030521048469576
47 The approximated values for the moments are:
48 moment-max-upper-matrix = 0.6181690752736390706245
49 moment-min-upper-matrix = 0.6181690752728714301565
50 moment-max-lower-matrix = 0.6181690752736003276488
51 moment-min-lower-matrix = 0.6181690752728326871808
52 The minimal lambda is in [1.285307939545900000000,1.285307939546100000000]
53 Final result (in the centre of the last interval): d = 0.9123781030527322323638
54 time = 5,609 ms.
55
56
57 -----
58 20 digits
59 -----
60
61 ? PintzRuzsa_psiapprox(4/5+10^(-20),20,20)
62 The expected number of correct decimal digits is = 20
63 Approximation for the minimal lambda is = 10^(-20)
64 Needed matrix exponent for this precision is = 2^72
65 Number of iterations in the dyadic procedure = 280
66 The approximated final values are:
67 max-upper-matrix = 0.91237810305275834972134056121053
68 min-upper-matrix = 0.91237810305275834972127103303804
69 max-lower-matrix = 0.91237810305275834972133828300078
70 min-lower-matrix = 0.91237810305275834972126875482828
71 The approximated values for the moments are:
72 moment-max-upper-matrix = 0.61816907526618862709860869006595
73 moment-min-upper-matrix = 0.61816907526618862709851932495382
74 moment-max-lower-matrix = 0.61816907526618862709860576186487
75 moment-min-lower-matrix = 0.61816907526618862709851639675273
76 The minimal lambda is in [1.285307939537797246834590000000,1.285307939537797246834610000000]
77 Final result (in the centre of the last interval): d = 0.91237810305275834972134056121053
78 time = 49,239 ms.
79
80
81 -----
82 30 digits
83 -----
84
85 ? PintzRuzsa_psiapprox(4/5+10^(-20),27,30)
86 The expected number of correct decimal digits is = 30
```

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87 Approximation for the minimal lambda is = 10^(-30)
88 Needed matrix exponent for this precision is = 2^105
89 Number of iterations in the dyadic procedure = 424
90 The approximated final values are:
91 max-upper-matrix = 0.912378103052758349721358590459910416545890
92 min-upper-matrix = 0.912378103052758349721358590459902322401313
93 max-lower-matrix = 0.912378103052758349721358590459910399454390
94 min-lower-matrix = 0.912378103052758349721358590459902305309813
95 The approximated values for the moments are:
96 moment-max-upper-matrix = 0.618169075266188626931299358124411230167273
97 moment-min-upper-matrix = 0.618169075266188626931299358124400826698984
98 moment-max-lower-matrix = 0.618169075266188626931299358124411208199432
99 moment-min-lower-matrix = 0.618169075266188626931299358124400804731143
100 The minimal lambda is in [1.28530793953779724665119741228003900000000,1.28530793953779724665119741228004100000000]
101 Final result (in the centre of the last interval): d = 0.912378103052758349721358590459910416545890
102 time = 4mn, 19,948 ms.
103
104
105 -----
106 50 digits
107 -----
108
109 ? PintzRuzsa_psiapprox(4/5+10^(-20),39,50)
110 The expected number of correct decimal digits is = 50
111 Approximation for the minimal lambda is = 10^(-50)
112 Needed matrix exponent for this precision is = 2^172
113 Number of iterations in the dyadic procedure = 624
114 The approximated final values are:
115 max-upper-matrix = 0.91237810305275834972135859045990929414085615244675930311308271
116 min-upper-matrix = 0.91237810305275834972135859045990929414085615244675924826502561
117 max-lower-matrix = 0.91237810305275834972135859045990929414085615244675930308170857
118 min-lower-matrix = 0.91237810305275834972135859045990929414085615244675924823365148
119 The approximated values for the moments are:
120 moment-max-upper-matrix = 0.61816907526618862693129935808253892939804025384544671244136441
121 moment-min-upper-matrix = 0.61816907526618862693129935808253892939804025384544664194472116
122 moment-max-lower-matrix = 0.61816907526618862693129935808253892939804025384544671240103899
123 moment-min-lower-matrix = 0.61816907526618862693129935808253892939804025384544664190439573
124 The minimal lambda is in [1.2853079395377972466511974122341479975582119999426043900000000,1.285307939537797246651197412234147997558]
125 Final result (in the centre of the last interval): d = 0.91237810305275834972135859045990929414085615244675930311308271
126 ? ##
127 *** last result computed in 30mn, 26,314 ms.
128
129 -----
```

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130
131 -----
132 2/3 on a quad core pc
133 -----
134 [languasc@labsrv0 ~]$ nice /usr/local/Gruppi/PariGP/bin/gp2c-run -pmy_ -g -W PRmethodfinal.gp
135 PRmethodfinal.gp.c: In function `my_PintzRuzsa':
136 PRmethodfinal.gp.c:94: warning: unused variable `my_j'
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139         GP/PARI CALCULATOR Version 2.3.2 (released)
140         amd64 running linux (x86-64/GMP-4.2.2 kernel) 64-bit version
141         compiled: Nov 30 2007, gcc-3.4.3 20041212 (Red Hat 3.4.3-9.EL4)
142         (readline v4.3 enabled, extended help available)
143
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147 WITHOUT ANY WARRANTY WHATSOEVER.
148
149 Type ? for help, \q to quit.
150 Type ?12 for how to get moral (and possibly technical) support.
151
152 parisize = 8000000, primelimit = 500000
153
154 -----
155 10 digits
156 -----
157
158 ? PintzRuzsa_psiapprox(2/3+10^(-20),12,10)
159 The expected number of correct decimal digits is = 10
160 Approximation for the minimal lambda is = 10^(-10)
161 Needed matrix exponent for this precision is = 2^39
162 Number of iterations in the dyadic procedure = 160
163 The approximated final values are:
164 max-upper-matrix = 0.8337213168426473838898
165 min-upper-matrix = 0.8337213168420918764748
166 max-lower-matrix = 0.8337213168425383672048
167 min-lower-matrix = 0.8337213168419828597898
168 The approximated values for the moments are:
169 moment-max-upper-matrix = 0.4413015839592436256564
170 moment-min-upper-matrix = 0.4413015839586416916237
171 moment-max-lower-matrix = 0.4413015839591254978852
172 moment-min-lower-matrix = 0.4413015839585235638525
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173 The minimal lambda is in [1.083575154049900000000,1.083575154050100000000]
174 Final result (in the centre of the last interval): d = 0.8337213168426473838898
175 time = 4,673 ms.
176
177
178 -----
179 20 digits
180 -----
181
182 ? PintzRuzsa_psiapprox(2/3+10^(-20),19,20)
183 The expected number of correct decimal digits is = 20
184 Approximation for the minimal lambda is = 10^(-20)
185 Needed matrix exponent for this precision is = 2^72
186 Number of iterations in the dyadic procedure = 277
187 The approximated final values are:
188 max-upper-matrix = 0.83372131684338485515459227435255
189 min-upper-matrix = 0.83372131684338485515452760477806
190 max-lower-matrix = 0.83372131684338485515458851235650
191 min-lower-matrix = 0.83372131684338485515452384278202
192 The approximated values for the moments are:
193 moment-max-upper-matrix = 0.44130158394251203319483400833145
194 moment-min-upper-matrix = 0.44130158394251203319476393398731
195 moment-max-lower-matrix = 0.44130158394251203319482993192600
196 moment-min-lower-matrix = 0.44130158394251203319475985758187
197 The minimal lambda is in [1.0835751540289729521761900000000,1.0835751540289729521762100000000]
198 Final result (in the centre of the last interval): d = 0.83372131684338485515459227435255
199 time = 41,941 ms.
200
201
202 -----
203 30 digits
204 -----
205
206 ? PintzRuzsa_psiapprox(2/3+10^(-20),26,30)
207 The expected number of correct decimal digits is = 30
208 Approximation for the minimal lambda is = 10^(-30)
209 Needed matrix exponent for this precision is = 2^105
210 Number of iterations in the dyadic procedure = 423
211 The approximated final values are:
212 max-upper-matrix = 0.833721316843384855154592152588205415890590
213 min-upper-matrix = 0.833721316843384855154592152588197887361263
214 max-lower-matrix = 0.833721316843384855154592152588205404464508
215 min-lower-matrix = 0.833721316843384855154592152588197875935182
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216 The approximated values for the moments are:
217 moment-max-upper-matrix = 0.441301583942512033013203743652502539297678
218 moment-min-upper-matrix = 0.441301583942512033013203743652494381570354
219 moment-max-lower-matrix = 0.441301583942512033013203743652502526916660
220 moment-min-lower-matrix = 0.441301583942512033013203743652494369189336
221 The minimal lambda is in [1.08357515402897295195834526956583900000000,1.08357515402897295195834526956584100000000]
222 Final result (in the centre of the last interval): d = 0.833721316843384855154592152588205415890590
223 time = 3mn, 53,681 ms.
224
225
226 -----
227 50 digits
228 -----
229
230 ? PintzPintzRuzsa_psiapprox(2/3+10^(-20),37,50)
231 The expected number of correct decimal digits is = 50
232 Approximation for the minimal lambda is = 10^(-50)
233 Needed matrix exponent for this precision is = 2^172
234 Number of iterations in the dyadic procedure = 628
235 The approximated final values are:
236 max-upper-matrix = 0.83372131684338485515459215258820372013640387733149037455160858
237 min-upper-matrix = 0.83372131684338485515459215258820372013640387733149032353630951
238 max-lower-matrix = 0.83372131684338485515459215258820372013640387733149037427262730
239 min-lower-matrix = 0.83372131684338485515459215258820372013640387733149032325732823
240 The approximated values for the moments are:
241 moment-max-upper-matrix = 0.44130158394251203301320374362026095967995267147401959779762169
242 moment-min-upper-matrix = 0.44130158394251203301320374362026095967995267147401954251871114
243 moment-max-lower-matrix = 0.44130158394251203301320374362026095967995267147401959749532451
244 moment-min-lower-matrix = 0.44130158394251203301320374362026095967995267147401954221641397
245 The minimal lambda is in [1.0835751540289729519583452695271703132722006062074439900000000,1.083575154028972951958345269527170313272
246 Final result (in the centre of the last interval): d = 0.83372131684338485515459215258820372013640387733149037455160858
247 time = 26mn, 25,158 ms.
248
249
250
251
252
```