```
 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 = 0.9123781030527583497213405612105
68  min-upper-matrix = 0.9123781030527583497212710330380
69  max-lower-matrix = 0.9123781030527583497213382830007
70  min-lower-matrix = 0.9123781030527583497212687548282
71  The approximated values for the moments are:
72  moment-max-upper-matrix = 0.6181690752661886270986086900659
73  moment-min-upper-matrix = 0.6181690752661886270985193249538
74  moment-max-lower-matrix = 0.6181690752661886270986057618648
75  moment-min-lower-matrix = 0.6181690752661886270985163967527
76  The minimal lambda is in [1.285307939537797246834590000000,1.285307939537797246834610000000]
77  Final result (in the centre of the last interval): d = 0.9123781030527583497213405612105
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
```

```
 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 = 0.91237810305275834972135859045991041654589 0
 92 | min-upper-matrix = 0.91237810305275834972135859045990232240131 3
 93 | max-lower-matrix = 0.91237810305275834972135859045991039945439 0
 94 | min-lower-matrix = 0.91237810305275834972135859045990230530981 3
 95 | The approximated values for the moments are:
 96 | moment-max-upper-matrix = 0.61816907526618862693129935812441123016727 3
 97 | moment-min-upper-matrix = 0.61816907526618862693129935812440082669898 4
 98 | moment-max-lower-matrix = 0.61816907526618862693129935812441120819943 2
 99 | moment-min-lower-matrix = 0.61816907526618862693129935812440080473114 3
100 | The minimal lambda is in [1.28530793953779724665119741228003900000000,1.28530793953779724665119741228004100000000]
101 | Final result (in the centre of the last interval): d = 0.91237810305275834972135859045991041654589 0
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 [1.28530793953779724665119741223414799755821199994260439000000000,1.28530793953779724665119741223414799755 8
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 | -------------------------------------------------------
```

```
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'
137 || PRmethodfinal.gp.c:94: warning: unused variable `my_l'
138 || PRmethodfinal.gp.c:94: warning: unused variable `my_i'
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 ||
144 ||                          Copyright (C) 2000-2006 The PARI Group
145 ||
146 || PARI/GP is free software, covered by the GNU General Public License, and comes
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
```

```
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
```

```
216  The approximated values for the moments are:
217  moment-max-upper-matrix = 0.44130158394251203301320374365250253929767
218  moment-min-upper-matrix = 0.44130158394251203301320374365249438157035
219  moment-max-lower-matrix = 0.44130158394251203301320374365250252691666
220  moment-min-lower-matrix = 0.44130158394251203301320374365249436918933
221  The minimal lambda is in [1.0835751540289729519583452695658390000000,1.0835751540289729519583452695658410000000]
222  Final result (in the centre of the last interval): d = 0.83372131684338485515459215258820541589059
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 [1.0835751540289729519583452695271703132722006062074439900000000,1.0835751540289729519583452695271703132726
246  Final result (in the centre of the last interval): d = 0.83372131684338485515459215258820372013640387733149037455160858
247  time = 26mn, 25,158 ms.
248
249
250
251
252
```