J8>OMWLsN?aNF'CD'%-!<%o!<%I$NH/8+$Khk =EMWJ8Cj=PK!—E8K>Bf%7%9%F%`—

A System for Making Summary by Extracting Key Sentences Using feature keywords -A Panoramic View System-

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Keywords: Summary, Keywords Extraction, Extraction of Key Sentences, Co-occurence of keywords,

Summary

There are so many resources of electronical documents. However, we cannot access the all documents and we cannot examine each documents precisely. Therefore summaries are available for the selections of the documents. A system for making summary is Paranomic View System(PVS) which extracts key sentences from a document by the original method. PVS extracts keywords from the top of the term-frequency mountain. Many ordinary systems extract keywords by high frequency. However, PVS also extracts low frequency keywords based on the co-occurence of the keywords in sentences. Such keywords feature each sentence and are useful for extractions of key sentences.

1. $O $8 $a $K

6aG/!$%$s%?!<%M%C%H$NMxMQ$,@9sKJkKD$l!$07ol$k>pJsNL$,BgI}$KA}$(F-$F$$$k!%>pJs$NEAC#$KMQ$$$ilkJ8=q$bEE;R2=$,?J$_!$E-mail rO8a!$Web %Z!<%8!$%M%C%H%K%e!<%9!$EE;R?^=q4[$JI5$^$6$^$J<jCJrDL8$FJ8>O$K@\$7!$>pJs$r3MF'@9k5!2q$,A}$($F$$$k!%7+7=$N>pJsNL$O"$^$j$KKDBg$G$"$j!$;~4V$d?4?H$N@)Ls$KhC$F!$A4FN>pJs$KL\$rDL$9$3HOHs>o$K:$FqG"$k!%

:G6a!$$=Nh$&$JB?$/$N>pJsNCf+iI,MWJ>pJs$rAGAa$/3MF'@9k$?$a$N8&5f$,!$>pJs8!:w$JINJ,Ln$G@9$s$K9I$Jol$F$$$k!%:G$bBeI=E*$J>pJs8!:w$N<jCJ$H7F$O%5!<%A%(%s%8%s$,5s2i$l!$%f!<%6$,F~NO$7$?8!:w8l$r4^$'%Z!<%8$r=PNO9k:]$K!$3F8!:w8l$N3FWeb %Z!<%8Cf$G$N=EMWEY$rFH<+$K7h$a$F=g0LIU$1$N8e$K=PNO5l$k[*1]!%$9Jo$A!$3FWeb %Z!<%8$N%-!<%o!<%I$H%f!<%6$,F~NO$7$?8!:w8l$H$,?tB?$/0lCW7F$$$l$P>e0L$K=PNO5l$kI>2A4X?t$HJk!%$=$lf(J8>ONCfG=EMW$JItJ,!#-!<%o!<%I$d=EMWJ8!KOI3+$r8+$D$1=P$9$3$HKO!$8!:w$N%i%s%-%s0$r2~A1$9$k>e$G0ULH$,$"$k!%

$^$?!$8=:_%5!<%A%(%s%8%s$N=PNOKh$/8+$+1kC;$$35MW$OA4$F!$8!:w$5l?3FWeb %Z!<%8$NKAF,$+$i<h$j=P5l$F$$k!%%K%e!<%95-;vNh$&$KKAF,J8$K0ULH$N$"$kFbMF$,4^$^lF$$k$H$$&@)Ls$O0lHL$K$OK~$?5l$J$$?$a!$7k6I$O=$N%Z!<%8$^$G%O%$%Q!<%j%s%/$rC)C?>e$G!$F~NO7?8!:w8l$,$INh$&$K;Hol$F$$k$+$r<B:]$K3NG'$9k3Hb7PG"$k!%$3$N860x$O!$J8>OCf$G=EMW$JItJ,$rFCDjG-$J$$$3HKhC$F$$k!%$"$i$+$8$a=EMWJ8$rCj=P7F$*/$3HG!$8!:w8l$r4^$'=EMWJ8$rM%@h7F3EMW$KMQ$$k3HKhCF$b!$8!:w$NG=N($,>e$,$k$H9M$(il$k!%

8!:w$NG=N($r>e2k=>Mh8&5fH7$F!$Web %Z!<%8$K4^$^lk%-!<%o!<%I$r%f!<%6$KDs6!7F8!:w$r;Y1g$9$k%7%9%F%`[:=;399]$,$"$k!%3l$OWeb %Z!<%8$+$iIQEY$KhC$F=g0L$E$1$5l?%-!<%o!<%I$rMQ$$F!$8!:w8l$K%^%C%A7?B?/$NWeb %Z!<%8$K6&DL$K8=$l$k%-!<%o!<%I$r%f!<%6$KDs6!$7$F$$k!%3N$"$i$+$8$a3F%Z!<%8$KM?$($F$*/%-!<%o!<%I$O!$3FWeb %Z!<%8Cf$G=EMWH5lkJ8$K4^$^lF$$J1l$P!$8!:w;Y1gH7FN8z2L$O==J,$GOJ$$$@m&!%

=>Mh$N=EMW2U=j!ŒJMn!$J8!$@a$J$I!K$NCj=P$*$hS=$NO"7k$KhkMWLs@8@.K*$$F$O!$J8>O$K4^$^lk3FJ8$rI>2A$7$?>e$G!$I>2ACM$N9b$J8$rCj=P9k$H$$&J}K!$,:N$ilF$$k!%3FJ8$NI>2A$K$O!$J8$K4^$^lkC18l$N%-!<%o!<%I$H7F$NI>2ACM$rC18l$N=P8=IQEY$d!$%F%-%9%H8GM-$K=P8=9kC18l$NI>2A$rAH9g$;$?TFIDFK![Salton 97]KhkCMJIGM?$(!$$=$NI>2ACM$NOB$GJ8$N=EMWEY

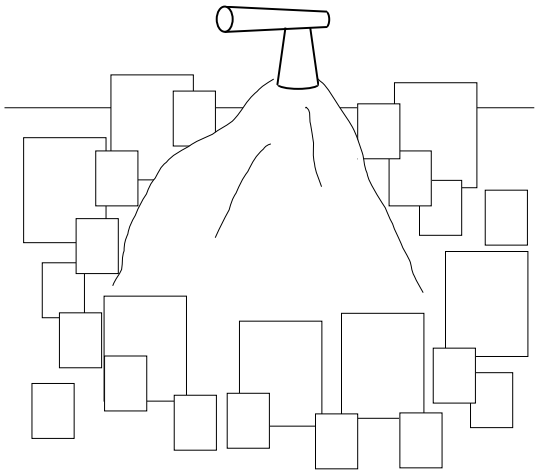
*1 $?$H$($P!$$¥?%$%H%k$K4^$^$l$k!W$d!¥U%)%s%H$,Bg$-$$!WJIG"$k!%

$rI=$9J}K!$,9-$/MQ$$ilF$$k!%$^$?!$J84V$N4XO"EY$K4p$E$$FB?$/$NJ8$H4X$oj,$"$kJ8$rA*$V<jK!b"$k[1|B<99]!%J8$HJ8$O!$N><T$K=P8=$9$kF1$8C18lb7$/$OF10l35G0$rI=$9C18l$N=P8=$KhG$F7k$SD1il!$B>$NJ8$HB?$/$N7k$SIU$-$rbDJ8$,=EMW$G$"$kH5lk!%3$N9M$(J}$O8lWCE*O":?[Morris 91] $KBeI=$5$l!$>pJs8!:w$d&-!<%o!<%ICj=P$K$bl~MQ$5lF$$k!%$=$N$[$+!$J8>OCf$K$*$1$kJ8$N0lCV>pJs[Brandow 95] $d@\B3;l$J$IFCDj$NC18l$r<j$,$+$jH9$kJ}K![G$98] JI$,$"$k!%

K\9F$GDs0F$9$k%7%9%F%'$K$*$$F$O!$%-!<%o!<%ICj=P$K4p$E$/=EMWJ8Cj=P$r9TJ&!%>Mh$+$i$NICQEY$Khk%-!<%o!<%I$r<j$,$+$jH7$F!$J8>O$N<gBj$HJk%-!<%o!<%I$rC18l4V$N4XO"$K4p$E$$FCj=P$7!$DcICQEY$N%-!<%o!<%I$NCf$+$i$bJ8>O$N<gBj$K9gCW$7$+$DJ8>O$rFCD'IU$1$k%-!<%o!<%I$r<hj@$9!%

0J2<$N2.$GDs0F9k%7%9%F%'$N35MW$H%"%k%4%j%:%'$N>\:Y$K$D$$F=R$Y!$3.$GJ8>O$+$i=EMWJ8$rCj=P9k<B837$r9T$J$&!%4.$G<B837k2LKBP9$k9M;!$*hSI>2A$r9T$J$$!$5.$G7kO@$H:#8e$NE8K>KD$$F=RYk!%

2. E8K>Bf%7%9%F%'



?^1 E8K>Bf%7%9%F%'354Q

2!1. E8K>Bf%7%9%F%'$N350@

??sCfKBg$-$J;3$,$"$kD.$rA[A|7FM_7!$%D.$NFCD'rHi($F@kEA$9k?aK$OG!2?$J$kJ}K!$,I,MW$@$m$&$+!%;30J30$ND.Cf$N0lE@$+$iD.A4BN$rD/$ah&H7Fb!$;k3&$K$O;3$P$+$j$,6/D4$5$l!$$=$l0J30$K<~JU$N7zJ*$,$$$/D+8+$($k$@$1G"m&!%FC$K;3$N8~3$&B&$JsF2?$,$"k+8!F$$bD+J!$$=3G!$2f!9$N%7%9%F%'$O;3$KEP$k!%;3D:$K$"$kE8K>BfJi$PD.A4BN$r8+EO93H$,2DG=$G$"$k!%D.A4BN$r8+EO$9Cf$G!$$3$ND.$rFCD'IU1k7'>l$dGnJ*4[!$8x1'JI!$;3$NO<$+$iGO5$$E$-$K$/$$>l=j$^$G$b!$$7C+jHB*$($k3H$,$G$-$kG"m&!%

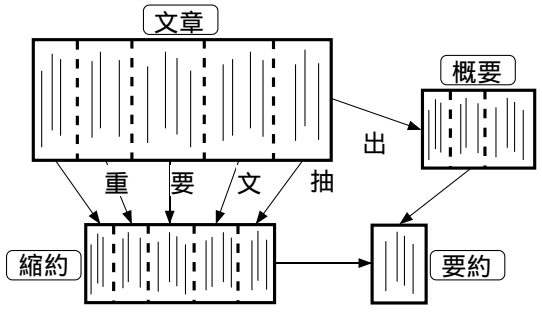
K\%7%9%F%'GO0lDNJ8>O$r!$C18l$N=P8=IQEY$KhC$FI=$5lk;3$r4^$'D.H_J9!%IQEY$N9b$$C18lKh$k;3$,$"$j!$IQEY$NDc$$C18l$OL12H$d3X9;!$IEl!$HJk!%J8>OrFI':]KO!$7+$jUV$78=$l$kC18l$OFI<T$N0u>]$K;D$jJ8>O$NCfNBg-$JFCD'$H7FB*$($ilk!%7+$7!$<B:]KO8+MnH5ld$9$$1lI$bJ8>O$NFCD'IU1r7F$$kIQEY$,Dc$$1lI$b=EMW$JC18l$,B8:_$9kNG"$k!%K\9F$GS$O!$$=Nh$&$JJ8>O$NFCD'$E1r9TJG$F$$kC18l$rC5$7$FI>2A$9k3HKhG$F!$J8>O$+$i=EMWJ8$rCj=P$9$kJ}K!$K$D$$F=RYk!%

2!2. K\%7%9%F%'$NL\I8!MWLs$H$O!)

K\%7%9%F%'$,=PNC$9$k=EMWJ8$H$O!$85$NJ8>O$NCf$G=EMW$HI>2A5l?J8$=$NbNG"$j!$$3lO!V6O?*2!WKEv?$k!%3$N>6O?r^Ha$kJ}K!$O!$L\E*$dMQESKhCF0[Jk$H9M$(ilk,!$J8>O$NA4HC0ON&AI$NDxEY$r%+%P!<9k$+$KhC$F<!$N#3<cN'$KJ,$1il$k!%$=liO9Jo$A!$

1. =LLs!J8>OA4BN$r=I<\$7F^Ha$k[J8>O$NA4BN]
2. 35MW!!MWE@r+$$D^s@!K$@$$?$$NFbMF[J8>O$N0lIt]
3. MWLs!J8>O$NMWE@$rB*$($FC;$/E;$a$?$b$N[J8>O$N%]%$s%H]

$N#3$DG"$k!%C1=c$KJ8>OA4BN$+$i=EMWJ8$rCj=P$7$?>19g!$$=$NCj=P$9$k=EMWJ8$NA4J8KBP9$k3d9g$KhC$F!$1$+$i3$,6hJI$G$-$kHb9M$($ilk*3!%7$+$7!$C1=c$KCj=P9kJ8$N3d9g$rJQ2=$5;$F$b!$J8>O$,D9$/JkKDlF!$<h$j=P5l$k=EMWJ8$NJ8>OFbGN0lCVKJPj$,@8$8F7$^$&!%$=$N$?a!$J8>O$N=LLs$r9M$(k:]$K$O!$J8>O$NJ,3d[J?Hx99] JI$N<jK!rAH_9go;!$CJMn4H$ND9$5$K1~8FCj=P9k=EMWJ8$N3d9g$r7hDj$9kJIN)IW$,I,MW$HJk!%FC$KJ8>O$NJ,3d$,85$+iJ5l$F$$k!$$b7/OJ5l$?$H2>Dj7?>19g$NJ8>OMWLs:n@.$N<j=g$O?^2$Nh&KJ$k!%



?^2 MWLs@8@.$NN.$l

?^2$N3F?^Fb$NE@@~$OCJMn$N@Z$lL\$rI=$7F$$k!%J8

*2 !J8>O$NBg;v$JItJ,$r!KH4$-=P$7?$b$N

*3 >6O?NFI_d9$5[FqGH99] $K4X$9$k5DO@$NM>COO"$k!%

>O$+$i$O!$=EMWJ8Cj=PKhCF3MWr@8@.$7!$CJMn4H$N=EMWJ8$rbH$K=ILs$,@8@.9k3H$,$G$-$k!%$=$N8e$K!$=ILs$H3$MWrAH_9go;k3HKhC$F!$J8>OA4BN$NN.$1$H!$J8>OCf$N=EMW$JItJ,HNAH9g$;$KhC$F!$E,@Z$JMWLs$,@8@.G-kH9M$($F$$$k!%

2.3 K\%7%9%F%'$N07$&J8>O

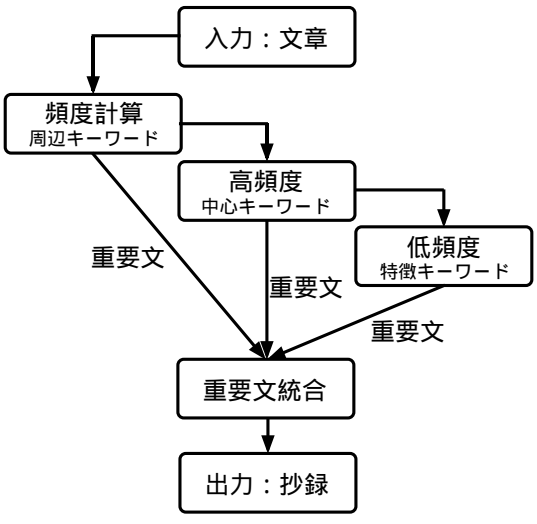
K\@aGO!$K\%7%9%F%'$,07$&J8>O$N@-<AKD$$F@bL@9k!%F~NOHJ$kJ8>O$N@-<AKO!$%F%-%9%H$ND9$5!$%8%c%s%k!$J,Ln!$C101!?J#?t%F%-%9%HNJLJI,$"$k[1|B<99]!%F%-%9%H$ND9$5KD$$F$O!$#1J8$d#2J8$JIN6KC<$KC;$$>19g$r=|$$FFCKLdoJ!%IQEYJI$NE}7W>pJs$rMQ$$k>19g!$Cj=P$9$k%-!<%o!<%I$dJ8$N@:EY$rF@k?aK!$$"$kDxEY$ND9$5$rJ8>O$K5a$akN$,DI>o$G$"$k$,!$K\%7%9%F%'$NA@$$H7F!$C1814V$N4XO"$K4p$E$$FC;$$J8>O$+$i$b@53N$K=EMW$JC181$dJ8$rCj=P$9k3HrL\;X7F$$k!%

$^$?J8>O$N%8%c%s%k$dJ,Ln$K4X$7Fb!$%8%c%s%k$dJ,Ln$K1~$8$?CN<1$d!$0UL#=hM}$r9TJo$J$$?aKFC$K;XDj$OJ*[4]!%

:G8e$K!$07$&%F%-%9%H$OC101$N%F%-%9%H$H9k!%7+$7J8>OA4BN$+iN=EMWJ8$NCj=P$r9M$($k:]KO!$K\%7%9%F%'$O!$J8$N=P8==g=x$K4X$9$k>pJs$rMQ$$J$$?aK!$M?$(il$?A4$F$N%F%-%9%H$rJBYFG-$k#1$D$N%F%-%9%H$KBP7F!$K\%7%9%F%'$,MQ$$ilk2DG=@-O"$k!%

2.4 >6O?@8@.%"%k%4%j:%'

K\@aGO!$F~NO$HJkJ8>O$+$i=EMWJ8$rCj=P$7$F>6O?$r@8@.9k%"%k%4%j:%'KD$$F@bL@9k!%3F%9%F%C%W$N3g8IFb$K2!k$K4p$E$/J*M}E*0UL#$r<($9!%



?^3 >6O?@8@.%"%k%4%j:%'

*4 7ABVAG2r@O$rMQ$$F$$k$?$a!$F|K\81$G<-=q$K4^$^1F$$kC181$,;H$o1F$"$k3H$H!$J8$N@Z$1L\$G$"$kF1E@$,J8>O$K4^$^$1$F$$k3H$,K>$^$7$$!%

%9%F%C%W#0!%-!<%o!<%I8uJd$N='Hw!IJ.:n$jN?aN@0CO!K

J8>O$N%-!<%o!<%I$N8uJdH7$F!$M=$a7ABVAG2r@O[Chasen]$KhC$F!$L>;1!IJaDLL>;1!$%5JQL>;1!$8GM-L>;1!$COL>!$?ML>!K!$F0;1!$7AMF;1*5$r<h$j=P7F$*$/!%

%9%F%C%W#1!<~JU%-!<%o!<%I$NCj=P!IJQEY$KhkC181$N;3$HD.$r@8@.!K

$^$:!$C1=c$KC181$N=P8=IQEY$KhC$F!$%-!<%o!<%I$rCj=P$9$k!%3$N%-!<%o!<%I$r<~JU%-!<%o!<%I$H8F$V!%

$$key1(w) = frequency(w) \quad (1)$$

<~JU%-!<%o!<%I$N?t$O!$J8>O$K4^$^$1k;1$N<dN'?t$N#2#0!s$rL\0B$H7F!$:GBg$G#2#08D$r<h$k*6!%9bIQEYKhCFC181$K9bI>2A$rM?$($kB?$/$N<jK!$,$"kh$&$J$K!$J8?t2sMQ$$ilkC181$N=EMW@-$O:F$S8@&$^Gb$J$$$[Luhn 58]!%7$+$7!$IQEY$N$_$G$O3FC181$,J8>ONCfGINh&$K8=$l!$$INh$&$JLr3d$r2L$?7$F$$k$+$rCNk3H,G-$J$$N$G!$C1814V$N4XO"$rbH$K=EMW$J%-!<%o!<%I$rC5$9A'n$,I,MW$HJk!%

%9%F%C%W#2!Cf?4%-!<%o!<%I$NCj=P(E8K>Bf$N7zC[)

<!$K!$<~JU%-!<%o!<%I$,8=$l$?;~$K8=ld9C181H7$FCf?4%-!<%o!<%I$H7FCj=P9k!%3$1$l$NIQEY$KhkB?$/$N<gD%$r I=%-!<%o!<%I$,B8:_9k[Bg_7 99] $H$$&9M$($K4p$E$$F$$k!%9Jo$A!$J8>OCf$N3FC181$K<!$NI>2A4X?t$GM?$($ilkI>2ACM$rM?$(!$=$NI>2ACMKh$k>e0L!C181<dN'?t$N#4!s$G:GBg#58D!K$rCf?4%-!<%o!<%IH9$k!%<~JU%-!<%o!<%I=89g$G$!$C181w$r4^$'J8$N?t$r$n(w) H9kH$-$NC181w$NI>2ACM$key(w)$O<!<0$HJk!%

$$key(w) = \prod_{g \subset G} \frac{n(w \cap g)}{n(g)} \quad (2)$$

3N<0$O!$<~JU%-!<%o!<%Ig,=P8=7?;~$KC181w$bF1;~$K=P8=$9$k>r7oIU3NN($r!9YFN<~JU%-!<%o!<%I$K4X$7$F@Q;$7$F$$k!%=N?a!$IQEY$Khk<~JU%-!<%o!<%I$HF1;~$K=P8=9k3d9g$,9b$$%-!<%o!<%I$O!$FC$KIQEY$,9b$$%-!<%o!<%I$K8B$ilk!%7$+$7!$C181$NJ8FbK*1k6&/4X78rbHK7F$$k?aK!$I,$:7b9Y$FIQEY=g$KA*Plko1GOJ$!%

%9%F%C%W#3!'7+jJV7Cf?4%-!<%o!<%I$NCj=P!EJ8K>Bf$NJd6/!K

A0%9%F%C%WGOA4FN<~JU%-!<%o!<%I$r<j$,$+$j$KCf?4%-!<%o!<%I$rC5$7$F$$?,!$<~JU%-!<%o!<%I$hjbJ8>O$N<gBj$rD>@\I=$9Cf?4%-!<%o!<%I$r<j$,$+jH9k3H$G!$<h$jB;$M$F$$kJ8>O$N3K$HJk%-!<%o!<%IrJd&!%$=$3$G!$Cf?4%-!<%o!<%I=89gS,8=l?H-$K!$F1;~$K

*5 !79k!$$J$k!$$"$k!$$h$k!$$$&!$$J$$!W$r=|$/!%

*6 #2#0!s$H$$&CM$O!$M=Hw<B83$+$iF@il$?J8>OCf$GJ#?t2s=P8=9kC181$N3d9g$NJ?6QCMG"$k!$F1IQEY$NC181$O9Y$FA*Br$9kH$$&r7o$N2<$G#2#0!s$K:G$b6a$/$Jk7$-$CM$r@_Dj$7$?>19g!$A4FN<~JU%-!<%o!<%I,J#?t2s=P8=9kC181HJG?!%

8=ld9%-!<%o!<%I$r5a$a$k!%$9Jo$A!$A4FNC18l$K:F$S<!$N<0$KhkI>2ACM$rM?$(!$$=$NI>2ACM$Khk>e0L!Ø18l<dN'?t$N#4!s$G:GBg#5$D!K$K4^$^$l$+$D!$$^$@ SKB0$5J%-!<%o!<%I$r?7$?$JCf?4%-!<%o!<%IH7$F SK2C$($k!%

$$key2(w) = \prod_{s \subset S} \frac{n(w \cap s)}{n(s)} \quad (3)$$

3NI>2A4X?t$O!$@h$NI>2A4X?t$N<~JU%-!<%o!<%I=89g $rCf?4%-!<%o!<%I=89g$HCV-49($?$bNK0lCW9k!%3 $N%9%F%C%W#3$r?7$?$JCf?4%-!<%o!<%I$,DI2C$5lJ$/$J k^$G7+$jUV$9!%

%9%F%C%W#4!'FŒ'%-!<%o!<%I$NH/8+ !ED8K>Bf$+iND/aKhkH/8+!K

:G8e$KJ8>O$N<gBjHJCF$$kCf?4%-!<%o!<%I$NN.$l Klh!$$+$DJ8>O$rFŒ'IU1F$$k%-!<%o!<%I$rCj=P$9 $k!%$=N?aNC18l$NI>2ACM$r<!<0$GM?$($k!%

$$key3(w) = \prod_{s \subset S} \frac{n(w \cap s)}{n(w)} \quad (4)$$

9JoA!$Cf?4%-!<%o!<%I$,=P8=9k;~KN$_=P8=$9 $kC18l$rC5$9L\E*$G!$$Il@$1B?$/$NCf?4%-!<%o!<%I$H L)@\$K4X7$7$F$$k$+$rI=$9>e$G=EMW$J%-!<%o!<%I$,B8:_$7 $F$$k!%3Nh$&$JFŒ'%-!<%o!<%IOFCKIQEY$,Dc$/$J $k798~$K$"$j!$Cf?4%-!<%o!<%I$,B?$/8=$l$kJ8$G7+;H ol$F$$J$C18l$,!$FŒ'%-!<%o!<%I$HJk!%9JoA!$ J8>O$N<gBj$HJkCf?4%-!<%o!<%I$+$i0olJ$SHC0C$G!$B> $NJ8$K$O8=$l$F$$J$C18l$r9b$/I>2A$9k3HKAjEv$7!$ C1=c$KJ8C10L$Gtfidf$r9T$JC?;~KHfY$F!$J8>O$N<gBj $K4X$7$F0l4S@-$N$"$kJ8$+$i$N%-!<%o!<%I$,F@il$k!%

%9%F%C%W#5!'J8>OCf$N3FJ8$rI>2A!'CC0h$NI>2A!K

J8>OCf$N3FJ8$KJ8Cf$K4^$^lkC18l$NI>2ACM$NAmOB$r 3FJ8$N=EMWEYH7$FM?$($k[Zechner 96]!$3FJ8TK$O <0(5)$+$i<0(7)$N#3DNI>2ACM$rM?$($k!%$?$@$7C18l wNI>2ACM$key1(w)$,!$A4C18l$N<0(1)Kh$kI>2ACM $NJ?6Q$r2<2s$k>19g$K$O!$$key1(w) = 0H9$k!%$^$?!$ $key2(w), key3(w)$$K$D$$F$bF1MM$NA':n$r9T$J$&&*7!%

$$sentence1(T) = \sum_{w \subset T} key1(w) \quad (5)$$

$$sentence2(T) = \sum_{w \subset T} key2(w) \quad (6)$$

$$sentence3(T) = \sum_{w \subset T} key3(w) \quad (7)$$

*7 3NA':n$O!$D9$$J8$[$I<+A3$KI>2ACM$,9b$/$Jk3HrM^$($k$H6&$K!$M-8z$JC18lH=$&$GJC18lHrL@3N$K6hJI$9k?aK9TJG$F$$k!%$^$?!$M-8z$JC18l$rF($5$J$$G=~J,$K4^$'h&$K!$3FI>2A4X?tKh$kI>2ACM$NJ?6Qr7$-$$CMH7$F@_Dj$7$?!%

I=1 <~JU%-!<%o!<%I!ØeOL!K

C18l	I>2ACM!ÍQEY!K
%-!<%o!<%I	105
J8	76
J8>O	73
=EMW$@	45
Cj=P	35
C18l	35
Cf?4	28
%7%9%F%'	26
4^$'	23
IQEY	20

%9%F%C%W#6!'=EMWJ8$N7hDj!'GÆkEACC0h$NFCDj!K

<0(1)$+$i<0(4)Kh$k3FJ8$NI>2ACM$r85$K!$=EMWJ8$r Am9gE*$K7hDj$9$k!%$=lK$O!$$^$:3FJ8$K<0(5)$+$i<0(7) N=l>lNCM$K4p$E$$$F!$I>2ACM$N9b$$=g$K=g0L$rD1 $k!%$9Jo$A!$3FJ8TO<0(5)Kh$k=g0L$rank1(T)$!$<0 (6)Kh$k=g0L$rank2(T)$H<0(7)$Khk=g0L$rank3(T) $N#3<dN'$N=g0Lrb$D*8!%$=$N=g0L$E1N8e$K!$<0(8)$N 3FJ8$N=g0L$N9g7W$r$=$NJ8$NI>2ACM$H7FM?$($k!%

$$value(T) = rank1(T) + rank2(T) + rank3(T) \quad (8)$$

3N,<0(8)NCMK4p$E$$$F!$MQES$Kl~8FI,MW$J?t *9$N=EMWJ8$r=PNO$H9k!%

3. <B 83

K\<jK!$K4p$E$$$F!$J8>O$K4^$^$l$k3FC18l!ÍD>;l!K$K I>2ACM$rM?$($F!$=EMWJ8$rCj=P$9$k<B83$r9TJC$?!%<B 834D6-$O!$Pentium II 350MHz(256MB) OS-Linux $G $"$j!$%W%m%0%i'$OC 8@8l$G=q$+lF$$k!%<B83$KMQ$$ $?%F%-%9%H$O!$K\9F!KÆ\>O$r=|$/153 J8492 <o1849 8D $NC18l!K$G$"$k!%

$^$:!$I=1$NIQEY$K4p$E$$$F>e0L20 8D$NC18l$r<~JU %-!<%o!<%IH7$F<h$j=P$9!'2Ø!&$N%9%F%C%W#1!K%

<!$K!$<~JU%-!<%o!<%I$,8=$l$?;~$K=P8=7d9%-!< %o!<%I$r!$Cf?4%-!<%o!<%I!'5ÛJ$D!K$H7F<h$j=P$9!'ØÆ9 %F%C%W#2!K%$^$?!$<h$j=P5l$?Cf?4%-!<%o!<%I$r85$K!$:F5"*$KCf?4%-!<%o!<%I$r=8akA':n$r9T$J$$!'Ø9%F%C %W#3!KCf?4%-!<%o!<%I=89g!ÍD=2$N!v0u$NC18l!K$,@8@. 5l$?!%

F@il$?#68D$NCf?4%-!<%o!<%I$r85$K!$Cf?4%-!<%o!<%I $,=P8=$9$k;~$KN_MQ$$$ild9%-!<%o!<%I$rFŒ'%-!< %o!<%I!ÍD=3!K$H7F$=$NI>2ACM$rF@$k!'Ø9%F%C%W#4!K% <!$K!$3FC18l$NI>2ACM$K4p$E$$$F3FJ8$KI>2ACM$rM?$($k!'Ø9%F%C%W#5!K*10!%:G8e$K!$3F%-!<%o!<%ICj=PK!Kh $kJ8$NI>2ACMKh$k=g0L$r85$K=EMWJ8$r=PNO9k!'Ø9%F%C %W#6!K%$K\9F$N>e0L#5J8Kh$k>6O?$O0J2<Nh$&$KJC

*8 F1$8I>2ACM$rbD>19g$OF1=g0L$HJk!%

*9 :G=EMWJ8$,I,MW$J>19g$O#1$D!$#1#0!s$N>6O?$KMQ$$$k>19g$K $OA4J8?t$N#1#0!sKEv?$k?t$NJ8$r<h$j=P$9!%

*10 I>2ACMN?$-$$CMHJ$kJ?6Q$O<~JU!$Cf?4!$FŒ'%-!<%o!<%I $N=g$K$=$l$>$l13.4, 0.32, 2.36 HJ$C?

I=2 Cf?4%-!<%o!<%I !ƀe0L!K

C18l	I>2ACM	IQEY
!vJ8	3.05	76
!v%-!<%o!<%I	2.23	105
!vJ8>O	2.22	73
!v=EMW$@	2.07	45
!vCj=P	1.33	35
%7%9%F%'	0.97	26
IQEY	0.87	20
4^$'	0.83	23
Cf?4	0.74	28
!vC18l	0.67	35

I=3 FCD'%-!<%o!<%I !ƀe0L!K

C18l	I>2ACM	IQEY
E}7W	34.01	1
A@$&	34.01	1
@:EY	34.01	1
@53N$@	34.01	1
L\;X$9	17.74	2
FCD'E1	15.12	1
F0:n	15.12	1
<A	15.12	1
5;=Q	15.12	1
0-$$	15.12	1
K\9F	12.81	2
8~>e	10.92	2

$? !ƀP8==g$KI=<(!K%B@;z$NC18l$,<g$JFCD'%-!<%o!<%I G"$j!$3g8lFb$K<0(8)$NCM(9g7W!a<~JU!\Cf?4!\FCD') $,$"$k!%

1. (24=3+7+14) !ǂ>Mh$+$i$NIQEY$Khk%-!<%o!<%I$r <j$,$+$jH7$F!$J8>O$N<gBj$HJk%-!<%o!<%I$rC1 8l4V$N4XO"$K4p$E$$FCj=P$7!$DcIQEY$N%-!<%o!<%I NCf+ibJ8>O$N<gBj$K9gCW7+$DJ8>O$rFCD'IU$1 $k%-!<%o!<%I$r<hj@$9!%W
2. (11=8+2+1) !ƀIQEYJI$NE}7W>pJs$rMQ$$$k>l9g!$Cj =P$9$k%-!<%o!<%I$dJ8$N@:EY$rF@k?aK!$$"$kDx EY$ND9$5$rJ8>O$K5a$akN$,DL>o$G$"$k$,!$K\%7%9 %F%'$NA@$$$H7F!$C18l4V$N4XO"$K4p$E$$FC;$$J8 >O$+$i$b@53N$K=EMW$JC18l$dJ8$rCj=P$9k3HrL\ ;X7F$$k!%W
3. (15=5+3+7) !ƀ9Jo$A!$J8>O$N<gBj$HJkCf?4%-!< %o!<%I$+$i0olJ$$HO0O$G!$B>$NJ8$K$O8=$l$F$$J $C18l$r9b$/I>2A$9k3HKAjEv$7!$C1=c$KJ8C10L $Gtfidf $r9T$JC?;~KHfY$F!$J8>O$N<gBj$K4X7F 0l4S@-N"$kJ8$+iN%-!<%o!<%I$,F@$ilk!%W
4. (10=4+1+5) !ƀ1lDN%-!<%o!<%ICj=PK!KhCF=E MWJ8Cj=P$r9T$J$&%7%9%F%'!$$"$k$$O5^6^$J%-!< %o!<%ICj=PK!$rC1=cKAH_9go;F=$NB??t7h$KhC $F=EMWJ8$rCj=P9k%7%9%F%'$N>l9g!$<h$j=P$5lk =EMWJ8KO0l4S@-$,$J$$3H,B?$$!%W
5. (20=7+4+9) !ƀ=:_O3$N%-!<%o!<%I=89g$r4QE@$H 7?=EMWJ8$rCj=P7F$$k$,!$Cf?4%-!<%o!<%IH7 FJLN4QE@$K4p$E$/%-!<%o!<%I=89g$rMQ0U9l$P!$0[Jk4QE@$K4p$E$/=EMWJ8Cj=P$K$bl~MQ$,2DG=G"$k!%W

3 !1k <B837k2L$N2r<a

Cf?4%-!<%o!<%I=89gH7$FF@$il?#68D$NC18l !ƀ8!$ %-!<%o!<%I!$J8>O!$=EMW$@!$Cj=P!$C18l!W$O!$$3$N<B83 Nc$K$*$$F$OIQEY=g$G$"$k$,!$K\9F$N%?%$H%k$,!ƀCD' %-!<%o!<%I$NH/8+Kh$k=EMWJ8Cj=P!W$G$"$k3H$+$i!$J8 >O$N<gBjH7$FE,@Z$G$"$k!%$3$3Gb$7 !ƀCD'!W$H$$$& 8@MU$b<gBj$HJkCf?4%-!<%o!<%I$K4^$a$?$$$HI.<I$,9M $($k>l9gKO!$4!2&$G=RYk !ǂQE@!WH7$FM?$(k3$H $d!$5.$G=R$Ykh$&$KJ8>O<+BN$r !ƀCD'!W$H$$$&8@MU$, %-!<%o!<%I$H7FF@ilkh$&$K2~A1$r?^$k3H$,9M$(il$k!%

$^$?!$Cf?4%-!<%o!<%I$NI>2ACM$OIQEY=g$HOJCF$* i:!$C18l4V$N4XO"$r85$KI>2ACM$,M?$(il$F$$$k!%$3 $NCf?4%-!<%o!<%I$NI>2ACMKh$k=EMWJ8$O>e5-=PNO$N=g 0L$O!$$1,2,3,4,7 HJCF$*$j!$K\<B837k2L$K$*$$FO= $N8z2L$,=-J,$K8=$l$F$$$k!%$^$?!$>6O?$N3F%-!<%o!<%I $K4p$E$/=g0L$KOPiD$-$,$"$j!$<~JU%-!<%o!<%I$HFC D'%-!<%o!<%I$rCf?4%-!<%o!<%I$KhC$F7k$SIU$1E}9g$7 $F$$$kMM;R$,$&$+$,$($k!%

:G8e$K!$4N?4$N>6O?$NF'bMFKD$$FG"k,!$<~gBj$rI= $9Cf?4%-!<%o!<%I$rB?$/4^$s$G$$kHHbK!$<~JU%-!< %o!<%I$KhkIQEY$,9b$$%-!<%o!<%I$r4^$_DD!$Cf?4%-!< %o!<%I$HN_=P8=9kDcIQEY$NFCD'%-!<%o!<%I$r4^s@ J8$,A*$PlF$$$k!%

4. %7%9%F%'I>2A

4 !1k %-!<%o!<%ICj=PK!$N4V$NAj4X4X78

<!$N#4$D$N%-!<%o!<%ICj=PK!$KhC$FCj=P$5lk=EMW J8$N4V$NAj4X4X78$rD4$Y$k<B83$r9TJC$?!%<B83$KMQ$$ $?J8=q$OWeb>e$N7]G=4X78$N%K%e!<%95-;v5526 7o*11$G $"$k!%

1) <~JU%-!<%o!<%I
2) tfidf Kh$k%-!<%o!<%I
3) Cf?4%-!<%o!<%I
4) FCD'%-!<%o!<%I

$^$:!$1) $H2) $NHf3S$r9TJC$?!%$=$N7k2L!$:G=EMWJ8 $N82 !s$,0lCW$7!$$^$?$=l>lN=PNO$N>e0L#5J8$rHf 3S7?H3$m!$J?6Q$G4.3 J8$,0lCW7F$*$j!$#93d$NJ8 =q$G4 J80J>e$,0lCW7F$$$?!%3N7k2L$NM}M3$H7F$O!$ 07C?J8=q$,C;$$$3HHOJLK!$%K%e!<%95-;v$O:#$^$G $OL5$+C?;vdJQoC?;v?7$7$;v$r5-;v$K9k$?$a$K B>$NJ8=qKOJ%-!<%o!<%I$,$=$N^$^$=$NJ8=qK*$$ $FB?$/;Hol$F$$$k$?$a$@$H9M$($ilk!%

<!$K!$K\%7%9%F%'$GMQ$$$k2)3)4) $N#3<dN'$N%-!<%o!< %IKh$k=EMWJ8Cj=P$N7k2L$rHf3S$7$?!%

#2DN%-!<%o!<%ICj=PK!A,BKhk=EMWJ8$N0lCWEY $Similar(A,B)$ $r<0(9)$GDjak!%$?$@$7!$n $OCj=P$9

*11 10J80J>e$N5-;v$K8EDj7F$$k!J?6Q21.3J8!K%

I=4 Cj=P$9%k=EMWJ8$H0lCWEY$N4X78 !D>;l!K

MWLsJ8$N?t	<~Cf	<~FC	CfFC	<~tfidf	<~CfFC
1	0.699	0.599	0.842	0.822	0.587
2	0.695	0.606	0.820	0.830	0.580
3	0.717	0.647	0.821	0.839	0.610
4	0.742	0.684	0.826	0.853	0.642
5	0.768	0.718	0.836	0.866	0.674
6	0.794	0.749	0.851	0.875	0.706
7	0.817	0.779	0.866	0.887	0.738

I=5 Cj=P$9%k=EMWJ8$H0lCWEY$N4X78 !D>;l!MQ8@!K

MWLsJ8$N?t	<~Cf	<~FC	CfFC	<~tfidf	<~CfFC
1	0.629	0.577	0.800	0.753	0.525
2	0.650	0.560	0.752	0.754	0.517
3	0.690	0.567	0.713	0.766	0.525
4	0.717	0.569	0.685	0.783	0.523
5	0.742	0.577	0.672	0.802	0.530
6	0.766	0.589	0.671	0.817	0.541
7	0.784	0.609	0.683	0.834	0.559

I=6 Cj=P$9%k=EMWJ8$H0lCWEY$N4X78#2 !D>;l!MQ8@!K

MWLsJ8$N?t	<~Cf	<~FC	CfFC	<~CfFC
1	0.519	0.148	0.407	0.148
2	0.574	0.167	0.333	0.167
3	0.617	0.222	0.383	0.210
4	0.657	0.306	0.454	0.287
5	0.685	0.321	0.494	0.309
10	0.719	0.419	0.585	0.404

$k=EMWJ8$N?tG"$j!$$Same(A,B)$ $OA $HB $G0lCW$9$k J8$N?t$NJ?6Q$G$"$k!%$^$?!$#3$D$N%-!<%o!<%ICj=PK!$K hk0lCWEY$bF1MM$K<0(10)GDja$k!%

$$Similar(A,B) = \frac{Same(A,B)}{n} \quad (9)$$

$$Similar(A,B,C) = \frac{Same(A,B,C)}{n} \quad (10)$$

3N0lCWEYr^Ha$?I=$,I=4$HI=5$G$"$k!%I=4$O%-!<%o!<%I$H7FL>;lN_$r07$C$?>l9g$N7k2LG"$j!$I=5$O%-!<%o!<%I$H7FL>;l$HMQ8@$NN>J}$r07$C$?>l9g$N7k2LG"$k!%

3N7k2L!$Cf?4%-!<%o!<%I$HFCD'%-!<%o!<%I$N0lCWEY$,9b$$CM$r<($7$F$$k!%3l$OJ8>O$,C;$$$?aKCf?4%-!<%o!<%I$r4^$'J8$N@dBP?t$,>/J/!$Cf?4%-!<%o!<%I$K4XO"7FF@il$kFCD'%-!<%o!<%I$r4^$'J8$K0lCW7?$?$a$H9M$(il$k!%$^$?L>;l$N$_$N>l9gKHfY$F!$MQ8@rb9MN8$7$?>l9g$KA4BN$K0lCWEY$,2<$,CF$$$k!%3l$O!$0lJ8$+$iCj=P5l$k%-!<%o!<%I$N?t$,A}$($?$3HKhC$FH/8+$7$F$$k$H8@$($k!%

$=$3$G!$$h$jD9$$J8>OKBP7$FF1MM$N<B83$r9T$JC?!%J8>OKO!$27 $N=q4J !JT?6Q295 @a!K$+iJ$k?7Ls@;=q$rMQ$$$?!%7k2L$rI=6$K<($9!%$3$N7k2L!$J8>O$,D9$/JC$?$3HKH<JC$F!$A4BNE*$K0lCWEY$,2<$,$C$F$$k!%0lCWEYNCfG$O!$<~JU%-!<%o!<%I$HCf?4%-!<%o!<%I$N0lCWEY$,:G$b9b$/$JCF$$k!%3l$O!$J8>O$,D9$/JjIQEYKh$k1F6A$,A}2C$7!$9bIQEY$NCf?4%-!<%o!<%I$H$N4V$GAj4X$,9b$/JC$?$?aH9M$($ilk!%

$^$?$$:lNNcK*$$F$b!$$J~JU!$Cf?4!K!Cf?4!$FCD'!K$N0lCWEY$,!$J~JU!$FCD'!Khj$b9b$/JC$F$$k3H$+$i!$Cf?4%-!<%o!<%I$,<~JU%-!<%o!<%I$HFCD'%-!<%o!<%I$HrDJ0Lr3d$r2L$?7F$*$j!$K\%7%9%F%'$N0U?^9kIQEY>pJs$+$i$CF@$ilJ$%-!<%o!<%I$rCf?4%-!<%o!<%I$H$$$&E8K>Bf$+$i$ND/$aKhCFH/8+7F$$k$H8@$($k!%

$^$?I=4$+$iI=6Cf$N !Cf?4!$FCD'!K$N0lCWEY$K$*$$F!$MWLsJ8?t$,1$+$i2$KA}$($?;~$K0lCWEY$,8:>/$7$F$$k!%3l$O!$9bIQEY$NC181$l$r:G$b4^$'J8$K$O!$FC$KFCD'$N$"$kC181$l,4^$^ld$9$$3Hr<($97k2L$G$"$j!$$3$N2r<a$H7F$O!$JV8>OKO:G$b<gD%$rI=$9L@3N$J#1J8$,$"$k!W$3Hr<($97k2L$H8@$($h$&!%

4!2. %-!<%o!<%ICj=PK!$NAH9g$;$N8z2L

0lDN%-!<%o!<%ICj=PK!KhCF=EMWJ8Cj=P$r9T$J$&%7%9%F%'!$$"$k$$O5$^$6$^$J%-!<%o!<%ICj=PK!$rC1=c$KAH$_9g$o$;$F$=$NB??t7hKhCF=EMWJ8$rCj=P$9$k%7%9%F%'$N>l9g!$<h$j=P5l$k=EMWJ8$K$O0l4S@-$,$J$$3H,B?$$!%7$+$7K\%7%9%F%'$N>l9g!$J8>O$N<gBj$rI=$9%-!<%o!<%I$r4^$_$+$DFCD'E*$J%-!<%o!<%I$r4^$'$h&$K!$$0UL#N"$k9Jj9~$_$r9T$J$($k%-!<%o!<%ICj=PK!$NAH9g$;$r<B8=$7$F$$k!%

3NJ8>O$N<gBj$O!$J8>O$NCf$GIQEY$N9b$$C181$l!$J~JU%-!<%o!<%I!K$HF1;~$K=P8=9kC181lH7F!$<g$K9bIQEY$N%-!<%o!<%I=89g$H7F$$k!%8=:_O3$N%-!<%o!<%I=89g$r4QE@H7$?=EMWJ8$rCj=P7F$$k!,!$Cf?4%-!<%o!<%I$H7FJL$N4QE@$K4pE/%-!<%o!<%I=89g$rMQ0U$9lP!$$0[Jk4QE@$K4p$E$/=EMWJ8Cj=P$K$b1~MQ$,2DG=G"$k!%2!k$N8@MU$r<Z$j$F498@$9kH!$E8K>Bf$r<+J,$N9%$_$N>l=j$K@_CV7F!JUj$NFCD'$r8+2s$9$3H,2DG=HJkNG"$k!%

4!3. KAF,J8$r4^$'3NN(B3$$F!$J8>O$NKAF,J8$r4^$'3NN(KD$$F9M;!9k!$I=7$HI=8HK%K%e!<%95-;v$rMQ$$$?>l9g$N3NN(CM$r<($9!%@hF,$NJ8$r4^$'3NN($O<~JU!$Cf?4!FCD'N=g$K8:>/$7$F$$k!$I=8$N:G=EMWJ8KD$$F$b!$IQEYKh$k%-!<%o!<%I$N_GO@hF,$NJ8$,44.9%$N3NN($G<h$j=P$5lk$,!$#3<cN'$N%-!<%o!<%I$NAH9g$;$Khk$H26.1%$N3NN(HJCF$$k!%3lO!$J8>O$NCf$G:G$b=EMW$J0UL#$N$"kJ8$O!$KAF,J8$hjb$'7$mJ8Cf$NFbMF$K4^$^$lk3Hr<($97k2L$G$"$k!%

5. 7kO@$H:#8e$NE8K>

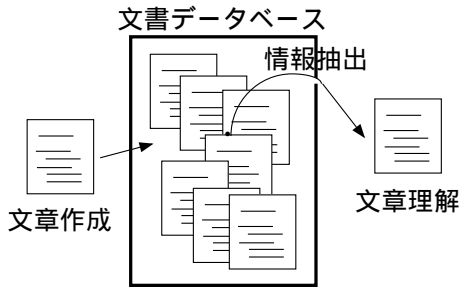
J8>OCf$K4^$^lkJ8>O$NN.$l$K1h$$$+$DFCD'E*$J%-!<%o!<%I$r8+=P$9<jK!$rDs0F$7!$3<cN'$N%-!<%o!<%ICj=PK!$NAH9g$;Kh$k=EMWJ8Cj=PK!$rDs0F7?!%3Nh&$JJ8>O$N>6O?$rMQ$$$?1~MQ$O5$^6^$J2DG=@-$rHkaF$$k!%

I=7 @hF,$NJ8$r4^$'3NN(!D>;l!K

MWLsJ8$N?t	<~JU	Cf?4	FCD'	<~CfFC	%i%s%@%'
1	0.463	0.400	0.362	0.318	0.047
2	0.575	0.517	0.476	0.423	0.094
3	0.645	0.607	0.570	0.500	0.141
4	0.699	0.662	0.633	0.565	0.188
5	0.743	0.714	0.690	0.628	0.235
6	0.779	0.757	0.738	0.679	0.282
7	0.811	0.793	0.778	0.725	0.329

I=8 @hF,$NJ8$r4^$'3NN(!D>;l!&MQ8@!K

MWLsJ8$N?t	<~JU	Cf?4	FCD'	<~CfFC	%i%s%@%'
1	0.449	0.342	0.325	0.261	0.047
2	0.580	0.478	0.430	0.365	0.094
3	0.653	0.564	0.497	0.434	0.141
4	0.708	0.621	0.533	0.474	0.188
5	0.753	0.675	0.560	0.509	0.235
6	0.789	0.721	0.578	0.537	0.282
7	0.819	0.758	0.591	0.556	0.329



?^4 >pJsEAC#$NN.$l

2f!CFCK!$J8>O$=NbNN:n@.$HFI2r$K4X9k;Yl g%7%9%F%'$r9M$($F$$$k!%J8>O$N;}$DK\Mh$NLr3d$G$"$k>pJs$NEAC#$N$?$a$K!$>pJsrAwkB&$H<u$lHkB&N=l>lN;Yl g$KMQ$$$ilk$H9M$($F$$$k!%$=$liO>pJs$r<u$lHk$?$a$NJ8>CFI2r;Yl g$H>pJsH/?.$N;Yl g$H7F$N!$J8>O:n@.$N;Yl g$G$"$k!%8=:_!I,MWJ>pJs$rC5$9$?$a$N;Yl g$O>pJsCj=PJI$G?tB?$/$N8&5f$,J5lF$*$j!$KAF,$G=RY?Web %Z!<%88!:wXNl~MQ$b0l$D$N2]Bj$G$"$k!%7+$7!$J8>O$=$NbN$N:n@.$*hSFI2r$r;Yl g$9$k%7%9%F%'$O$"$^j8+il$J$$!%

%-!<%o!<%ICj=P$d=EMWJ8Cj=P$N5;=Q$,8~>e$7h&Hb!$J8>O$N<A$,0-$1lP@5$7$/F0:n7J$2DG=@-$,$"$k!%01 4S@-NJ$J8>O$d!$>~$j8@MU$,B?$$J8>OJI$,$=lG$"$k!%bAms!$%7%9%F%'$N2~NI$r=E$Mk3HG!$$INh$&$JJ8>O$+$i$b=EMWJ8$rCj=PG-kh$&$J0lHIE*$J%7%9%F%'$N9=C[$rL\;X$9Nb8&5f$N0l$D$NJ}8~$GO"$k!%$7$+$7!$%7%9%F%'$P$+$j$,8~>e$7$F?M4V$,BDMn7F$b:$$kNG$"$C$F!$%7%9%F%'$H?M4V$N4V$NN><T$NJb$_4s$jKhCFo+$jNI$$J8>O$N:n@.$H=EMWJ8$NCj=P$N4V$NN><T$NBE6(E@$,8+$$=P5lkHI.<TiO9M$($F$$$k!%

◇ ;2 9M J8 8%◇

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[J?Hx 99] J?HxEX, KIFb7<, LZC+6/: C18l=EMWEY$H8lWCE*7kB+@-$rMxMQ7?%F%-%9%H%;%0%a%s%F!<%7%g%s, >pJs=hM}3X2q<+A38@8l=hM}8&5f2q;qNA!$99-NL-130, Vol.99, No.22, pp.41 – 48,(1999).

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[G$98] G$J!7Q!$Dj1JLw;K!E}7W>pJs$HJ8>O9=B$$K4pE/=EMWJ8$N<+FCCj=P, >pJs=hM}3X2q;=Q8&5fJs9pNL125, Vol.98, No.48, pp.71 – 78, (1998).

[Bg_7 99] Bg_79,@8, %M%k%9%Y%s%=%s, C+FbED@5I': KeyGraph:C18l6&5/%0%i%U$NJ,3d!E}9g$Khk%-!<%o!<%ICj=P, EE;RDL?.3X2q;cO@J8;a, Vol.J82-D-I, No.2, pp. 391 – 400, (1999).

[1|B<99] 1|B<3X, FqGHlQ;L!%F%-%9%H<+FCMWLs$K4X$9$k8&5fF08~, <+A38@8l=hM}, Vol.6, No.6, pp.1 – 26, (1999).

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