# 2hA|!&8@8l>pJs$NE}9gE*MxMQ$K$h$k
# 1GA|%G!<%?$N<+F0E*%$%s%G%/%7%s%0$N;n$_

0f<j 0lO:, EDCf 1QI'
{ide, tanaka}@mtl.t.u-tokyo.ac.jp
El5~Bg3XBg3X1! 9)3X7O8&5f2J

## 1 $O$8$a$K

### 1.1 8&5f$NGX7J

:r:#$NJ|AwG^BN$NB?MM2=$d%A%c%s%M%k?t$NA}2C$K$H$b$J$$!"F|!9J|Aw$5$l$k1GA|$NNL$OA}Bg$7$F$$$k!#$7$+$7!"$3$l$i$N>pJs$X$N:w0zIU$1(%$%s%G%/%7%s%0)$O!"0lIt$NHVAH$KBP$9$k4JC1$J$b$N$,?7J9$N TV Ms$d TV ;(;o$K7G:\$5$l$F$$$kDxEY$G$"$k!#>pJs$N:FMxMQ$d1GA|$N8!:w$N<{MW$H$$$&E@$+$i!"K\3JE*$J8!:w$,$G$-$k$h$&$K%G!<%?$r%92=$5$l$F$$$k$3$H$,:G$b4|BT$5$l$k%K%e!<%9HVAH$K$$$?$C$F$O!"FbMF$N%j%"%k%?%$%`@-$b<jEA$C$F!"$3$N$h$&$J:w0zIU$1$O$[$H$s$I9T$J$o$l$F$$$J$$!#

=>Mh$+$i?7J95-;v$N%G!<%?%Y!<%92=$K4X$7$F$OMM!9$J8&5f$,9T$J$o$l!"$9$G$K8!:w%5!<%S%9$,%Q%=%3%sDL?.$J$I$GDs6!$5$l!">&MQE*$K$b<BMQCJ3,$K$"$k!#$7$+$7!"TV%K%e!<%9$X$N:w0zIU$1$O!"2hA|$d2;@<G'<1$N:$Fq$5$K$h$j!"$"$^$j<+F02=$,?J$s$G$$$J$$$N$,8=>u$G$"$k!#L5O@!"CMU $N Informedia %W%m%8%'%/%H [Info] $r$O$8$a!"MM!9$J;n$_$,9T$J$o$l$F$$$k$,!"8@8l>pJs$rE}7WE*$K=hM}$7$F%-!<%o!<%I$rCj=P$7$?$j!"OCBj$N:G=i$N;zKk$r$=$N$^$^:w0z$H$7$FMxMQ$7$?$j$9$k$K$H$I$^$C$F$$$k!#$3$l$i$N<jK!$O!"2hA|FbMF$H$N$-$a:Y$+$JBP1~IU$1$,9T$J$o$l$F$*$i$:!"$^$?8@8l>pJs$NMxMQ$bK\3JE*$H$O8@$$$,$?$$!#

### 1.2 8&5f$NL\E*$H35MW

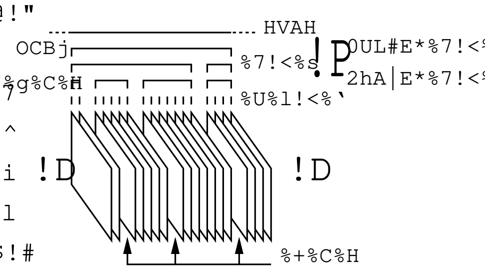
$=$3$GK\8&5f$G$O!"2hA|=hM}$OI,MW:G>.8B$NFCD'NLCj=P$K$H$I$a$k0lJ}$G!"1GA|FbMF$KBP$7$F$-$a:Y$+$JBP1~IU$1$r9T$J$&$?$a$K!"6qBNE*$JFbMF$NG'<1$K8@8l>pJs$r@Q6KE*$KMxMQ$9$k$3$H$r9M$($k!#$=$7$F!"$3$N$h$&$K2hA|>pJs$H8@8l>pJs$rE}9gE*$KMxMQ$9$k$3$H$K$h$k<+F0E*$J:w0zIU$1$NM-8z@-$r<($9$3$H$rL\;X$9!#

6qBNE*$K$O!"F02hA|$r4JC1$J2hA|E*FCD'NL$K4p$E$$$FJ,N`$7!"3FJ,N`$K1~$8$F0[$J$k:w0zIU$1$r!";zKk$rCf?4$H$7$?8@8l>pJs$+$iCj=P$9$k!#$3$N$h$&$J:w0zIU$1$r9T$J$&$3$H$K$h$j!"%K%e!<%9$K$7$P$7$PEP>l$9$kE57?E*$J%7%g%C%H$NCf$+$iFCDj$N>r7o$K9gCW$9$k$b$N$r8!:w$9$k:]$K!"A08e$NM>J,$J%7%g%C%H$r>J$-!"<B:]$K$=$N9T0Y$r9T$J$C$F$$$k$b$N$N$_$rDs<($7!"$+$D3FJ,N`Kh$K0[$J$k8!:wFbMF$K1~$8$FIUM?$9$k%-!<%o!<%I$K$h$j!"$-$a:Y$+$J8!:w$r2DG=$K$9$k!#

K\9F$G$O!"$^$:$3$N$h$&$J=hM}$r<B8=$9$k%7%9%F%`$rDs0F$7!"<B8=$KI,MW$JMWAG5;=Q$N>R2p$*$h$S3F5;=Q$N@-G=I>2A$r9T$J$C$FLdBjE@$rL@$i$+$K$7!":G8e$K$=$l$i$r$^$H$a$?%7%9%F%`A4BN$N<B8=@-$rC5$k!#

### 1.3 F02hA|$N9=@.$HMQ8l$NDj5A

0lHL$KF02hA|$O?^1$K<($9$h$&$K3,AXE*$K9=@.$5$l$F$$$k$H$_$J$;$k!#$3$N9=@.$K$O!"V%U%l!<%`!W!V%7%g%C%H!W!V(2hA|E*) %7!<%s!W!VHVAH!W$H$$$&=c?h$K2hA|E*$J3,AX$H!"$=$N>e$K=E$J$j9g$&$h$&$J!V0UL#E*%7!<%s!W!VOCBj!W!VHVAH!W$H$$$&0UL#E*$J3,AX$N 2 DL$j$,$"$k!#




?^ 1: F02hA|$N9=@.$HMQ8l$NDj5A

$^$?!V1GA|!W$H$O!"F02hA|$d2;@<$r4^$a$FJ|Aw$5$l$k>pJs$N=89g$r;X$9$3$H$H$9$k!#

## 2 %7%g%C%HJ,N`$K1~$8$?:w0zIU$15!9=

### 2.1 :w0zIU$15!9=

?^2$K!"K\9F$GDs0F$9$k%7%9%F%`$N35N,?^$r<($9!#?^Cf$GFv$/$J$C$F$$$kItJ,$*$h$SGK@~$G0O$^$l$F$$$kItJ,$OK\9F$G$O<BAu$7$F$$$J$$!#

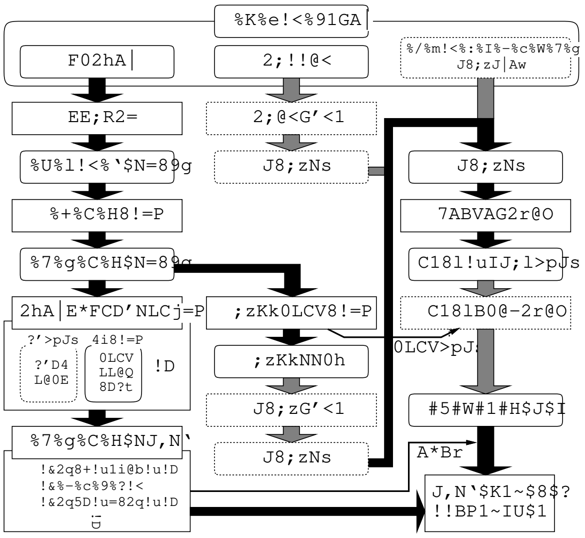
#### 2.1.1 2hA|=hM}

0J2<$K!"2hA|=hM}$NN.$l$r<($9!#

1. F02hA|$NEE;R2=: 7W;;5!$GF02hA|$N=hM}$r2DG=$K
2. %+%C%H$N8!=P: 2hA|E*$KO"B3$7$?:G>.$N$^$H$^$j (%7%g%C%H) $NGD0.

---

* "An Attempt to Automatically Index Motion Images by Integrated Processing of Image and Language Information"
Ichiro Ide, Hidehiko Tanaka
University of Tokyo, Graduate School of Engineering
7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan




?^ 2: %7%g%C%HJ,N`$K1~$8$?:w0zIU$15!9=

3. 2hA|E*FCD'NL$NCj=P: ?'D4, L@0E$J$I$N?'>pJs$d!"
   2hA|Cf$N4iNN0h$N0LCV, Bg$-$5, 8D?t$J$I!"2hA|$N
   $_$+$iF@$i$l$kFCD'NL$rCj=P
4. %7%g%C%H$NJ,N`: F@$i$l$?2hA|E*FCD'NL$NAH9g$;$+
   $i%7%g%C%H$rE57?E*$J%7%g%C%H$KJ,N`

$3$3$G=EMW$J$N$O!"E57?E*$J%7%g%C%H$X$NJ,N`$O2hA|E*FCD'NL$N$_$K$h$j<+F0E*$K9T$J$&$3$H$G$"$k!#K\9F$G$O!"E57?E*$J%7%g%C%H$H$7$F<!$N$b$N$r<h$j>e$2$k!#

- [2q8+%7%g%C%H] 2q8+&1i@b&Js9p&%$%s%?%S%e!<
  1, 2 ?M$N?MJ*$, Cf?4It$KHf3SE*Bg$-$/1G$C$F$$$k

>e5-$N=hM}0J30$K!";zKk$rCj=P$9$k$?$a$K!"1., 2. $N8e$K<!$N=hM}$r9T$J$&!#

3. ;zKk$N8!=P: ;zKk$NB8:_$H0LCV$r8!=P
4. J8;zG'<1: 8!=P$7$?;zKk$rG'<1$7!"8@8l=hM}$

#### 2.1.2 8@8l=hM}

0J2<$K!"8@8l=hM}$NN.$l$r<($9!#$3$l$i$K4p$E$%g%C%HJ,N`$K1~$8$FI,MW$J%-!<%o!<%I$N8uJd$rMQ

1. 7ABVAG2r@O: JUMAN[JUMAN] $rMxMQ
2. C18l$NB0@-2r@O: %-!<%o!<%I$NCj=P$KMxMQ

#### 2.1.3 >pJs$NE}9g: BP1~IU$1

**2.1.1** $G2hA|E*FCD'NL$K4p$E$$$FJ,N`$7$?%7%g%C%HKh$K!"**2.1.2** $GB0@-2r@O$r9T$J$C$?%-!<%o!<%I8uJd$NCf$+$iI,MW$JB0@-$H0lCW$9$k$b$N$H$NBP1~IU$1$r9T$J$&!#

# 3 2hA|=hM}

## 3.1 2hA|$NEE;R2=

7W;;5!$K$h$j2hA|=hM}$r9T$J$&$?$a$K$O!"$^$:%S%G%*%-%c%W%A%c%\!<%I$rMxMQ$7!"%J%m%0$NF02hA|$r!"%S%G%*%-%c%W%A%c%\!<%I$rMxMQ$7$FEE;R2=$7!"%U%l!<%`$H$$$&@E;_2hA|$N=89g$K$9$k!#$3$N:]

$,$"$k!#0J2<$N<B83$G;HMQ$9$kF02hA|$rEE;R2=$7$?:]$N=t>r7o$rI= 1 $K<($9!#F|K\$dJF9q$N TV J|Aw$G:NMQ$5$l$F$$$k NTSC 7A<0$NF02hA|$OLs 30fps $G$"$k$,!"I,MW$J%G%#%9%/NN0h$*$h$S7W;;5!$N=hM}G=NO$K8B3&$,$"$j!"K\8&5f$K$O 5fps $G==J,$HH=CG$7$?!#

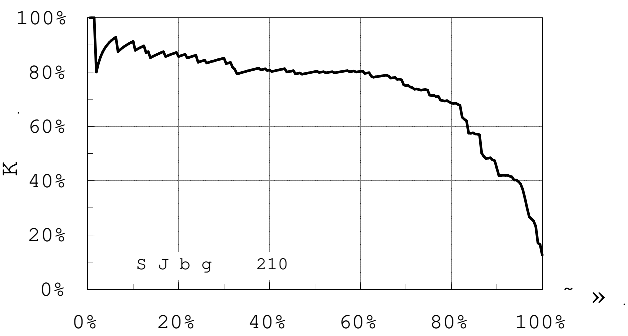
| 9`L\ | >r7o |
|---|---|
| %-%c%W%A%c%\!<%I | SUN Video Card |
| Bg$-$5 | 2# 320 × =D 240 |
| ?'?t | 14,777,216 ?' (24bit) |
| J]B8%G!<%?7A<0 | UYVY Hs05=L [SunVideo] |
| I8K\2=%l!<%H | 5 frame/IC (=fps) |
| HVAHL> | NHK %K%e!<%9 9 |
| J|1GF|;~ | J?@. 9 G/ 1 7n 9 F| |
| Am;~4V?t | Ls 30 J, (8,930frame) |

I= 1: F02hA|EE;R2=$N:]$N=t>r7o

## 3.2 %+%C%H8!=P$K$h$k%7%g%C%HJ,3d

K\$K!"%U%l!<%`$r%7%g%C%H$H$$$&O"B3$7$?2hA|$N=89g$K$^$H$a$kI,MW$,$"$k!#$=$N$?$a$K!"%7%g%C%H4V$N6-3&$G$"$k%+%C%H$r8!=P$9$k$,!"K\8&5f$G$O!"Hf3SE*;(2;$KBP$9$kBQ@-$,$"$j9b@-G=$H8@$o$l$F$$$k $\chi^2$ 8!Dj$K$h$k8!=PK! [D9:d 92] $r:NMQ$7$?!#

K\<jK!$O!"2hA|$r (K\8&5f$G$O!"=D 4×2# 4=16) J,3d$7!"J,3d$5$l$?3FNN0hFb$K$*$$$F!"<!$N%U%l!<%`$NF10lNN0h$H$N?'%R%9%H%0%i%`$NJQ2=$r $\chi^2$ 8!Dj$K!$K$h$jDjNL2=$7!"ogCM$r1[$($kNN0h$,0lDj?t (K\8&5f$G$O 8(/16)= H>J,) $KC#$9$k$H!"%+%C%H$,H/@8$7$?$H$_$J$9!#(HsJ,3d)$\chi^2$ 8!Dj$K$h$k<jK!$H3S$Y$F!"6I=jE*$JJQF0$K1F6A$5$l$K$/$$$H$$$&FCD'$,$"$k!#




?^ 3: $\chi^2$ 8!Dj$K$h$k%+%C%H8!=PK!$NI>2A

?^ 3 $K!"J,3d $\chi^2$ 8!Dj$K$h$k%+%C%H8!=PK!$rI= 1$NF02hA|$KE,MQ$7$?7k2L$N:F8=N($HE,9gN($N4X78$r<($9!#$3$N7k2L$r8+$k$H!":F8=N($, 60%0J2<$G==J,$H$9$l$P!"80%0J>e$NE,9gN($,=P$F$$$k!#$7$+$7!"8eCJ$X$N1F6A$rKI$0$?$a$K$O!"$3$NCJ3,$G$h$j@53N$K8!=P$9$kI,MW$,$"$k!#8m8!=P$5$l$k%C%H$NA08e$G$O!"%U%i%C%7%e$,2hA|A4BN$r>H$i$7$?$j!"2hA|$,5^7c$KJQ2=$9$k!"$H$$$&8=>]$,4Q;!$5$l$?!#$3$l$i$N8!=P$G$3$l0J>e$N@-G=8~>e$O8+9~$_$K$/$/!"8=;~

E@$G$O2hA|E*$K;w$?%7%g%C%H$N=89g$G$"$k2hA|E*$K!<%;
$r8!=P$9$k%"%k%4%j%:%`$N:NMQ$K$h$j!"8m8!=P%+%(%H$N
A08e$r:F$S$D$J$.9g$o$;$k$3$H$r9M$($F$$$k!#

## 3.3 4iNN0h$N8!=P$H%7%g%C%HJ,N`$NNc

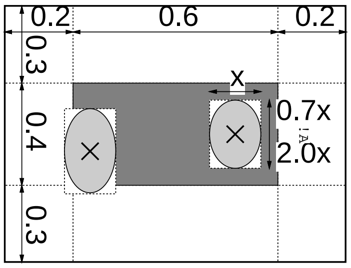
### 3.3.1 4iNN0h$N8!=P

2hA|Cf$N4iNN0h$r8!=P$9$k8&5f$OHf3SE*8E$/$+$i9T
$J$o$l$F$*$j!"J#;($J%b%G%k$rMQ$$$?<jK!$+$iC1=c$J%Q
%?!<%s%^%C%A%s%0$K$$$?$k$^$G!"MM!9$J<jK!$,Ds0F$5$l
$F$$$k!#$7$+$7!"J#;($J<jK!$O7W;;NL$,KDBg$K$J$j!"K\
8&5f$N$h$&$KB??t$N2hA|$r2r@O$9$k$h$&$J>l9g$O!"$J$k
$Y$/7W;;NL$,>/$J$$<jK!$rMxMQ$7$?$$!#

$=$3$G!"K\8&5f$G$O?'>pJs$K4p$E$$$FH)?'NN0h$r8!=P
$7 [:4!9LZ 91]!"$=$NNN0h$K30@\$9$k6k7A$NJU$ND9$5$N=D
2#Hf$,0lDj$NHO0OFb (0.7!A2.0) $N$b$N$r8!=P$9$k<jK!$r
:NMQ$9$k!#H)?'NN0h$N8!=P$N:]$K$O!"?M4V$N?':L463P$K
6a$$ HSV (H:?'Aj, S::LEY, V:L@EY) ?':BI87O$N$&$A!"L@
$k$5$KL54X78$J H $H S $N$_$rMxMQ$7$F$$$k!#

### 3.3.2 %7%g%C%HJ,N`$NNc

**2.1.2** $G=R$Y$?$h$&$K!"K\9F$G$O%7%g%C%HJ,N`$NNc$H
$7$F!"1,2 ?M$N?MJ* (4i) $,2hA|$NCf?4E*NN0h$KB8:_$9$k
$b$N$r2q8+%7%g%C%H$H$7$FJ,N`$9$k$3$H$r;n$_$k!#6qBN
E*$K$O!"3F%7%g%C%H$NBh 1 %U%l!<%`$K$D$$$F!"?^ 4$KLV
$+$1$G<($9$h$&$JHO0O$K=E?4$,4^$^$l$kH)?'NN0h$, 1, 2
8D$N$b$N$r8!=P$9$k!#




?^ 4: !V2q8+%7%g%C%H!W$N8!=P>r7o

$3$N$h$&$J>r7o$K4p$E$$$?8!=P<B83$N7k2L$rI= 2$K<(
$9!#$J$*!"2q8+%7%g%C%H$OA4It$G 47 %7%g%C%HB8:_$9$k!#

| | | | |
|---|---|---|---|
| 8!=P@.8y | | 39 | :F8=N( 83% |
| 8!=P1L$l | | 8 | |
| 8m8!=P | 4i$G$J$$NN0h$N8m8!=P | 6 | E,9gN( 64% |
| | ?^ 4$N8!=P>r7o$NLdBj | 8 | |

I= 2: 2q8+%7%g%C%H8!=P<B83$N7k2L

$3$N$h$&$K!"C1=c$J2hA|E*FCD'NL$rMxMQ$7$F$$$k$K$b
$+$+$o$i$:!"$+$J$j$N@-G=$,F@$i$l$?!#8!=P1L$l$O!"2h
A|$,0E$9$.$?$j?^ 4$N>r7o$,<c43ITE,@Z$G$"$k$3$H$,86
0x$G$"$C$?!#8m8!=P$N8e<T$N860x$O!"8!=P>r7o$r8!F$$9
$l$P=|5n$G$-$=$&$G$"$k!#

## 3.4 ;zKk$N8!=P

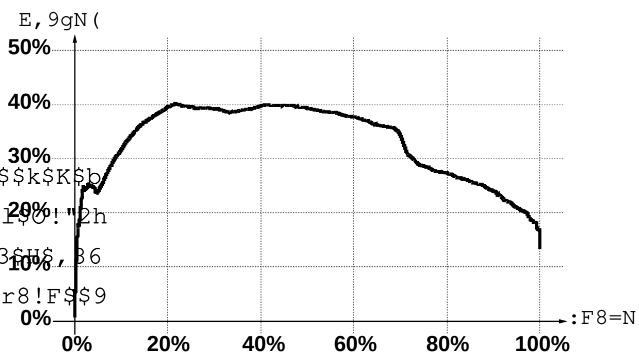
TV J|Aw$K$OI= 3$K<($9$h$&$JMM!9$J7ABV$N8@8l>pJs
$,IU?o$7$F$$$k!#$3$l$i$N8@8l>pJs$r7W;;5!>e$G=hM}$9
$k$?$a$K$O!"EE;R2=$9$kI,MW$,$"$k!#$=$N$?$a!"I= 3$N
J,N`$N$&$A!"2;@<$N>l9g$O2;@<G'<1$r!"2hA|$N>l9g$OJ8
;zG'<1$r9T$J$&I,MW$,$"$k!#8=;~E@$G$O!"A0<T$O0MA3<B
MQCJ3,$K$O$J$$$H9M$($FMxMQ$7$J$$$,!"8e<T$K4X$7$F$O!"
1) %*%U%i%$%sJ8;zG'<1$,<BMQ2=$5$l$F$$$k$3$H!"2)TV
J|Aw$GMQ$$$i$l$F$$$k;zKk$O6Q@0$N$H$l$?3h;zBN$G$"$k
$3$H!"$K$h$jMxMQ$9$k$3$H$r9M$($F$$$k!#

| 7ABV | Nc |
|---|---|
| 2;@< | <g2;@<, I{2;@< |
| 2hA| | ;zKk |
| DEE;R | J8;zJ|Aw, %/%m!<%:%I%-%c%W%7%g%s |

I= 3: TV J|Aw$KIU?o$9$k8@8l>pJs

$7$+$7!"J8;zG'<1$r9T$J$&A0$K;zKk$NB8:_$H$=$N0LCV
$rFCDj$9$kI,MW$,$"$k!#FC$K8e<T$O!"HVAH$K1~$8$F$"$k
DxEY7h$^$C$F$$$k2hLL9=@.$K4X$9$kCN<1$K$h$jIU2CE*$J
>pJs$bF@$i$l$k [EOJU 96] $?$a!"=EMW$G$"$k!#

;zKk$O%+%a%i$G;#1F$5$l$?2hA|$N>e$K CG $rMxMQ$7$F
%9!<%Q!<%$%s%]!<%:$7$F$$$k$?$a!"NX3T$N%(%C%8$,Hs>o
$K6/$/N)$C$F$$$k!#$=$3$GK\8&5f$G$O!"2hA|$r2# 4×=D
3=12 $KJ,3d$7!"J,3d$5$l$?3FNN0hFb$N3F2hAG$K$*$1$k
%i%W%i%7%"%s$H8F$P$l$kCM [2hA| HB] $K$h$j!"%(%C%8$N
6/$5$rDjNL2=$7!"ogCM$r1[$($k2hAG$N3d9g$,0lDjCM$r1[
$($k$H!";zKk$,B8:_$9$k$H9M$($k!#?^ 5$K!"K\;zKk8!=P
K!$rI= 1$NF02hA|$KE,MQ$7$?7k2L$N:F8=N($HE,9gN($N4X
78$r<($9!#$3$N7k2L$r8+$k$H!"E,9gN($,:GBg$G 40%$H!"
8m8!=P$,B?$9$.$F<BMQ$KBQ$($J$$@-G=$G$"$k$3$H$,J,$+
$k!#<B837k2L$N?tCM$,>e0L$NNN0h$r8+$k$H!"8m8!=P$N86
0x$O!":=IM$N3HBg, LZ$N>?, <JLOMM$NMNI~$J$I!":Y$+$J
LOMM$K$J$C$F$$$k>l=j$NL5?t$K$"$k%(%C%8$,8!=P$5$l$F
$$$?!#:#8e!"$3$N$h$&$J:Y$+$JLOMM$N%(%C%8$,%7%g%C%H
Fb$G$O$"$^$jJQF0$7$J$$$N$KBP$7$F!";zKk$,%7%g%C%H$N
ESCf$GEP>l!&>CLG$9$k:]$K5^7c$J%(%C%8$NJQ2=$,8+$i$l
$k$3$H$rMxMQ$9$k$3$H$r9M$($F$$$k!#




?^ 5: ;zKk0LCV8!=PK!$NI>2A

# 4 8@8l=hM}

## 4.1 ;zKk$NJ,N`

I= 4$K!"TV %K%e!<%9$KEP>l$9$k;zKk$NJ,N`$H!"$=$l$NF02hA|Cf$N 130 9`L\$N;zKk$N3FJ,N`Kh$N3d9g$r<($9!#

| # | J,N` | 3d9g |
|---|---|---|
| 1 | 1GA\|$N;#1F$5$l$?>l=j$d;~4V$r<($9$b$N | 37% |
| 2 | ?M4V$r;X$9$b$N (AH?%+;aL>+7I>N$J$I) | 20% |
| 3 | Cj>]E*;vBV$N@bL@ (KAF,$N%?%$%H%k$J$I) | 12% |
| 4 | H/8@FbMF$=$N$b$N (309q8l$rK]Lu$7$?$b$N$J$I) | 9% |
| 5 | $=$NB>HVAH@=:n$K4X$9$k>pJs (Js9p, Cf7Q$J$I) | 9% |
| 6 | 1GA\|$N6qBNE*$J>u67@bL@ | 8% |
| 7 | H/8@FbMF$rMWLs$7$?$b$N | 5% |

I= 4: TV %K%e!<%9$K$*$1$k;zKk$NJ,N` (0lIt [3QED 96])

$3$N$&$A 1, 2 $O$=$N$^$^!"3, 6, 7 $O4JC1$JCj=P$HM $r7P$F%-!<%o!<%I$K$J$jF@$k!#$^$? 5 $OF1;~$K2hA|$H$N B8:_$9$kB>$N;zKk$N07$$$r@)8f$9$k$N$KMxMQ$G$-$k!#

$3$N$h$&$J;zKk$N3FJ,N`$NFCD'$K4X$7$F$O [EOJU 96] $K>\$7$$2r@ONc$,$"$k!#

## 4.2 ;zKk$K4p$E$/%-!<%o!<%I$NCj=P

2q8+%7%g%C%H$r8!:w$9$k:]$K$O!"$=$N2q8+$K4X$9$k%-!<%o!<%I 2<$N$h$&$J%-!<%o!<%I$K4p$E$/$H9M$($i$l$k!#

1. >l=j>pJs: COL>, 2q5DL>$J$I "+ I= 4$N#1 $h$j
2. ;~4VE*>pJs: G/7nF|, ;~9o$J$I "+ #1 $h$j
3. 2q8+<T: ?ML>, 8*=q, AH?%L>$J$I "+ #2 $h$j
4. 2q8+FbMF "+ #3, #6, #7 $h$j

$3$3$G!"$I$N$h$&$K$7$F;zKk$KEP>l$9$kC18l$K0UL#E* $JB0@-IU$1$r9T$J$$!"I= 4$N$h$&$JJ,N`$r9T$J$&$+$,Ld Bj$G$"$k!#JUMAN $N2r@O7k2L$+$i$O!"IJ;l$*$h$S<c43 $NJ8K!E*B0@-$,F@$i$l$k$@$1$G$"$j!"$3$3$GI,MW$H$9$k $h$&$J0UL#E*$JB0@-$OF@$i$l$J$$!#Nc$($P!"JUMAN $O !V>.BtE^<s!W$r!V8GM-L>;l+IaDLL>;l!W$H2r<a$9$k$,!"$3$ $l$@$1$G$O!"$3$N8l$,?ML>$+COL>$+J,$+$i$J$$!#

$^$?!"J,N`8lWCI=[J,N`]$d EDR EE;R2=<-=q$J$I$N<- =q$O35G0E*$JJ,N`$,Cf?4$J$?$a!"0UL#E*$JMQK!$K4p$E$$ $?B0@-IU$1$K$O;H$$$K$/$$!#>e5-$NNc$N!VE^<s!W$O!"J,N` 8lWCI=$G$O!V1.243:D9!W$KJ,N`$5$l$k$,!"$3$NCf$K$O !V5254Bg>-!W$H$$$&8l$b$"$j!"!V8GM-L>;l+!X1.243:D9!Y!W $,?ML>$G$"$k$H5,B'2=$9$k$N$OL5M}$J>e$K!"!VBgE}NN!W$d !VMF5?<T!W$H$$$C$?C18l$OJL$N9`L\$KJ,N`$5$l$F$$$k!#

$=$3$G!"$3$3$GI,MW$J>pJs$rF@$k$?$a$K$O!"IaDLL>;l $,$I$N$h$&$J8GM-L>;l$H0l=o$KMQ$$$i$l$k$+$J$I$r5-=R $7$?<-=q$,I,MW$K$J$k!#K\8&5f$G$O8@8l=hM}$r8&5f$9$k $3$H$,<gL\E*$G$O$J$$$N$G!"EvLL$O;zKk$KEP>l$7$?C18l $N0UL#E*$JB0@-$r5-=R$7$?<-=q$r<+:n$7$F;HMQ$9$k$,!" $3$N$h$&J>pJs$r5-=R$7$?<-=q$NEP>l$,4|BT$5$l$k!#

# 5 $*$o$j$K

K\9F$G$O!"2hA|>pJsC1FH$G$OF@$i$l$J$$$%-!<%o!<%I$K 8@8l>pJs$r!"8@8l>pJsC1FH$G$OF@$i$l$J$$$%7%g%C%H$NJ, N`$r2hA|>pJs$rMxMQ$9$k$3$H$K$h$j!"=>Mh$J$i$PKDBg$J CN<1%Y!<%9$rMQ0U$7$J$1$l$P$J$i$J$$$=hM}$r!"2DG=$J8B $jJ|Aw$5$l$F$$$k>pJs$N$_$rMQ$$$F9T$J$&<jK!$rDs0F $7!"FC$K2hA|=hM}$K4X$7$F4pACE*$J2r@O<jK!$NI>2A$r9T $J$C$?!#8@8l=hM}$K4X$7$F$O!"<B:]$N%K%e!<%9HVAH$KEP >l$9$k;zKk$N2r@O$r9T$J$$!"%-!<%o!<%ICj=P$r9T$J$&$? $a$K!"0UL#E*B0@-$r5-=R$7$?<-=q$NI,MW@-$r<($7$?!#

:#8e$O!"2hA|=hM}$K4X$7$F$O!"A4HLE*$J@-G=$N8~>e$H!" 07$($k2hA|E*FCD'NL (L@0E$d?'D4$J$I) $H$=$l$rMQ$$$F $G$-$k%7%g%C%H$N<oN` (4iNN0h$, 2hA|Cf$K 3 2U=j0J >e$"$k>l9g$O2q5D$H$_$J$9$J$I) $rA}$d$9!#0lJ}8@8l=h M}$K4X$7$F$O!";zKk$KEP>l$9$kC18l$N0UL#E*B0@-$r5-=R $7$?<-=q$*$h$S2r@O5,B':n@.$r9T$J$$!"%7%9%F%`A4BN$r F0:n$5$;$k$3$H$rL\;X$9!#

## <U<-

K\8&5f$N9=A[$O5~ETBg3X9)3XIt$N3QEDC#I'=u<j$K$h$k:)@ZCz G+$J8f;XF3$KIi$&$H$3$m$,Bg$-$/!"$3$N>l$r<Z$j$F?<<U$9$k!#

$^$?!"2hA|=hM}$N4pACE*;v9`$K4X$7$F65$($F2<$5$C$?>e:d 1Q<y;a!"<+A38@8l=hM}$K4X$9$kM-1W$J<(:6$rM?$($F2<$5$C$?1J >>7r;J;a!"<BAu$K6(NO$7$F2<$5$C$?;3K\98;J;a$K46<U$9$k!#

$J$*!"<+A38@8l2r@O$K$OF|K\8l7ABVAG2r@O%7%9%F%`JUMAN 3.0β $r;HMQ$5$;$F$$$?$@$$$?!#

## ;29MJ88%


[3QED 96] 3QED C#I', Bg@P 9*, EOJU LwI', D9Hx bC; !V%-%c%W %7%g%s$H5-;v$F%-%9%H$N:GD90lCWJ8;zNs>H9g$K$h$kJsF; HVAH$H?7J95-;v$H$NBP1~$E$1$N<+F02=!W; >pJs=hM}3X2q 5;=Q8&5fJs9p 96-NL-115, Vol.96, No.88, pp.17-24, Sep. 1996.

[EOJU 96] EOJU LwI', 2,ED ;j90, D9Hx bC; !VTV %K%e!<%9$GMQ $$$i$l$k%F%m%C%W$N0UL#2r@O!W; >pJs=hM}3X2q5;=Q8&5fJs 9p 96-NL-116, Vol.96, No.89, pp.107-114, Nov. 1996.

[D9:d 92] D9:d 98O/, EDCf >y; !V%+%i!<%S%G%*1GA|$K$*$1$k<+ F0:w0zIU$1K!$HJ*BNC5:wK!!W; >pJs=hM}3X2qO@J8;o Vol.33, No.4, pp.543-550, Apr. 1992.

[?"LZ 91] :4!9LZ EX, @V>> LP, Kv1J 9/?N; !V4i2hA|G'<1$N$? $a$N?'>pJs$rMQ$$$?4i$N0LCV9g$o$;K!!WEE;R>pJsDL?.3X 2q5;=Q8&5fJs9p IE91-2, pp.9-15, Apr. 1991.

[2hA|HB] 9bLZ 44M:, 2<ED M[5W; !V2hA|2r@O%O%s%I%V%C%/!W; El5~Bg3X=PHG2q, Jan. 1991.

[J,N`] 9qN) 9q8l8&5f=j; !V9qN) 9q8l8&5f=j8@8l=hM}%G!<%?=8 5 J,N`8lWCI=[%U%m%C%T!<HG]!W; =(1Q=PHG, Dec. 1993.

[JUMAN] >>K\ M5<#, 9u66 DwIW, 1'DEO$ Ip?N, L/LZ M5, D9 Hx bC; !VF|K\8l7ABVAG2r@O%7%9%F% JUMAN ;HMQ@bL@=q version 3.0 Beta!W; Jul. 1996.

[SunVideo] "SunVideo User's Guide", pp.125-128; Sun Microsystems, Inc., 1994.

[Info] "The Informedia Project"; http://www.informedia.cs.cmu.edu/.