cycle-and-arrowplots.R

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```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.1.2
```

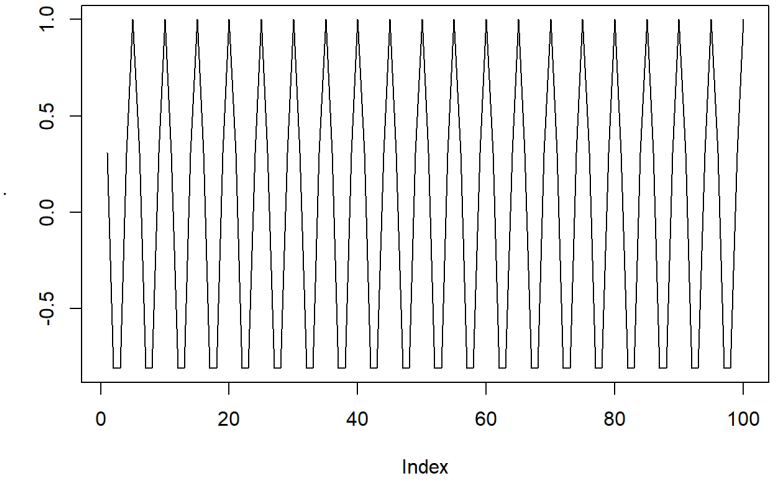
```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --
```

```
## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.2     v dplyr   1.0.7
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.1
```

```
## Warning: package 'ggplot2' was built under R version 4.1.3
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
t=1:100

x=cos(2*pi*t/5)
x %>% plot(type="l")
```




```
y=x+rnorm(100)


library(ggplot2)

year5=rep(c(1:20),each=5)
year10=rep(c(1:10),each=10)
year5
```

```
##   [1]  1  1  1  1  1  2  2  2  2  2  3  3  3  3  3  4  4  4  4  5  5  5  5  5
##  [26]  6  6  6  6  6  7  7  7  7  7  8  8  8  8  8  9  9  9  9  9 10 10 10 10 10
##  [51] 11 11 11 11 11 12 12 12 12 12 13 13 13 13 13 14 14 14 14 14 15 15 15 15 15
##  [76] 16 16 16 16 16 17 17 17 17 17 18 18 18 18 18 19 19 19 19 19 20 20 20 20 20
```

```
df=data.frame(y=y,year5=year5)
year10year=rep(c(1:10),times=10)

year=rep(c(1,2,3,4,5),times=20)

df$year=year
df
```

```
##               y year5 year
## 1   -1.132217068     1    1
## 2   -0.452879819     1    2
## 3   -1.234080361     1    3
## 4    1.942071328     1    4
## 5    2.009372086     1    5
## 6    0.901200552     2    1
## 7   -1.343775149     2    2
## 8   -2.907836098     2    3
## 9    0.243858298     2    4
## 10  -0.623755775     2    5
## 11  -0.401696232     3    1
## 12  -0.532927699     3    2
## 13  -0.160266741     3    3
## 14   0.292039457     3    4
## 15   0.290522773     3    5
## 16  -0.512926859     4    1
## 17  -1.745567703     4    2
## 18  -1.234570790     4    3
## 19   1.147778122     4    4
## 20   0.437091112     4    5
## 21   0.460464139     5    1
## 22  -1.719114481     5    2
## 23  -1.715817360     5    3
## 24   0.792439957     5    4
## 25   0.466327218     5    5
## 26   1.625912199     6    1
## 27  -0.955909278     6    2
## 28  -1.048982508     6    3
## 29   0.216924317     6    4
## 30   0.897524795     6    5
## 31  -0.722429946     7    1
## 32  -0.521331053     7    2
## 33  -1.374882970     7    3
## 34   0.242329498     7    4
## 35   2.759801533     7    5
## 36   0.464304779     8    1
## 37  -0.441793063     8    2
## 38  -1.550672738     8    3
## 39  -0.009001108     8    4
## 40   2.972169188     8    5
## 41  -0.041823343     9    1
## 42  -1.173565510     9    2
## 43  -1.718170975     9    3
## 44  -1.097208810     9    4
## 45  -0.956890196     9    5
## 46   1.099210838    10    1
## 47   0.119701210    10    2
## 48  -1.509349753    10    3
## 49  -0.615921462    10    4
## 50  -0.179009282    10    5
## 51   1.268450131    11    1
## 52  -0.948573982    11    2
## 53  -2.037294831    11    3
## 54   0.514108392    11    4
## 55   1.920731028    11    5
## 56   0.977722869    12    1
## 57   0.391136913    12    2
## 58  -1.766919714    12    3
## 59  -0.008841701    12    4
## 60   2.159155314    12    5
## 61   1.235289292    13    1
## 62  -0.264463539    13    2
## 63   0.398274763    13    3
## 64   0.758789707    13    4
## 65   0.949570412    13    5
## 66   0.938651488    14    1
## 67   1.254440726    14    2
## 68  -1.482113260    14    3
## 69   1.725693203    14    4
## 70   0.221517524    14    5
## 71   1.202854463    15    1
## 72  -1.452108387    15    2
## 73  -3.297329387    15    3
## 74   1.159399899    15    4
## 75  -0.560487489    15    5
## 76  -1.086856015    16    1
## 77  -1.293007195    16    2
## 78   0.305263804    16    3
## 79  -0.139975797    16    4
## 80  -0.514451260    16    5
## 81  -0.195041110    17    1
## 82  -1.591202744    17    2
## 83  -0.294550292    17    3
```

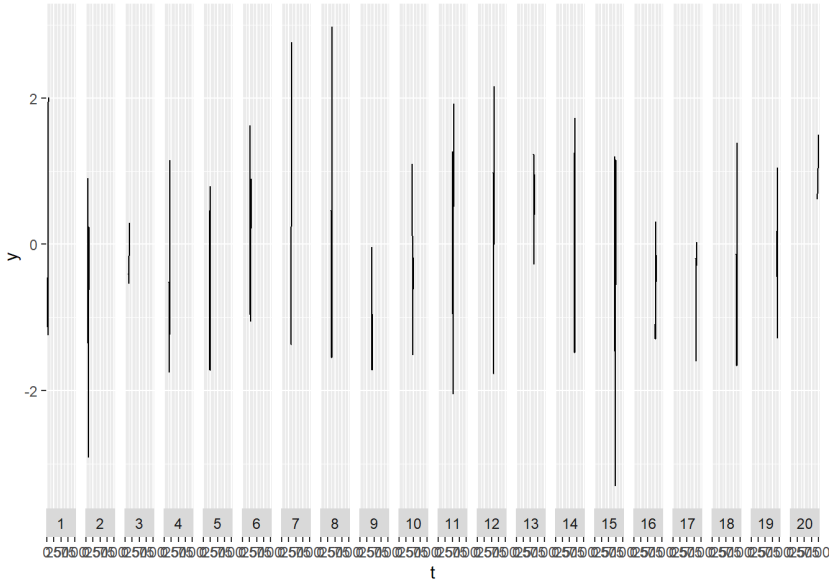
```
## 84   0.030943322    17    4
## 85  -0.053036206    17    5
## 86  -0.133487354    18    1
## 87  -0.250782181    18    2
## 88  -1.659518661    18    3
## 89   1.139219589    18    4
## 90   1.387382482    18    5
## 91   0.177898454    19    1
## 92  -0.440584501    19    2
## 93  -1.273483729    19    3
## 94   1.050247299    19    4
## 95   0.801629257    19    5
## 96   0.610678814    20    1
## 97   0.694507563    20    2
## 98   0.923493221    20    3
## 99   1.035337643    20    4
## 100  1.498551647    20    5
```

```
df$dates=t
df
```

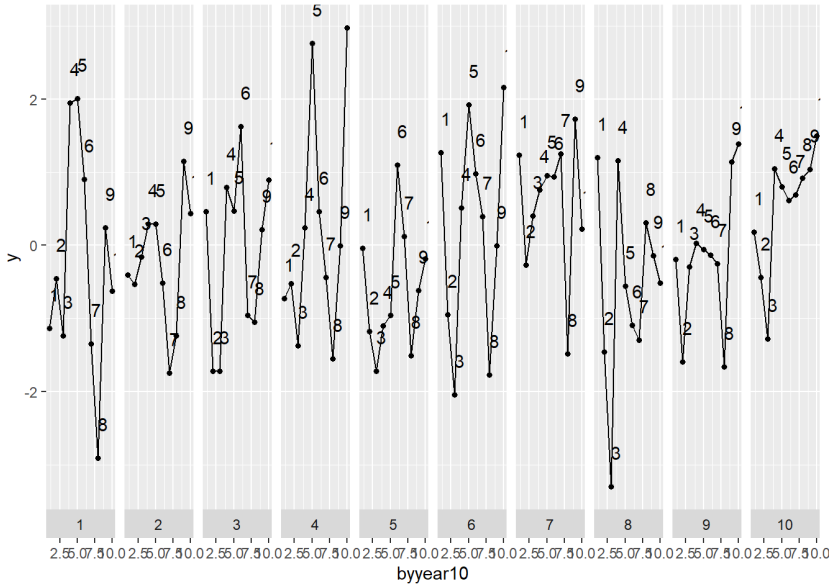
```
##               y year5 year dates
## 1   -1.132217068     1    1     1
## 2   -0.452879819     1    2     2
## 3   -1.234080361     1    3     3
## 4    1.942071328     1    4     4
## 5    2.009372086     1    5     5
## 6    0.901200552     2    1     6
## 7   -1.343775149     2    2     7
## 8   -2.907836098     2    3     8
## 9    0.243858298     2    4     9
## 10  -0.623755775     2    5    10
## 11  -0.401696232     3    1    11
## 12  -0.532927699     3    2    12
## 13  -0.160266741     3    3    13
## 14   0.292039457     3    4    14
## 15   0.290522773     3    5    15
## 16  -0.512926859     4    1    16
## 17  -1.745567703     4    2    17
## 18  -1.234570790     4    3    18
## 19   1.147778122     4    4    19
## 20   0.437091112     4    5    20
## 21   0.460464139     5    1    21
## 22  -1.719114481     5    2    22
## 23  -1.715817360     5    3    23
## 24   0.792439957     5    4    24
## 25   0.466327218     5    5    25
## 26   1.625912199     6    1    26
## 27  -0.955909278     6    2    27
## 28  -1.048982508     6    3    28
## 29   0.216924317     6    4    29
## 30   0.897524795     6    5    30
## 31  -0.722429946     7    1    31
## 32  -0.521331053     7    2    32
## 33  -1.374882970     7    3    33
## 34   0.242329498     7    4    34
## 35   2.759801533     7    5    35
## 36   0.464304779     8    1    36
## 37  -0.441793063     8    2    37
## 38  -1.550672738     8    3    38
## 39  -0.009001108     8    4    39
## 40   2.972169188     8    5    40
## 41  -0.041823343     9    1    41
## 42  -1.173565510     9    2    42
## 43  -1.718170975     9    3    43
## 44  -1.097208810     9    4    44
## 45  -0.956890196     9    5    45
## 46   1.099210838    10    1    46
## 47   0.119701210    10    2    47
## 48  -1.509349753    10    3    48
## 49  -0.615921462    10    4    49
## 50  -0.179009282    10    5    50
## 51   1.268450131    11    1    51
## 52  -0.948573982    11    2    52
## 53  -2.037294831    11    3    53
## 54   0.514108392    11    4    54
## 55   1.920731028    11    5    55
## 56   0.977722869    12    1    56
## 57   0.391136913    12    2    57
## 58  -1.766919714    12    3    58
## 59  -0.008841701    12    4    59
## 60   2.159155314    12    5    60
## 61   1.235289292    13    1    61
## 62  -0.264463539    13    2    62
## 63   0.398274763    13    3    63
## 64   0.758789707    13    4    64
## 65   0.949570412    13    5    65
## 66   0.938651488    14    1    66
## 67   1.254440726    14    2    67
## 68  -1.482113260    14    3    68
## 69   1.725693203    14    4    69
## 70   0.221517524    14    5    70
## 71   1.202854463    15    1    71
## 72  -1.452108387    15    2    72
## 73  -3.297329387    15    3    73
## 74   1.159399899    15    4    74
## 75  -0.560487489    15    5    75
## 76  -1.086856015    16    1    76
## 77  -1.293007195    16    2    77
## 78   0.305263804    16    3    78
## 79  -0.139975797    16    4    79
## 80  -0.514451260    16    5    80
## 81  -0.195041110    17    1    81
## 82  -1.591202744    17    2    82
## 83  -0.294550292    17    3    83
```

```
## 84   0.030943322    17    4    84
## 85  -0.053036206    17    5    85
## 86  -0.133487354    18    1    86
## 87  -0.250782181    18    2    87
## 88  -1.659518661    18    3    88
## 89   1.139219589    18    4    89
## 90   1.387382482    18    5    90
## 91   0.177898454    19    1    91
## 92  -0.440584501    19    2    92
## 93  -1.273483729    19    3    93
## 94   1.050247299    19    4    94
## 95   0.801629257    19    5    95
## 96   0.610678814    20    1    96
## 97   0.694507563    20    2    97
## 98   0.923493221    20    3    98
## 99   1.035337643    20    4    99
## 100  1.498551647    20    5   100
```

```
ggplot(data=df)+
  geom_line(aes(x=t,y=y))+
  facet_grid(~year5,switch="x")
```

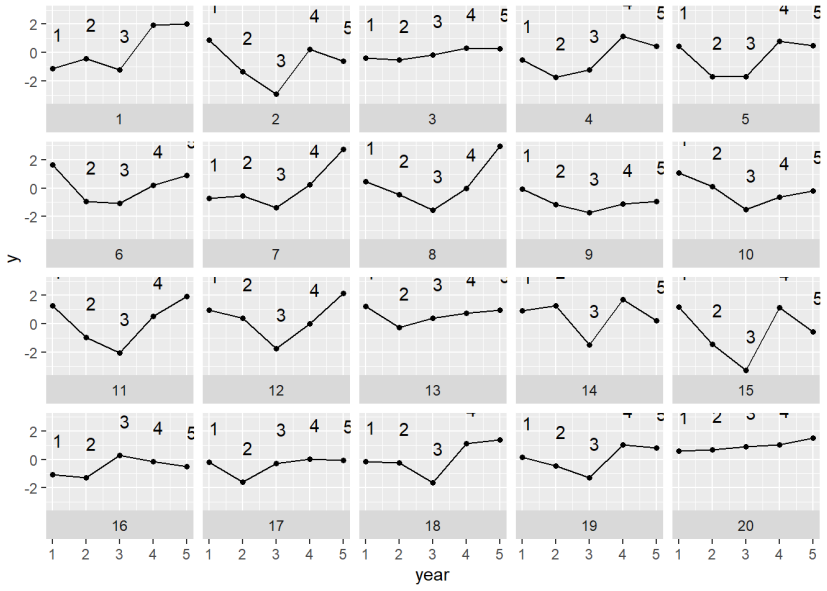



```
df$year10=year10
df$byyear10=year10year

ggplot(data=df,aes(x=byyear10,y=y,label=byyear10))+
  geom_line()+
  geom_point(size=1.2)+
  facet_grid(~year10,switch="x")+
  geom_text(hjust=0,vjust=-2)
```

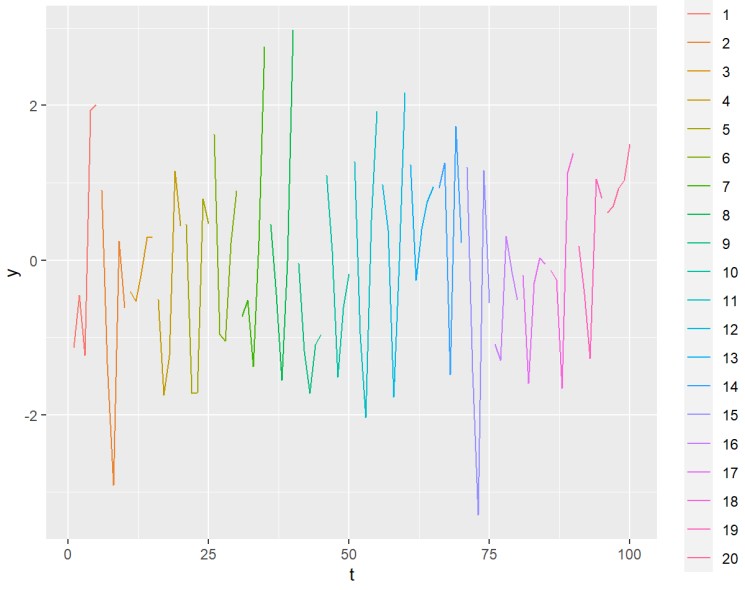


```
ggplot(data=df,aes(x=year,y=y,label=year))+
  geom_line()+
  geom_point(size=1.2)+
  facet_wrap(~year5,switch="x")+
  geom_text(hjust=0,vjust=-2)
```

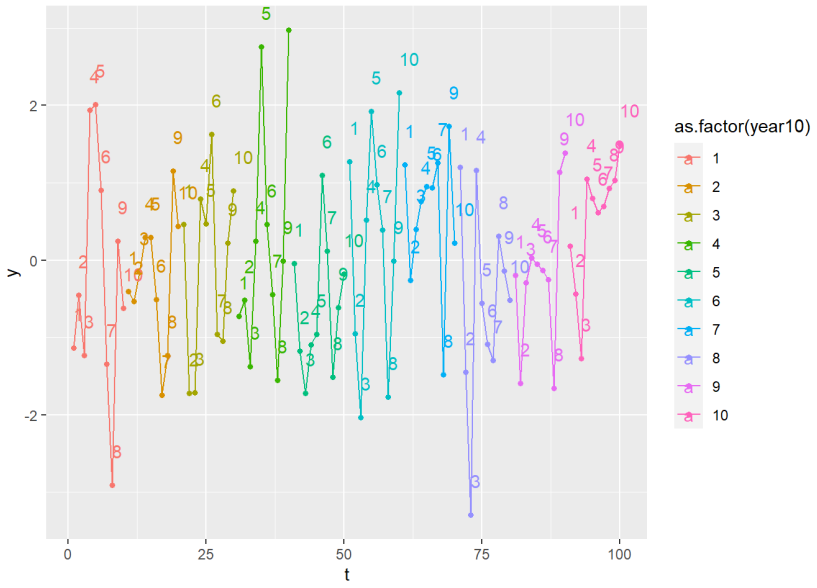
```
## Warning: 'switch' is deprecated.
## Use 'strip.position' instead.
## See help("Deprecated")
```




```
ggplot(data=df,aes(x=t,y=y,label=year))+
  geom_line(aes(color=as.factor(year5)))
```



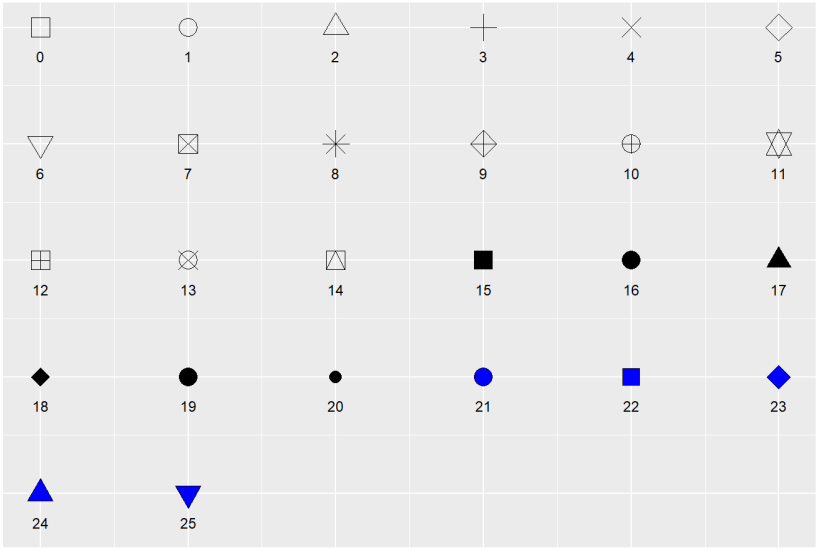

```
ggplot(data=df,aes(x=t,y=y,label=byyear10,color=as.factor(year10)))+
  geom_line()+
  geom_point(size=1.2)+
  geom_text(hjust=0,vjust=-2)
```



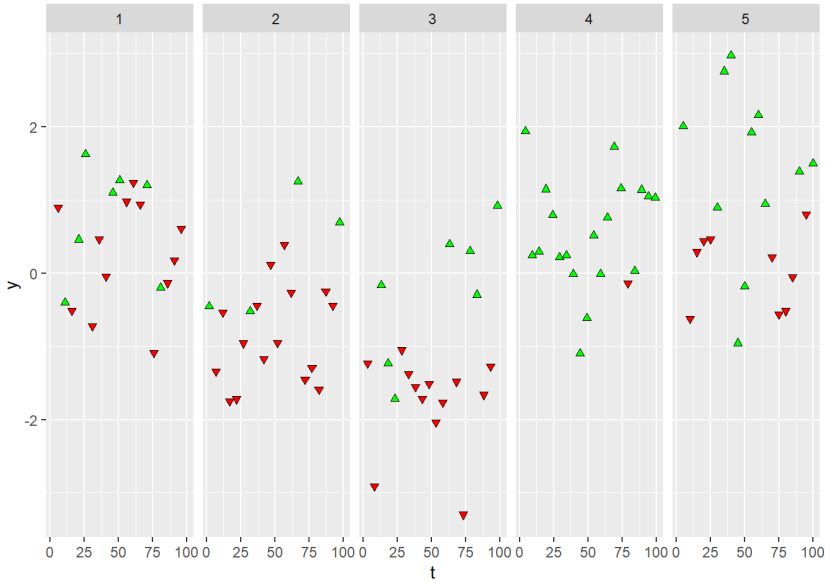

```
ggpubr::show_point_shapes()
```

```
## Scale for 'y' is already present. Adding another scale for 'y', which will
## replace the existing scale.
```

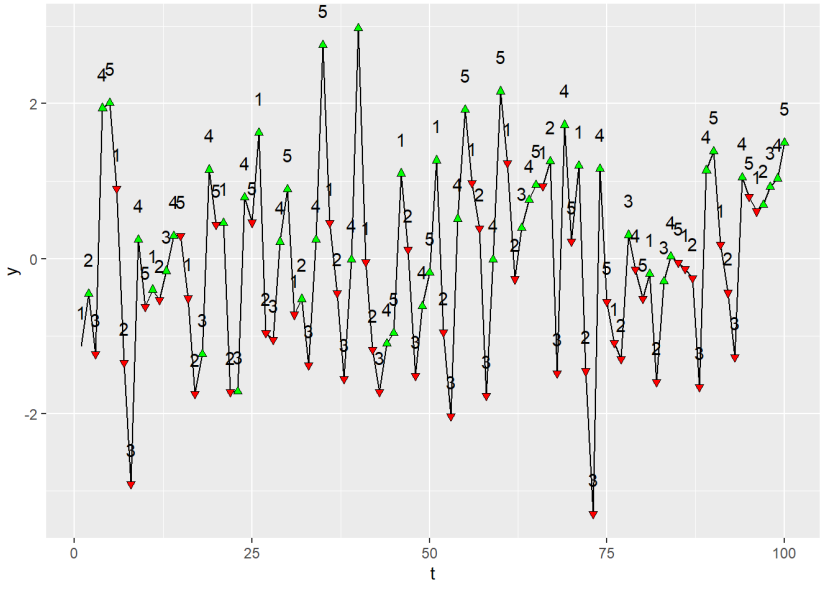
Point shapes available in R




```
#### plot negative or positive by year of 5year period

df$pos=ifelse(y-lag(y)>0,1,0)
df$t=df$dates
ggplot()+
  geom_point(data=df %>% filter(pos==1),aes(x=t,y=y),shape=24,fill="green")+
  geom_point(data=df %>% filter(pos==0),aes(x=t,y=y),shape=25,fill="red")+
  facet_grid(~year)
```




```
p1=ggplot()+
  geom_line(data=df,aes(x=t,y=y))+
  geom_point(data=df %>% filter(pos==1),aes(x=t,y=y),shape=24,fill="green")+
  geom_point(data=df %>% filter(pos==0),aes(x=t,y=y),shape=25,fill="red")+
  geom_text(data=df,aes(x=t,y=y,label=year),vjust=-2)


p1
```




```
ftable(df$pos~df$year)
```

```
##         df$pos  0  1
## df$year
## 1               12  7
## 2               16  4
## 3               13  7
## 4                1 19
## 5                9 11
```

```
library(epiDisplay)
```

```
## Warning: package 'epiDisplay' was built under R version 4.1.3
```

```
## Loading required package: foreign
```

```
## Loading required package: survival
```

```
## Loading required package: MASS
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select
```

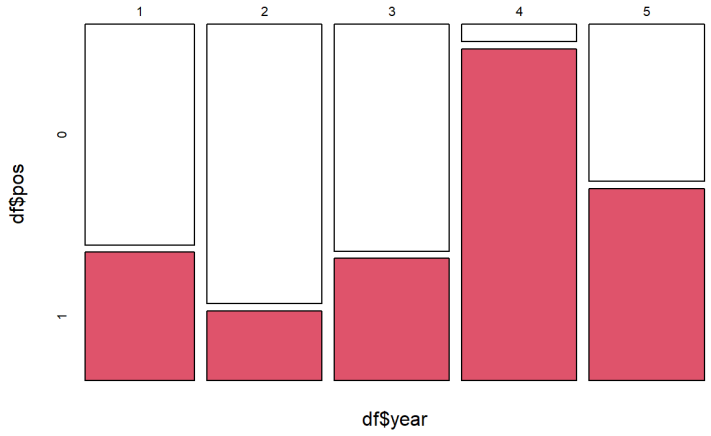
```
## Loading required package: nnet
```

```
##
## Attaching package: 'epiDisplay'
```

```
## The following object is masked from 'package:ggplot2':
##
##     alpha
```

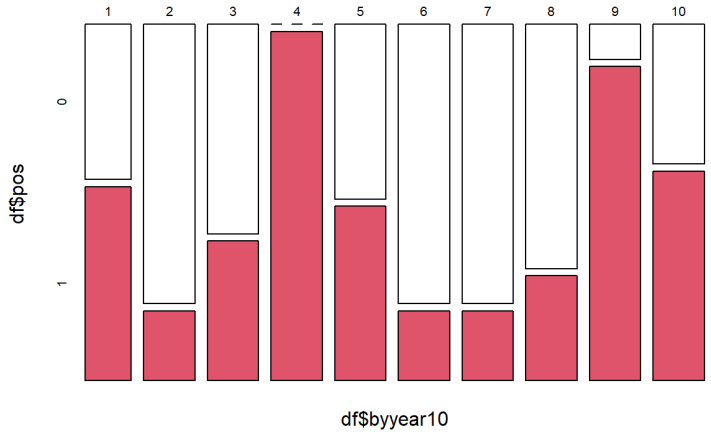
```
tabpct(column=df$pos,row=df$year)
```

```
##
## Original table
##        df$pos
## df$year   0   1  Total
##   1      12   7     19
##   2      16   4     20
##   3      13   7     20
##   4       1  19     20
##   5       9  11     20
##   Total  51  48     99
##
## Row percent
##        df$pos
## df$year       0       1  Total
##       1      12       7     19
##          (63.2)  (36.8)  (100)
##       2      16       4     20
##            (80)    (20)  (100)
##       3      13       7     20
##            (65)    (35)  (100)
##       4       1      19     20
##             (5)    (95)  (100)
##       5       9      11     20
##            (45)    (55)  (100)
##
## Column percent
##        df$pos
## df$year   0       %   1       %
##   1      12  (23.5)   7  (14.6)
##   2      16  (31.4)   4   (8.3)
##   3      13  (25.5)   7  (14.6)
##   4       1   (2.0)  19  (39.6)
##   5       9  (17.6)  11  (22.9)
##   Total  51   (100)  48   (100)
```




```
tabpct(column=df$pos,row=df$byyear10)
```

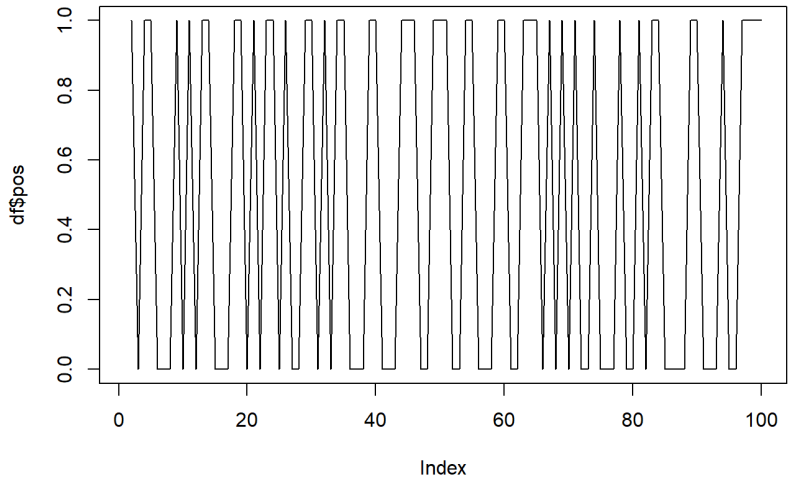
```
##
## Original table
##            df$pos
## df$byyear10   0   1  Total
##       1       4   5      9
##       2       8   2     10
##       3       6   4     10
##       4       0  10     10
##       5       5   5     10
##       6       8   2     10
##       7       8   2     10
##       8       7   3     10
##       9       1   9     10
##       10      4   6     10
##       Total  51  48     99
##
## Row percent
##            df$pos
## df$byyear10       0       1  Total
##          1        4       5      9
##              (44.4)  (55.6)  (100)
##          2        8       2     10
##                (80)    (20)  (100)
##          3        6       4     10
##                (60)    (40)  (100)
##          4        0      10     10
##                 (0)   (100)  (100)
##          5        5       5     10
##                (50)    (50)  (100)
##          6        8       2     10
##                (80)    (20)  (100)
##          7        8       2     10
##                (80)    (20)  (100)
##          8        7       3     10
##                (70)    (30)  (100)
##          9        1       9     10
##                (10)    (90)  (100)
##          10       4       6     10
##                (40)    (60)  (100)
##
## Column percent
##            df$pos
## df$byyear10   0       %   1       %
##       1       4   (7.8)   5  (10.4)
##       2       8  (15.7)   2   (4.2)
##       3       6  (11.8)   4   (8.3)
##       4       0   (0.0)  10  (20.8)
##       5       5   (9.8)   5  (10.4)
##       6       8  (15.7)   2   (4.2)
##       7       8  (15.7)   2   (4.2)
##       8       7  (13.7)   3   (6.2)
##       9       1   (2.0)   9  (18.8)
##       10      4   (7.8)   6  (12.5)
##       Total  51   (100)  48   (100)
```



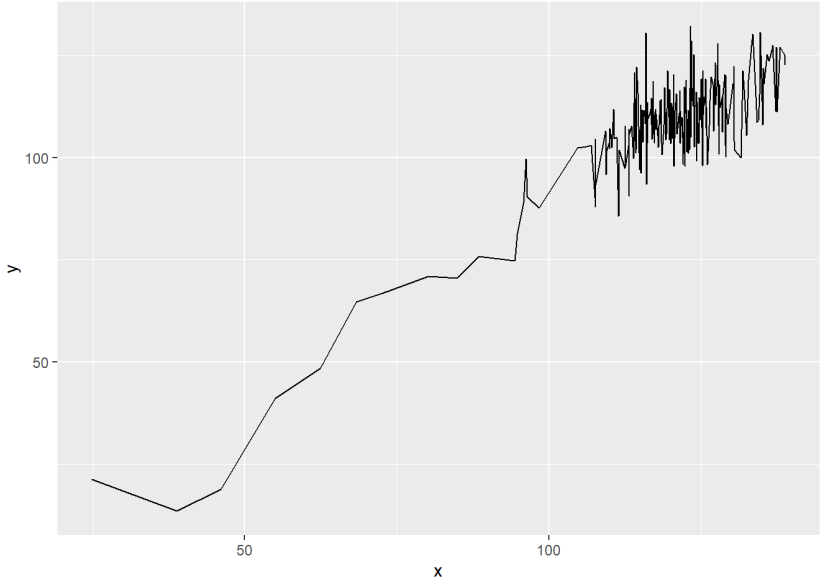

```
gmodels::CrossTable(df$year,df$pos, prop.t=TRUE, prop.r=TRUE, prop.c=TRUE)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  99
##
##
##              | df$pos
##      df$year |         0 |         1 | Row Total |
## -------------|-----------|-----------|-----------|
##            1 |        12 |         7 |        19 |
##              |     0.500 |     0.531 |           |
##              |     0.632 |     0.368 |     0.192 |
##              |     0.235 |     0.146 |           |
##              |     0.121 |     0.071 |           |
## -------------|-----------|-----------|-----------|
##            2 |        16 |         4 |        20 |
##              |     3.150 |     3.347 |           |
##              |     0.800 |     0.200 |     0.202 |
##              |     0.314 |     0.083 |           |
##              |     0.162 |     0.040 |           |
## -------------|-----------|-----------|-----------|
##            3 |        13 |         7 |        20 |
##              |     0.706 |     0.750 |           |
##              |     0.650 |     0.350 |     0.202 |
##              |     0.255 |     0.146 |           |
##              |     0.131 |     0.071 |           |
## -------------|-----------|-----------|-----------|
##            4 |         1 |        19 |        20 |
##              |     8.400 |     8.925 |           |
##              |     0.050 |     0.950 |     0.202 |
##              |     0.020 |     0.396 |           |
##              |     0.010 |     0.192 |           |
## -------------|-----------|-----------|-----------|
##            5 |         9 |        11 |        20 |
##              |     0.165 |     0.175 |           |
##              |     0.450 |     0.550 |     0.202 |
##              |     0.176 |     0.229 |           |
##              |     0.091 |     0.111 |           |
## -------------|-----------|-----------|-----------|
## Column Total |        51 |        48 |        99 |
##              |     0.515 |     0.485 |           |
## -------------|-----------|-----------|-----------|
##
##
```

```
plot(df$pos,type="l")
```




```
e1=rnorm(n=250,mean=10,sd=5)
e2=rnorm(n=250,mean=13,sd=4)

t=250

constants=c(-0.7,1.3)
coefs=c(0.7,0.2,0.2,0.7)
y0=c(5,10)

y=vector()
x=vector()
for (i in 1:t){
  if (i==1){
    y[i]=y0[1]+e1[i]
    x[i]=y0[2]+e2[i]
  }else {
    y[i]=constants[1]+coefs[1]*y[i-1]+coefs[2]*x[i-1]+e1[i]
    x[i]=constants[2]+coefs[3]*y[i-1]+coefs[4]*x[i-1]+e2[i]
  }
}


df=data.frame(t=1:250,x=x,y=y)


ggplot(data=df)+
  geom_line(aes(x=x,y=y))
```



```
library(rgl)
```

```
## Warning: package 'rgl' was built under R version 4.1.2
```

```
plot3d(x=df$t,y=df$x,z=df$y,type="l")
?plot3d
```

```
## starting httpd help server ...
```

```
##  done
```

```
library(ggarchery)
```

```
## Warning: package 'ggarchery' was built under R version 4.1.3
```

```
## Warning: replacing previous import 'dplyr::collapse' by 'glue::collapse' when
## loading 'ggarchery'
```

```
library(magrittr)
```

```
##
## Attaching package: 'magrittr'
```

```
## The following object is masked from 'package:purrr':
##
##     set_names
```

```
## The following object is masked from 'package:tidyr':
##
##     extract
```

```
library(tidyr)
```

```
ggplot(df[seq(5,100,by=5),],aes(label=t))+
  geom_point(aes(x=x,y=y))+
  geom_arrowsegment(aes(x=lag(x),xend=x,y=lag(y),yend=y))+
  geom_text(aes(x=x,y=y,label=t),vjust=-2,hjust=0)
```

```
## Warning: Removed 1 rows containing missing values (geom_arrowsegment).
```