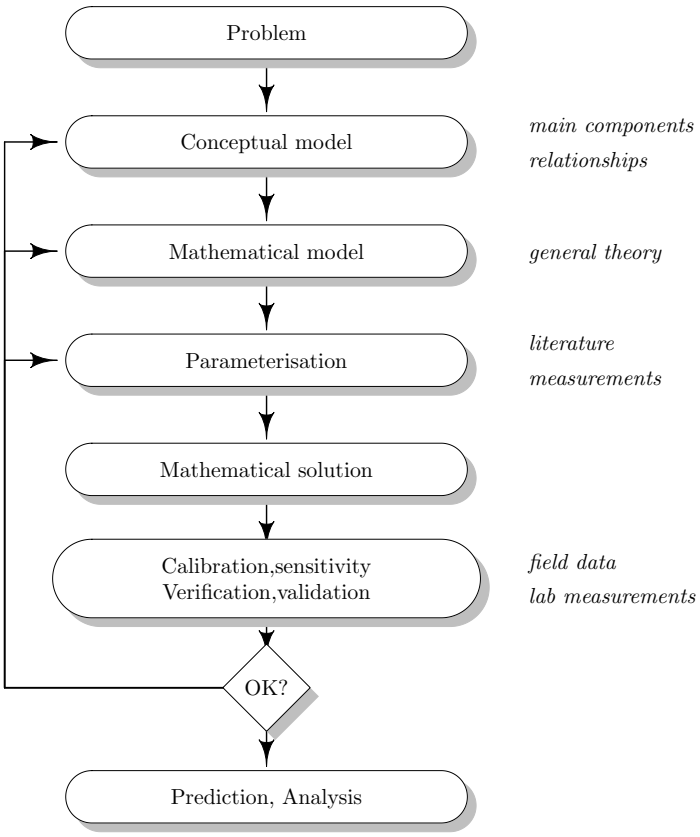
```
library(diagram)

## Loading required package:  shape

read_demo("flowchart", package = "diagram", labels = "demo-flowchart")
```

```
## Flowchart examples
par(ask = TRUE)

## MODELLING DIAGRAM
mar <- par(mar = c(1, 1, 1, 1))
openplotmat(main = "from Soetaert and herman, book in prep", cex.main = 1)
elpos <- coordinates(c(1, 1, 1, 1, 1, 1, 1, 1), mx = -0.1)
segmentarrow(elpos[7, ], elpos[2, ], arr.pos = 0.15, dd = 0.3, arr.side = 3,
    endhead = TRUE)
segmentarrow(elpos[7, ], elpos[3, ], arr.pos = 0.15, dd = 0.3, arr.side = 3,
    endhead = TRUE)
segmentarrow(elpos[7, ], elpos[4, ], arr.pos = 0.15, dd = 0.3, arr.side = 3,
    endhead = TRUE)

pin <- par("pin")  # size of plotting region, inches
xx <- 0.2
yy <- xx * pin[1]/pin[2] * 0.15  # used to make circles round

sx <- rep(xx, 8)
sx[7] <- 0.05

sy <- rep(yy, 8)
sy[6] <- yy * 1.5
sy[7] <- sx[7] * pin[1]/pin[2]

for (i in c(1:7)) straightarrow(to = elpos[i + 1, ], from = elpos[i, ], lwd = 2,
    arr.pos = 0.6, endhead = TRUE)
lab <- c("Problem", "Conceptual model", "Mathematical model", "Parameterisation",
    "Mathematical solution", "", "OK?", "Prediction, Analysis")

for (i in c(1:5, 8)) textround(elpos[i, ], sx[i], sy[i], lab = lab[i])

textround(elpos[6, ], xx, yy * 1.5, lab = c("Calibration,sensitivity", "Verification,validat
textdiamond(elpos[7, ], sx[7], sy[7], lab = lab[7])

textplain(c(0.7, elpos[2, 2]), yy * 2, lab = c("main components", "relationships"),
    font = 3, adj = c(0, 0.5))
textplain(c(0.7, elpos[3, 2]), yy, "general theory", adj = c(0, 0.5), font = 3)
textplain(c(0.7, elpos[4, 2]), yy * 2, lab = c("literature", "measurements"),
```

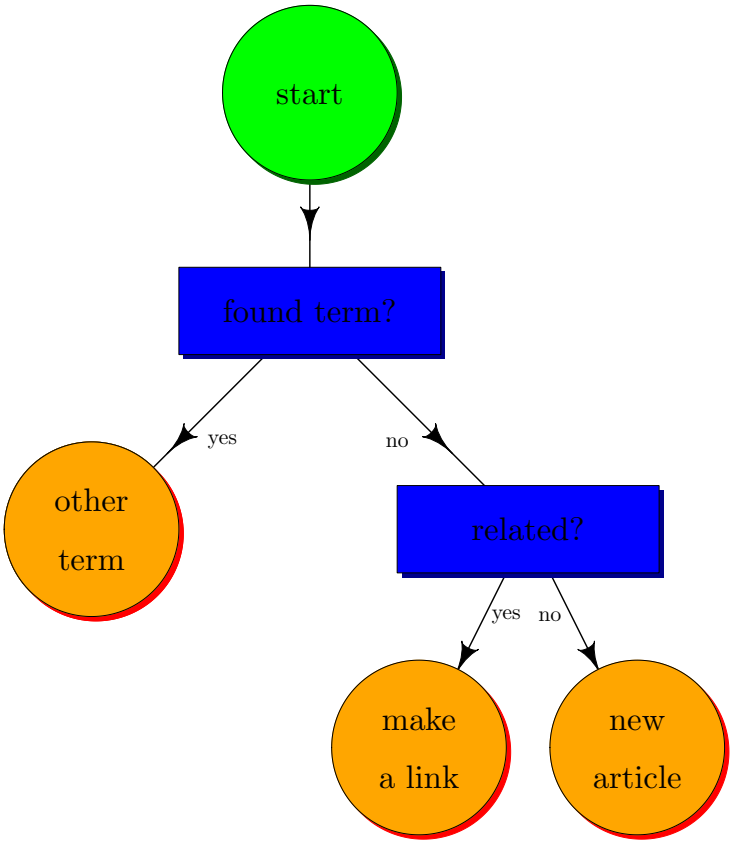
```
    font = 3, adj = c(0, 0.5))
textplain(c(0.7, elpos[6, 2]), yy * 2, lab = c("field data", "lab measurements"),
    font = 3, adj = c(0, 0.5))
```

from Soetaert and herman, book in prep



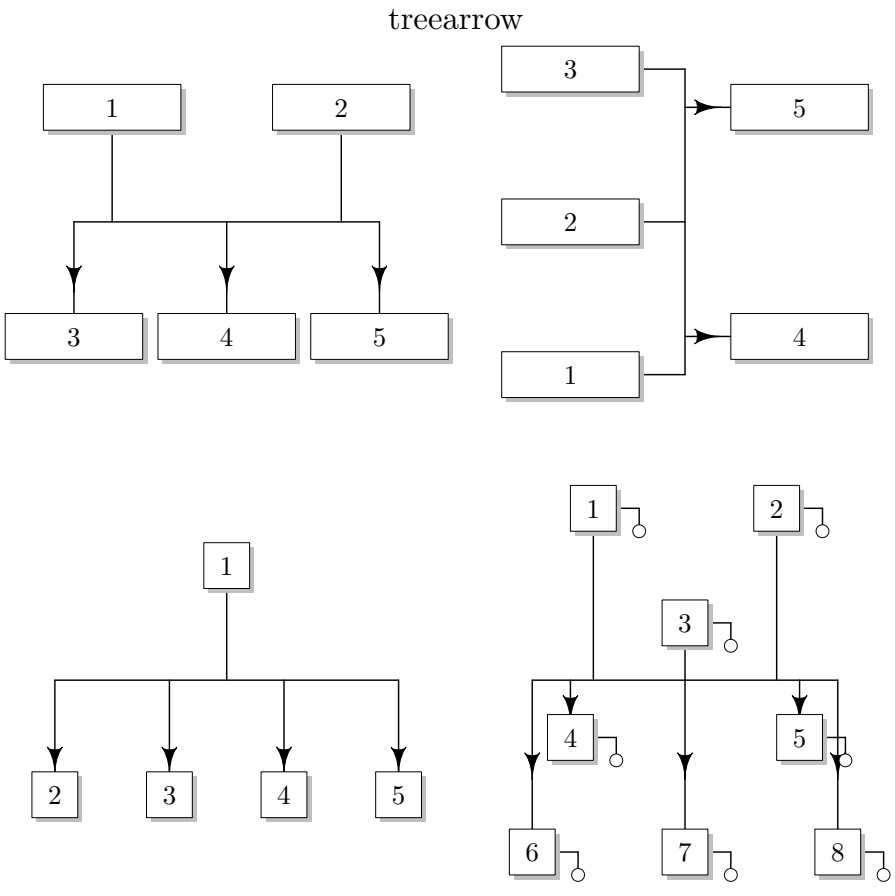

```
##### DIAGRAM

par(mar = c(1, 1, 1, 1))
openplotmat()
elpos <- coordinates(c(1, 1, 2, 4))
fromto <- matrix(ncol = 2, byrow = TRUE, data = c(1, 2, 2, 3, 2, 4, 4, 7, 4,
    8))
nr <- nrow(fromto)
arrpos <- matrix(ncol = 2, nrow = nr)
for (i in 1:nr) arrpos[i, ] <- straightarrow(to = elpos[fromto[i, 2], ], from = elpos[fromto
    1], ], lwd = 2, arr.pos = 0.6, arr.length = 0.5)
```

```
textellipse(elpos[1, ], 0.1, lab = "start", box.col = "green", shadow.col = "darkgreen",
    shadow.size = 0.005, cex = 1.5)
textrect(elpos[2, ], 0.15, 0.05, lab = "found term?", box.col = "blue", shadow.col = "darkbl
    shadow.size = 0.005, cex = 1.5)
textrect(elpos[4, ], 0.15, 0.05, lab = "related?", box.col = "blue", shadow.col = "darkblue"
    shadow.size = 0.005, cex = 1.5)
textellipse(elpos[3, ], 0.1, 0.1, lab = c("other", "term"), box.col = "orange",
    shadow.col = "red", shadow.size = 0.005, cex = 1.5)
textellipse(elpos[3, ], 0.1, 0.1, lab = c("other", "term"), box.col = "orange",
    shadow.col = "red", shadow.size = 0.005, cex = 1.5)
textellipse(elpos[7, ], 0.1, 0.1, lab = c("make", "a link"), box.col = "orange",
    shadow.col = "red", shadow.size = 0.005, cex = 1.5)
textellipse(elpos[8, ], 0.1, 0.1, lab = c("new", "article"), box.col = "orange",
    shadow.col = "red", shadow.size = 0.005, cex = 1.5)

dd <- c(0, 0.025)
text(arrpos[2, 1] + 0.05, arrpos[2, 2], "yes")
text(arrpos[3, 1] - 0.05, arrpos[3, 2], "no")
text(arrpos[4, 1] + 0.05, arrpos[4, 2] + 0.05, "yes")
text(arrpos[5, 1] - 0.05, arrpos[5, 2] + 0.05, "no")
```

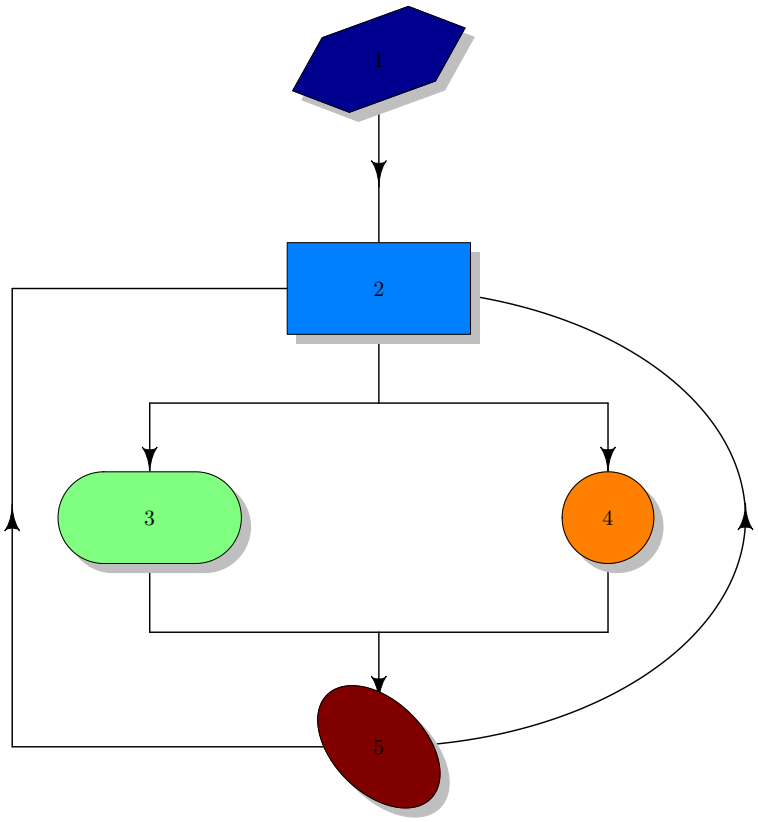



```
#####
par(mfrow = c(2, 2))
par(mar = c(0, 0, 0, 0))
openplotmat()
elpos <- coordinates(c(2, 3))
treearrow(from = elpos[1:2, ], to = elpos[3:5, ], arr.side = 2, path = "H")
for (i in 1:5) textrect(elpos[i, ], 0.15, 0.05, lab = i, cex = 1.5)

openplotmat()
elpos <- coordinates(c(3, 2), hor = FALSE)
treearrow(from = elpos[1:3, ], to = elpos[4:5, ], arr.side = 2, arr.pos = 0.2,
    path = "V")
for (i in 1:5) textrect(elpos[i, ], 0.15, 0.05, lab = i, cex = 1.5)
```

```
openplotmat()
elpos <- coordinates(c(1, 4))
treearrow(from = elpos[1, ], to = elpos[2:5, ], arr.side = 2, arr.pos = 0.7,
    path = "H")
for (i in 1:5) textrect(elpos[i, ], 0.05, 0.05, lab = i, cex = 1.5)

openplotmat()
elpos <- coordinates(c(2, 1, 2, 3))
elpos[1, 1] <- 0.3
elpos[2, 1] <- 0.7
treearrow(from = elpos[1:3, ], to = elpos[4:8, ], arr.side = 2, path = "H")
for (i in 1:8) bentarrow(from = elpos[i, ], to = elpos[i, ] + c(0.1, -0.05),
    arr.pos = 1, arr.type = "circle", arr.col = "white", arr.length = 0.2)
for (i in 1:8) textrect(elpos[i, ], 0.05, 0.05, lab = i, cex = 1.5)
mtext(side = 3, outer = TRUE, line = -2, "treearrow", cex = 1.5)
```

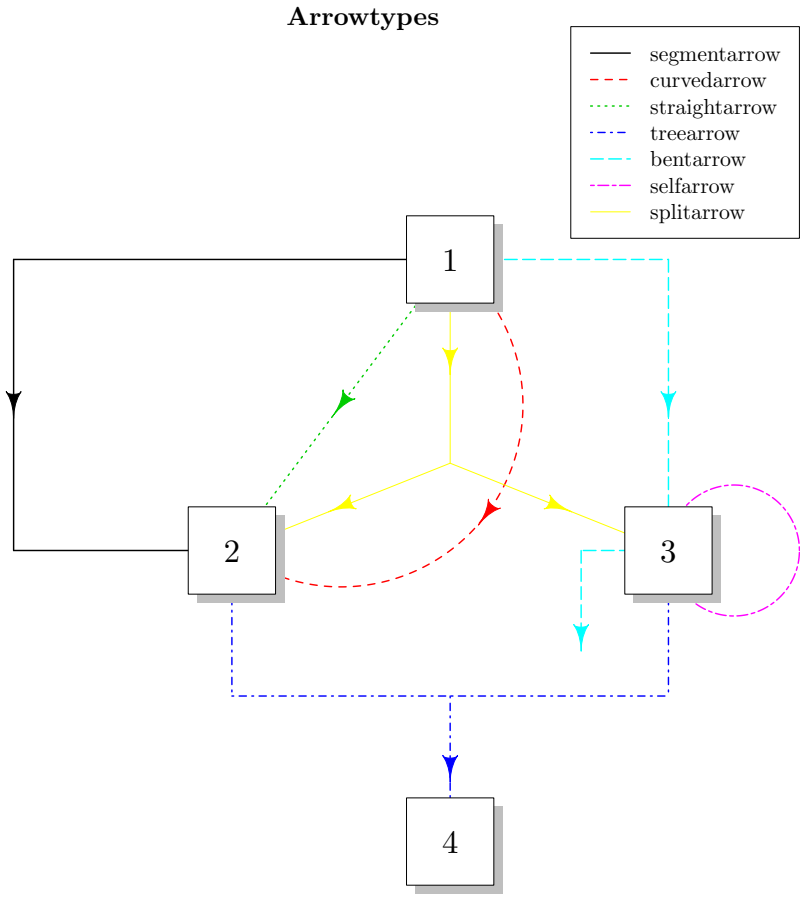


```
par(mfrow = c(1, 1))

par(mar = c(0, 0, 0, 0))
openplotmat()
elpos <- coordinates(c(1, 1, 2, 1))
straightarrow(to = elpos[2, ], from = elpos[1, ])
treearrow(from = elpos[2, ], to = elpos[3:4, ], arr.side = 2, path = "H")
treearrow(from = elpos[3:4, ], to = elpos[5, ], arr.side = 2, path = "H")
segmentarrow(from = elpos[5, ], to = elpos[2, ], dd = 0.4)
curvedarrow(from = elpos[5, ], to = elpos[2, ], curve = 0.8)
col <- femmecol(5)
texthexa(mid = elpos[1, ], radx = 0.1, angle = 20, shadow.size = 0.01, rady = 0.05,
    lab = 1, box.col = col[1])
textrect(mid = elpos[2, ], radx = 0.1, shadow.size = 0.01, rady = 0.05, lab = 2,
    box.col = col[2])
textround(mid = elpos[3, ], radx = 0.05, shadow.size = 0.01, rady = 0.05, lab = 3,
    box.col = col[3])
textellipse(mid = elpos[4, ], radx = 0.05, shadow.size = 0.01, rady = 0.05,
    lab = 4, box.col = col[4])
textellipse(mid = elpos[5, ], radx = 0.05, shadow.size = 0.01, rady = 0.08,
    angle = 45, lab = 5, box.col = col[5])
```



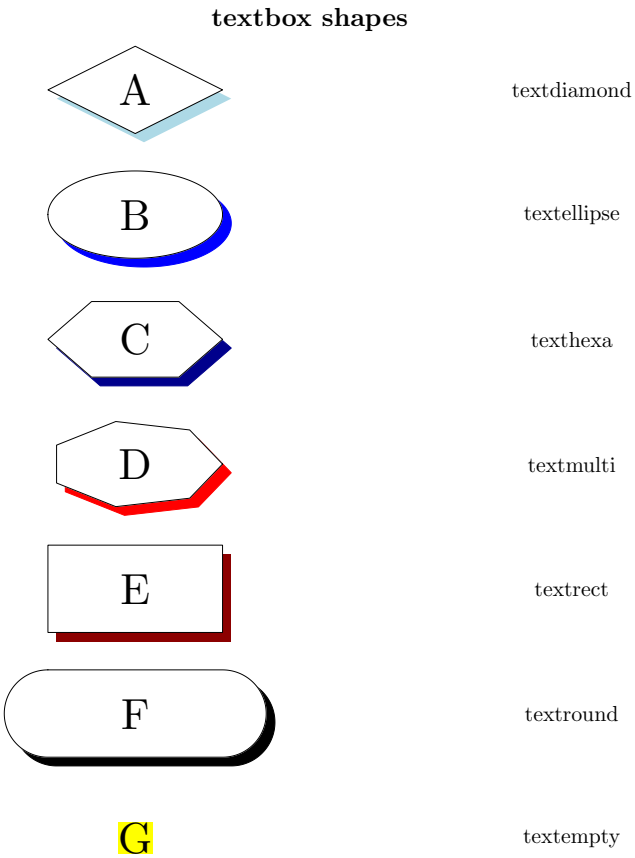

```
par(mar = c(1, 1, 1, 1))
openplotmat(main = "Arrowtypes")
elpos <- coordinates(c(1, 2, 1), mx = 0.1, my = -0.1)
curvedarrow(from = elpos[1, ], to = elpos[2, ], curve = -0.5, lty = 2, lcol = 2)
straightarrow(from = elpos[1, ], to = elpos[2, ], lty = 3, lcol = 3)
segmentarrow(from = elpos[1, ], to = elpos[2, ], lty = 1, lcol = 1)
treearrow(from = elpos[2:3, ], to = elpos[4, ], lty = 4, lcol = 4)
bentarrow(from = elpos[3, ], to = elpos[3, ] - c(0.1, 0.1), arr.pos = 1, lty = 5,
    lcol = 5)
bentarrow(from = elpos[1, ], to = elpos[3, ], lty = 5, lcol = 5)
selfarrow(pos = elpos[3, ], path = "R", lty = 6, curve = 0.075, lcol = 6)
splitarrow(from = elpos[1, ], to = elpos[2:3, ], lty = 1, lwd = 1, dd = 0.7,
    arr.side = 1:2, lcol = 7)
```

```
for (i in 1:4) textrect(elpos[i, ], 0.05, 0.05, lab = i, cex = 1.5)

legend("topright", lty = 1:7, legend = c("segmentarrow", "curvedarrow", "straightarrow",
    "treearrow", "bentarrow", "selfarrow", "splitarrow"), lwd = c(rep(2, 6),
    1), col = 1:7)
```



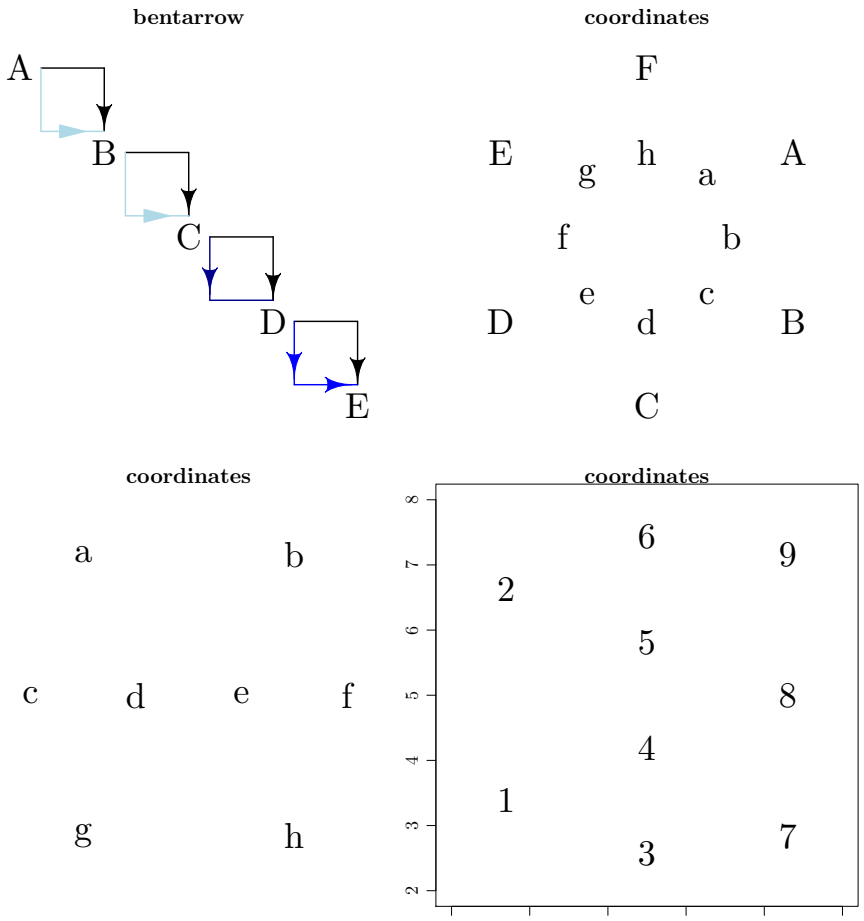

```
openplotmat(main = "textbox shapes")
rx <- 0.1
ry <- 0.05
pos <- coordinates(c(1, 1, 1, 1, 1, 1, 1), mx = -0.2)
textdiamond(mid = pos[1, ], radx = rx, rady = ry, lab = LETTERS[1], cex = 2,
    shadow.col = "lightblue")
textellipse(mid = pos[2, ], radx = rx, rady = ry, lab = LETTERS[2], cex = 2,
    shadow.col = "blue")
texthexa(mid = pos[3, ], radx = rx, rady = ry, lab = LETTERS[3], cex = 2, shadow.col = "dark
```

```
textmulti(mid = pos[4, ], nr = 7, radx = rx, rady = ry, lab = LETTERS[4], cex = 2,
    shadow.col = "red")
textrect(mid = pos[5, ], radx = rx, rady = ry, lab = LETTERS[5], cex = 2, shadow.col = "dark
textround(mid = pos[6, ], radx = rx, rady = ry, lab = LETTERS[6], cex = 2, shadow.col = "bla
textempty(mid = pos[7, ], lab = LETTERS[7], cex = 2, box.col = "yellow")
pos[, 1] <- pos[, 1] + 0.5
text(pos[, 1], pos[, 2], c("textdiamond", "textellipse", "texthexa", "textmulti",
    "textrect", "textround", "textempty"))
```




```
mf <- par(mfrow = c(2, 2))
example(bentarrow)

##
## bntrrw> openplotmat(main = "bentarrow")
```

```
##
## bntrrw> pos <- cbind( A <- seq(0.1, 0.9, by = 0.2), rev(A))
##
## bntrrw> text(pos, LETTERS[1:5], cex = 2)
##
## bntrrw> for (i in 1:4)
## bntrrw+   bentarrow(from = pos[i,] + c(0.05, 0), to = pos[i+1,] + c(0, 0.05),
## bntrrw+             arr.pos = 1, arr.adj = 1)
##
## bntrrw> for (i in 1:2)
## bntrrw+   bentarrow(from = pos[i,] + c(0.05, 0), to = pos[i+1, ] + c(0, 0.05),
## bntrrw+             arr.pos = 0.5, path = "V", lcol = "lightblue",
## bntrrw+             arr.type = "triangle")
##
## bntrrw> bentarrow(from = pos[3, ] + c(0.05, 0), to = pos[4, ] + c(0, 0.05),
## bntrrw+           arr.pos = 0.7, arr.side = 1, path = "V", lcol = "darkblue")
##
## bntrrw> bentarrow(from = pos[4, ] + c(0.05, 0), to = pos[5, ] + c(0, 0.05),
## bntrrw+           arr.pos = 0.7, arr.side = 1:2, path = "V", lcol = "blue")

example(coordinates)

##
## crdnts> openplotmat(main = "coordinates")

##
## crdnts> text(coordinates(N = 6), lab = LETTERS[1:6], cex = 2)
##
## crdnts> text(coordinates(N = 8, relsize = 0.5), lab = letters[1:8], cex = 2)
##
## crdnts> openplotmat(main = "coordinates")

##
## crdnts> text(coordinates(pos = c(2, 4, 2)), lab = letters[1:8], cex = 2)
##
## crdnts> plot(0, type = "n", xlim = c(0, 5), ylim = c(2, 8), main = "coordinates")
```



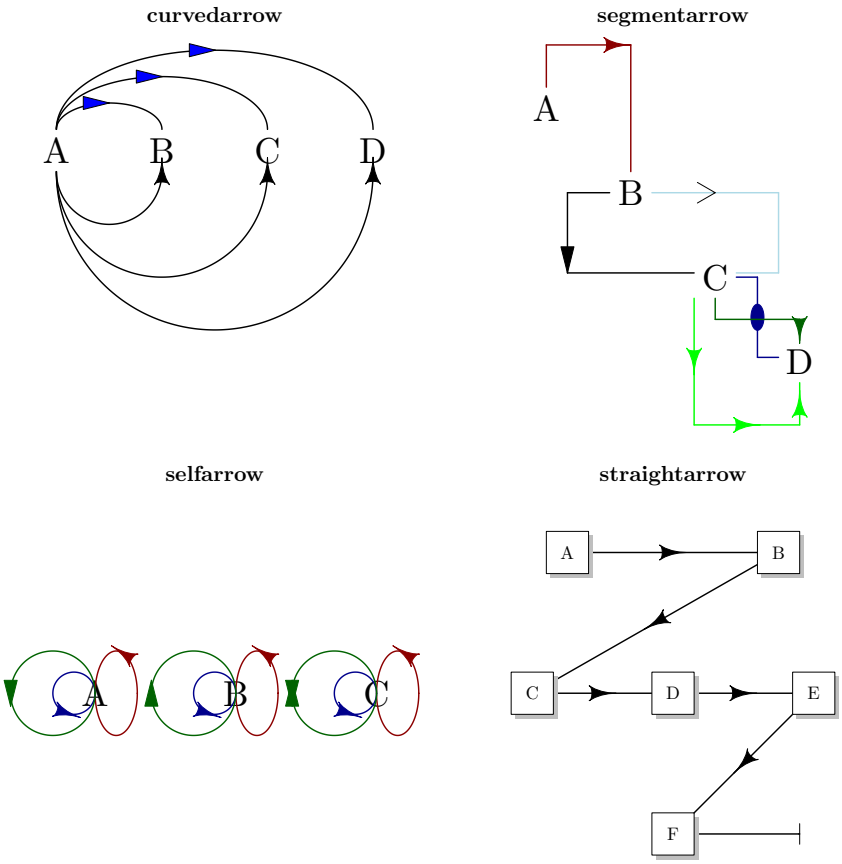

```
##
## crdnts> text(coordinates(pos = c(2, 4, 3), hor = FALSE), lab = 1:9, cex = 2)

par(mfrow = c(2, 2))
example(curvedarrow)

##
## crvdrr> openplotmat(main = "curvedarrow")

##
## crvdrr> pos <- coordinates(pos = 4, my = 0.2)
##
## crvdrr> text(pos, LETTERS[1:4], cex = 2)
##
## crvdrr> for (i in 1:3)
## crvdrr+   curvedarrow(from = pos[1, ] + c(0,-0.05), to = pos[i+1, ] + c(0,-0.05),
```

```
## crvdrr+               curve = 0.5, arr.pos = 1)
##
## crvdrr> for (i in 1:3)
## crvdrr+   curvedarrow(from = pos[1, ] + c(0, 0.05), to = pos[i+1, ] + c(0, 0.05),
## crvdrr+               curve = -0.25, arr.adj = 1, arr.pos = 0.5,
## crvdrr+               arr.type = "triangle", arr.col = "blue")

example(segmentarrow)

##
## sgmntr> openplotmat(main="segmentarrow")

##
## sgmntr> pos <-cbind(A <- seq(0.2, 0.8, by = 0.2), rev(A))
##
## sgmntr> text(pos, LETTERS[1:4], cex = 2)
##
## sgmntr> segmentarrow(from = pos[1, ] + c(0, 0.05), to = pos[2, ] + c(0, 0.05),
## sgmntr+              arr.pos = 1, arr.adj = 1, dd = 0.1,
## sgmntr+              path = "UHD", lcol = "darkred")
##
## sgmntr> segmentarrow(from = pos[2, ] + c(-0.05, 0), to = pos[3, ] + c(-0.05, 0.01),
## sgmntr+              arr.pos = 1, arr.adj = 1, dd = 0.1,
## sgmntr+              lcol = "black", arr.type = "triangle")
##
## sgmntr> segmentarrow(from = pos[2, ] + c(0.05, 0), to = pos[3, ] + c(0.05, 0.01),
## sgmntr+              arr.pos = 0.5, dd = 0.3, path = "RVL", arr.side = 1,
## sgmntr+              lcol = "lightblue", arr.type = "simple")
##
## sgmntr> segmentarrow(from = pos[3, ] + c(0.05, 0), to = pos[4, ] + c(-0.05, 0.01),
## sgmntr+              arr.pos = 0.5, dd = 0.05, path = "RVL", lcol = "darkblue",
## sgmntr+              arr.type = "ellipse")
##
## sgmntr> segmentarrow(from = pos[3, ] + c(0, -0.05), to = pos[4, ] + c(0, 0.05),
## sgmntr+              arr.pos = 0.5, arr.side = 3, dd = 0.05, path = "DHU",
## sgmntr+              lcol = "darkgreen")
##
## sgmntr> segmentarrow(from = pos[3,] + c(-0.05, -0.05), to = pos[4, ] + c(0, -0.05),
## sgmntr+              arr.pos = 0.5, arr.side = 1:3, dd = 0.3, path = "DHU",
## sgmntr+              lcol = "green")

example(selfarrow)

##
## slfrrw> openplotmat(main = "selfarrow")
```

```
##
## slfrrw> pos <- coordinates(3, mx = 0.05)
##
## slfrrw> text(pos, LETTERS[1:3], cex = 2)
##
## slfrrw> for (i in 1:3)
## slfrrw+   selfarrow(pos = pos[i, ], path = "R", arr.pos = 0.2,
## slfrrw+             curve = c(0.05, 0.1), lcol = "darkred")
##
## slfrrw> for (i in 1:3)
## slfrrw+   selfarrow(pos = pos[i, ], path = "L", arr.pos = 0.7,
## slfrrw+             lcol = "darkblue", curve = c(0.05, 0.05))
##
## slfrrw> for (i in 1:3)
## slfrrw+   selfarrow(pos = pos[i, ], path = "L", arr.pos = 0.5,
## slfrrw+             lcol = "darkgreen", code = i, arr.type = "triangle")
```

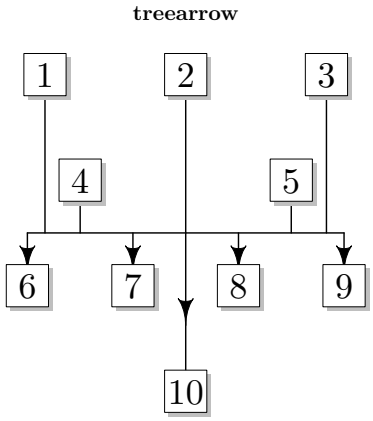
```
example(straightarrow)
```

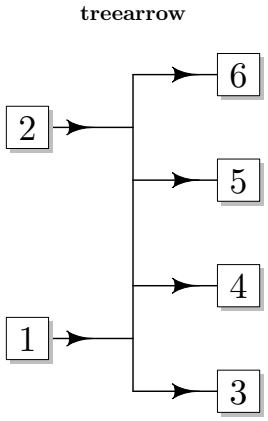
```
##
## strght> openplotmat(main = "straightarrow")
```

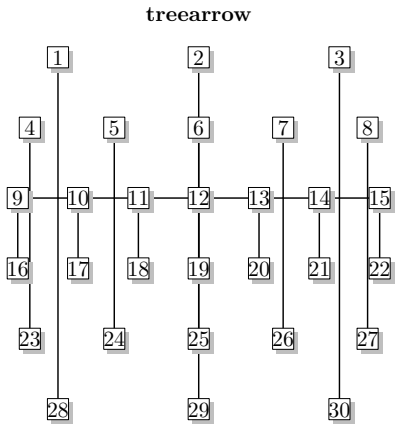



```
##
## strght> pos <- coordinates(c(2, 3, 1))
##
## strght> for (i in 1:5)
## strght+   straightarrow(from = pos[i, ], to = pos[i+1, ], arr.pos = 0.5)
##
## strght> straightarrow(from = pos[6, ], to = pos[6, ] + c(0.3, 0.),
## strght+               arr.type = "T", arr.pos = 1, arr.lwd = 3)
##
## strght> for (i in 1:6)
## strght+   textrect(pos[i, ], lab = LETTERS[i], radx = 0.05)

par(mfrow = c(2, 2))
example(treearrow)

##
```

```
## trerrw> openplotmat(main = "treearrow")

##
## trerrw> pos <- coordinates(c(3, 2, 4, 1))
##
## trerrw> treearrow(from = pos[1:5, ], to = pos[6:10, ])
##
## trerrw> for (i in 1:10)
## trerrw+   textrect(pos[i, ], lab = i, cex = 2, radx = 0.05)
##
## trerrw> openplotmat(main = "treearrow")

##
## trerrw> pos <- coordinates(c(2, 4), hor = FALSE)
##
## trerrw> treearrow(from = pos[1:2, ], to = pos[3:6, ],
## trerrw+           arr.side = 1:2, path = "V")
##
## trerrw> for (i in 1:6)
## trerrw+   textrect(pos[i, ], lab = i, cex = 2, radx = 0.05)
##
## trerrw> openplotmat(main = "treearrow")

##
## trerrw> pos <- coordinates(c(3, 5, 7, 7, 5, 3))
##
## trerrw> treearrow(from = pos[1:15, ], to = pos[15:30, ], arr.side = 0)
##
## trerrw> for (i in 1:30)
## trerrw+   textrect(pos[i, ], lab = i, cex = 1.2, radx = 0.025)

par(mfrow = c(2, 2))
```

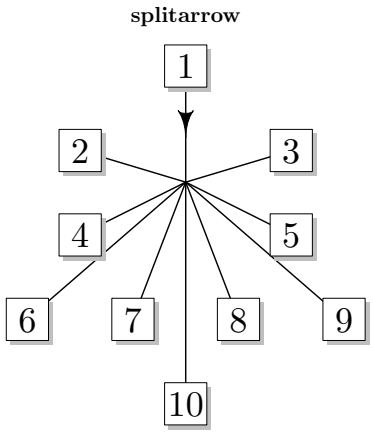


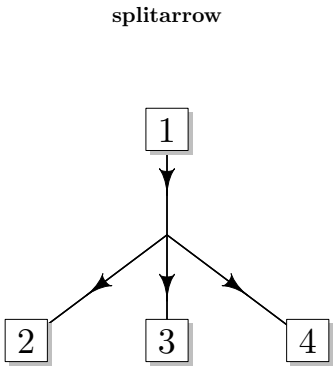


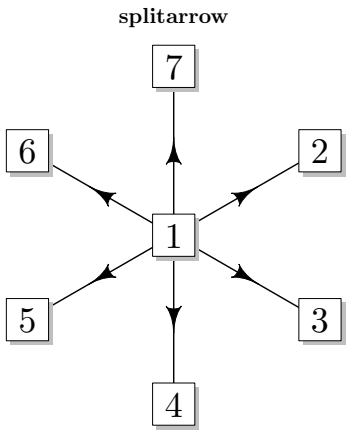



```
example(splitarrow)

##
## spltrr> openplotmat(main = "splitarrow")

##
## spltrr> pos <- coordinates(c(1, 2, 2, 4, 1))
##
## spltrr> splitarrow(from = pos[1, ], to = pos[2:10, ],
## spltrr+            arr.side = 1, centre = c(0.5, 0.625))
##
## spltrr> for (i in 1:10)
## spltrr+   textrect(pos[i, ], lab = i, cex = 2, radx = 0.05)
##
## spltrr> openplotmat(main = "splitarrow")
```

```
##
## spltrr> pos <- coordinates(c(1, 3))
##
## spltrr> splitarrow(from = pos[1,], to = pos[2:4, ], arr.side = 1)
##
## spltrr> splitarrow(from = pos[1,], to = pos[2:4, ], arr.side = 2)
##
## spltrr> for (i in 1:4)
## spltrr+   textrect(pos[i, ], lab = i, cex = 2, radx = 0.05)
##
## spltrr> openplotmat(main = "splitarrow")

##
## spltrr> pos <- coordinates(N = 6)
##
## spltrr> pos <- rbind(c(0.5, 0.5), pos)
##
## spltrr> splitarrow(from = pos[1, ], to = pos[2:7, ], arr.side = 2)
##
## spltrr> for (i in 1:7)
## spltrr+   textrect(pos[i, ], lab = i, cex = 2, radx = 0.05)

par(mfrow = c(2, 2))
```

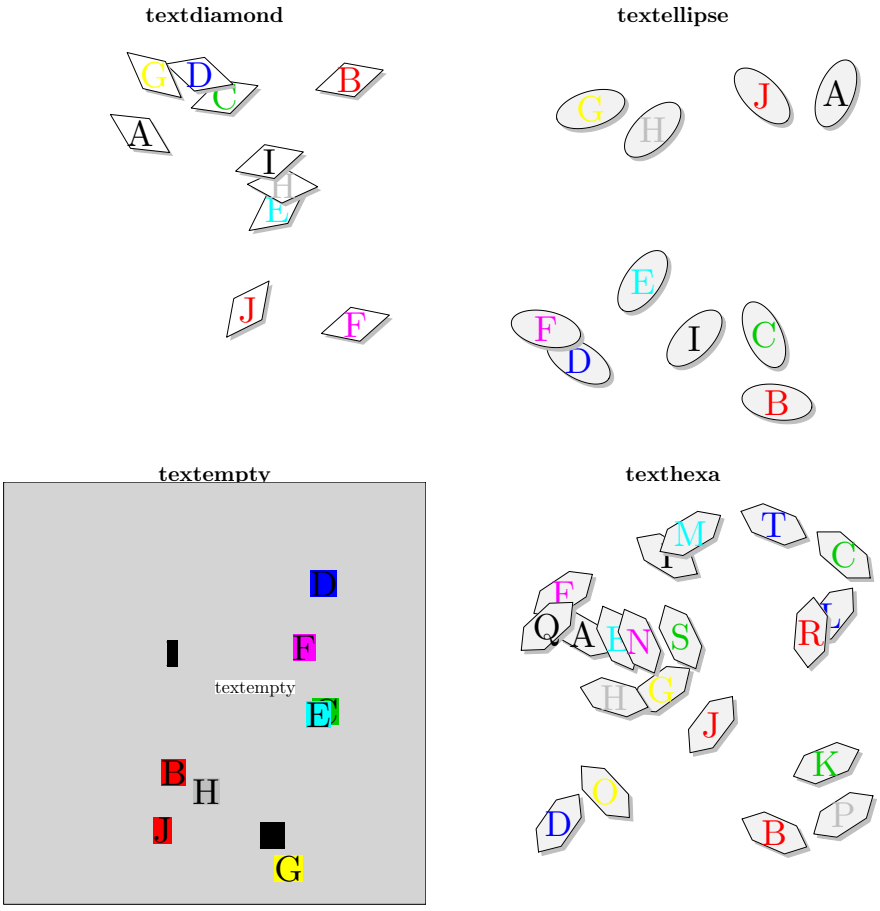






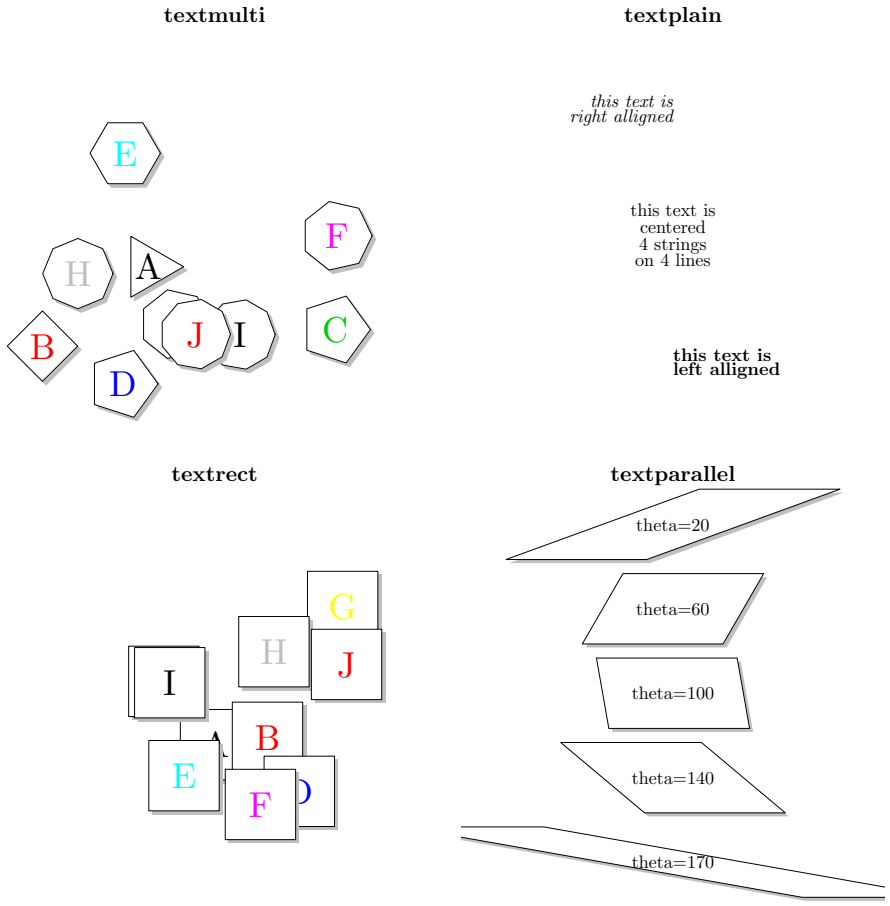

```
example(textdiamond)

##
## txtdmn> openplotmat(xlim = c(-0.1, 1.1), main = "textdiamond")

##
## txtdmn> for (i in 1:10)
## txtdmn+   textdiamond(mid = runif(2), col = i, radx = 0.1, rady = 0.05,
## txtdmn+               lab = LETTERS[i], cex = 2, angle = runif(1)*360)

example(textellipse)

##
## txtllp> openplotmat(xlim = c(-0.1, 1.1), main = "textellipse")

##
```

```
## txtllp> for (i in 1:10)
## txtllp+   textellipse(mid = runif(2), col = i, box.col = grey(0.95),
## txtllp+               radx = 0.1, rady = 0.05, lab = LETTERS[i],
## txtllp+               cex = 2, angle = runif(1)*360)

example(textempty)

##
## txtmpt> openplotmat(xlim = c(-0.1, 1.1), col = "lightgrey", main = "textempty")

##
## txtmpt> for (i in 1:10)
## txtmpt+   textempty(mid = runif(2), box.col = i, lab = LETTERS[i], cex = 2)
##
## txtmpt> textempty(mid = c(0.5, 0.5), adj = c(0, 0),
## txtmpt+   lab = "textempty", box.col = "white")

example(texthexa)

##
## texthx>   openplotmat(xlim = c(-0.1, 1.1), main = "texthexa")
```




```
##
## texthx>   for (i in 1:20)
## texthx+     texthexa(mid = runif(2), angle = runif(1)*360, col = i,
## texthx+              box.col = grey(0.95), radx = 0.1, rady = 0.05,
## texthx+              lab = LETTERS[i], cex = 2)

example(textmulti)

##
## txtmlt>   openplotmat(xlim = c(-0.1, 1.1), main = "textmulti")

##
## txtmlt>   for (i in 1:10)
## txtmlt+     textmulti(mid = runif(2), col = i, radx = 0.1, rady = 0.1,
## txtmlt+              lab = LETTERS[i], cex = 2, nr = trunc(i/1.5)+3)

example(textplain)
```

```
##
## txtpln>   openplotmat(main = "textplain")

##
## txtpln>   textplain(mid = c(0.5, 0.5),
## txtpln+             lab = c("this text is", "centered", "4 strings", "on 4 lines"))
##
## txtpln>   textplain(mid = c(0.5, 0.2), adj = c(0, 0.5), font = 2, height = 0.05,
## txtpln+             lab = c("this text is","left alligned"))
##
## txtpln>   textplain(mid = c(0.5, 0.8), adj = c(1, 0.5), font = 3, height = 0.05,
## txtpln+             lab = c("this text is","right alligned"))

example(textrect)

##
## txtrct>   openplotmat(xlim = c(-0.1, 1.1), main = "textrect")

##
## txtrct>   for (i in 1:10)
## txtrct+     textrect(mid = runif(2), col = i, radx = 0.1, rady = 0.1,
## txtrct+             lab = LETTERS[i], cex = 2)
##
## txtrct>   openplotmat(xlim = c(-0.1, 1.1), main = "textparallel")
```




```
##
## txtrct>   elpos <-coordinates (c(1, 1, 1, 1, 1))
##
## txtrct>   textparallel(mid = elpos[1,], col = 1, radx = 0.2, rady = 0.1,
## txtrct+             lab = "theta=20", theta = 20)
##
## txtrct>   textparallel(mid = elpos[2,], col = 1, radx = 0.2, rady = 0.1,
## txtrct+             lab = "theta=60", theta = 60)
##
## txtrct>   textparallel(mid = elpos[3,], col = 1, radx = 0.2, rady = 0.1,
## txtrct+             lab = "theta=100", theta = 100)
##
## txtrct>   textparallel(mid = elpos[4,], col = 1, radx = 0.2, rady = 0.1,
## txtrct+             lab = "theta=140", theta = 140)
##
## txtrct>   textparallel(mid = elpos[5,], col = 1, radx = 0.2, rady = 0.1,
```

```
## txtrct+             lab = "theta=170", theta = 170)

example(textround)

##
## txtrnd>   openplotmat(xlim = c(-0.1, 1.1), main = "textround")

##
## txtrnd>   for (i in 1:10)
## txtrnd+     textround(mid = runif(2), col = i,
## txtrnd+                 radx = 0.03, rady = 0.075,
## txtrnd+                 lab = LETTERS[i], cex = 2)



par(mfrow = mf)
```

textround