

# Package ‘TurtleGraphics’

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**VignetteBuilder** knitr

**Depends** R (>= 3.0), grid

**Description** An implementation of turtle graphics  
<[http://en.wikipedia.org/wiki/Turtle\\_graphics](http://en.wikipedia.org/wiki/Turtle_graphics)>.  
Turtle graphics comes from Papert's language Logo and has  
been used to teach concepts of computer programming.

**License** GPL (>= 3)

**URL** <http://www.gagolewski.com/software/TurtleGraphics/>

**BugReports** <https://github.com/gagolews/TurtleGraphics/issues>

**RoxygenNote** 5.0.1

**NeedsCompilation** no

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TurtleGraphics-package

*Turtle Graphics in R*

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## Description

Learn computer programming while having a jolly time

## Details

Move the Turtle with commands that are relative to its own position, e.g., "move forward 100 pixels" or "turn right 30 degrees". From these building blocks you can build more complex shapes like circles, fractals, etc. Combined with R control flow, functions, and recursion, the idea of Turtle graphics allows students to get familiar with computer programming in a very accessible and pleasant way.

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## See Also

Other TurtleGraphics: [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

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`turtle_do`*Evaluate a Larger Portion of Turtle Drawing Code*

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## Description

`turtle_do` evaluates an R expression with the Turtle temporarily hidden (for performance reasons).

## Usage

```
turtle_do(expr)
```

## Arguments

`expr`                    expression to evaluate

## Details

The terrarium must be initialized prior to using these functions, see [turtle\\_init](#).

In order to decrease the evaluation time of `expr`, it is evaluated with Turtle temporarily hidden. Basically it means that if a Turtle image is visible (see [turtle\\_show](#) and [turtle\\_hide](#)) `turtle_do` removes it, evaluates `expr` and redraws it on the function exit.

## See Also

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

## Examples

```
turtle_init()
turtle_do({
  for (i in 1:4) {
    turtle_forward(50)
    turtle_right(90)
  }
})
```

---

turtle_getpos	<i>Get the Turtle's Current Position and Direction</i>
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**Description**

turtle\_getpos returns the Turtle's current position on the plane.

turtle\_getangle returns the Turtle's current direction, in degrees. An angle of 0 represents a north-facing Turtle.

**Usage**

```
turtle_getpos()
```

```
turtle_getangle()
```

**Details**

The terrarium must be initialized prior to using these functions, see [turtle\\_init](#).

**Value**

Both functions return a (named) numeric vector. turtle\_getpos returns a vector of length two which specifies the x and y coordinates. The turtle\_getangle returns the angle.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

**Examples**

```
turtle_init()  
turtle_getpos()["x"] # x coordinate  
turtle_getpos()["y"] # y coordinate
```

---

turtle_goto	<i>Set the Turtle's Position and Direction</i>
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---

**Description**

turtle\_goto and turtle\_setpos move the Turtle to a given location without changing its direction.

turtle\_setangle rotates the Turtle to a given (absolute) angle, where 0 denotes a north-facing Turtle.

**Usage**

```
turtle_goto(x, y)
```

```
turtle_setpos(x, y)
```

```
turtle_setangle(angle)
```

**Arguments**

`x, y` numeric; coordinates specifying new Turtle's location.

`angle` numeric; rotation angle in degrees.

**Details**

The terrarium must be initialized prior to using these functions, see [turtle\\_init](#).

If the given location  $(x, y)$  lies outside the terrarium, the behavior of these functions depends on the mode argument in [turtle\\_init](#).

`turtle_goto` may draw the path between the current Turtle's position and the new location. Its behavior depends on the current plot settings, see [turtle\\_up](#), [turtle\\_down](#). In case of `turtle_setpos`, however, the path drawing is always disabled.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

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turtle\_init

*Set Up a New, Shiny Terrarium*

---

**Description**

This function creates a new empty plot with the Turtle centered on the board and facing to the north.

**Usage**

```
turtle_init(width = 100, height = 100, mode = c("error", "clip", "cycle"))
```

**Arguments**

`width` numeric; plot width.

`height` numeric; plot height.

`mode` character string; one of "error", "clip", or "cycle".

**Details**

The mode argument determines what happens if the Turtle tries to move outside the terrarium. `clip` allows it to do that, but the drawing will be clipped to the predefined plot region. `error` throws an error. `cycle` makes the Turtle appear on the other side of the board.

After the `turtle_init()` function has been called you can e.g. move the Turtle with the `turtle_forward` function, turn its direction with `turtle_right` or set display parameters of the Turtle's trace, see `turtle_param`.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

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 turtle\_move

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*Move the Turtle Forward or Backward*


---

**Description**

`turtle_forward` moves the Turtle in forward direction and `turtle_backward` moves the Turtle back.

**Usage**

```
turtle_move(distance, direction = c("forward", "backward"))
```

```
turtle_forward(distance)
```

```
turtle_backward(distance)
```

**Arguments**

distance	single numeric value; specifies the distance to make. Negative distance results in moving in the opposite direction.
direction	character string; moving direction. One of "forward" or "backward".

**Details**

The Turtle must be initialized prior to using these functions, see [turtle\\_init](#).

These functions make use of the Turtle's display options specified by the `turtle_param` function (or if not, use the default options set by `turtle_init`).

Note that if `turtle_up` or `turtle_down` was called, the Turtle's trace will be or not be drawn, respectively.

If you are willing to call these functions in an R loop, you may want to hide the Turtle temporarily (see `turtle_hide` and `turtle_do`) before making actual moves. This will increase the drawing performance significantly.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

**Examples**

```
turtle_init()
turtle_left(30)
turtle_forward(2)
turtle_up()
turtle_forward(1)
turtle_down()
turtle_right(60)
turtle_forward(9)
```

---

turtle\_param

*Set Display Options*

---

**Description**

Sets the display options for the Turtle's trace. It is possible to change its color, line type and line width.

**Usage**

```
turtle_param(col = NULL, lwd = NULL, lty = NULL)

turtle_col(col)

turtle_lwd(lwd)

turtle_lty(lty)
```

**Arguments**

col	numeric or character; trace color, see e.g. <a href="#">colors</a> and <a href="#">gpar</a> .
lwd	numeric; trace line width, see <a href="#">gpar</a> .
lty	numeric; trace line type, see <a href="#">gpar</a> .

**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

**Examples**

```
turtle_init()
turtle_forward(5)
turtle_up()
turtle_forward(3)
turtle_down()
turtle_left(90)
turtle_forward(5)
turtle_param(col = "red", lwd = 2, lty = 2)
turtle_forward(5)
```

---

turtle\_reset

*Reset the Turtle's Position and Direction*

---

**Description**

This function resets the Turtle's position, direction, and graphical options.

**Usage**

```
turtle_reset()
```

**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

After a call to this function, the Turtle will be placed in the terrarium's center and it will be directed to the north.

The drawing remains unchanged.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

**Examples**

```
turtle_init()
turtle_forward(4)
turtle_param(col="red", lty=2, lwd=3)
turtle_reset()
turtle_left(45)
turtle_forward(3)
```



---

`turtle_show`*Show or Hide the Turtle*

---

**Description**

These functions enable or disable displaying the Turtle's image on the screen.

**Usage**

```
turtle_show()
```

```
turtle_hide()
```

**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

It is recommended to hide the Turtle when performing multiple Turtle moves, for efficiency reasons, see also [turtle\\_do](#).

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_status](#), [turtle\\_turn](#), [turtle\\_up](#)

**Examples**

```
turtle_init()
turtle_forward(4)
turtle_hide()
turtle_left(30)
turtle_forward(3)
```

---

`turtle_status`*Read the Turtle's Status*

---

**Description**

This function gives information about the current Turtle's position, direction, and on display options.

**Usage**

```
turtle_status()
```

**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

**Value**

Returns a list with three elements.

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_turn](#), [turtle\\_up](#)

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turtle_turn	<i>Turn (Rotate) the Turtle</i>
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---

**Description**

Turn the Turtle in the given direction by the given angle.

**Usage**

```
turtle_turn(angle, direction = c("left", "right"))
```

```
turtle_left(angle)
```

```
turtle_right(angle)
```

**Arguments**

angle	single numeric value; rotation angle in degrees. A negative value turns the Turtle in the opposite direction than the given one.
direction	character string; direction of the turn. Possible values are "left" and "right".

**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_up](#)

**Examples**

```
turtle_init()
turtle_left(30) # equivalent to turtle_turn(30, "left")
turtle_right(40)
turtle_turn(30, sample(c("left", "right"), 1)) # random turn
```

---

`turtle_up`*Turn on or off Turtle Trace Drawing*

---

**Description**

When the Turtle moves, it may or may not leave a visible trace. These functions control such a behavior.

**Usage**`turtle_up()``turtle_down()`**Details**

The Turtle must be initialized prior to using this function, see [turtle\\_init](#).

**See Also**

Other TurtleGraphics: [TurtleGraphics-package](#), [turtle\\_do](#), [turtle\\_getpos](#), [turtle\\_goto](#), [turtle\\_init](#), [turtle\\_move](#), [turtle\\_param](#), [turtle\\_reset](#), [turtle\\_show](#), [turtle\\_status](#), [turtle\\_turn](#)

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