

# Package ‘lsoda’

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**Type** Package

**Title** 'C++' Header Library for Ordinary Differential Equations

**Version** 1.2

**Description** A 'C++' header library for using the 'libsoda-cxx' library with R. The 'C++' header reimplements the 'lsoda' function from the 'ODEPACK' library for solving initial value problems for first order ordinary differential equations (Hindmarsh, 1982; <[https://computing.llnl.gov/sites/default/files/ODEPACK\\_pub1\\_u88007.pdf](https://computing.llnl.gov/sites/default/files/ODEPACK_pub1_u88007.pdf)>). The 'C++' header can be used by other R packages by linking against this package. The 'C++' functions can be called inline using 'Rcpp'. Finally, the package provides an 'ode' function to call from R.

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**URL** <https://github.com/mclements/lsoda>

**BugReports** <https://github.com/mclements/lsoda/issues>

**Imports** Rcpp (>= 1.0.12)

**Suggests** deSolve, RcppArmadillo, RcppEigen, microbenchmark

**LinkingTo** Rcpp

**RoxygenNote** 7.3.2

**Encoding** UTF-8

**NeedsCompilation** yes

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**Repository** CRAN

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Contents

|                   |          |
|-------------------|----------|
| ode . . . . .     | 2        |
| ode_cpp . . . . . | 3        |
| <b>Index</b>      | <b>4</b> |

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|     |                                                          |
|-----|----------------------------------------------------------|
| ode | <i>Ordinary differential equation solver using lsoda</i> |
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Description

Ordinary differential equation solver using lsoda

Usage

ode(y, times, func, parms, rtol = 1e-06, atol = 1e-06, ...)

Arguments

- y                    vector of initial state values
- times                vector of times – including the start time
- func                 R function with signature function(t,y,parms,...) that returns a list. The first list element is a vector for dy/dt. The second list elements, if it exists, is a vector of result calculations to be retained.
- parms                list or vector of parameters that are pass to func
- rtol                  double for the relative tolerance
- atol                  double for the absolute tolerance
- ...                   other parameters that are passed to func

Value

a matrix for times in the first column and the state andd results values in the other columns.

Examples

```
times = c(0,0.4*10^(0:10))
y = c(1,0,0)
func = function(t,y,parms,b=-0.04E0) {
  ydot = rep(0,3)
  ydot[1] = parms$a * y[2] * y[3] + b * y[1]
  ydot[3] = 3.0E7 * y[2] * y[2]
  ydot[2] = -1.0 * (ydot[1] + ydot[3])
  list(ydot, sum(y))
}
lsoda::ode(y, times, func, parms=list(a=1.0E4), rtol=1e-8, atol=1e-8)
```

ode\_cpp

*Ordinary differential equation solver using lsoda (C++ code)***Description**

Ordinary differential equation solver using lsoda (C++ code)

**Usage**

```
ode_cpp(y, times, func, rtol = 1e-06, atol = 1e-06)
```

**Arguments**

|       |                                                                                                                                                                                                      |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| y     | vector of initial state values                                                                                                                                                                       |
| times | vector of times – including the start time                                                                                                                                                           |
| func  | R function with signature function(t,y) that returns a list: the first list element is a vector for dy/dt; the second list element, if it exists, is a vector of result calculations to be retained. |
| rtol  | double for the relative tolerance                                                                                                                                                                    |
| atol  | double for the absolute tolerance                                                                                                                                                                    |

**Value**

a matrix for times in the first column and the state and results values in the other columns.

**Examples**

```
times = c(0,0.4*10^(0:10))
y = c(1,0,0)
func = function(t,y) {
  ydot = rep(0,3)
  ydot[1] = 1.0E4 * y[2] * y[3] - .04E0 * y[1]
  ydot[3] = 3.0E7 * y[2] * y[2]
  ydot[2] = -1.0 * (ydot[1] + ydot[3])
  list(ydot, sum(y))
}
lsoda::ode_cpp(y,times,func, rtol=1e-8, atol=1e-8)
```

# Index

ode, [2](#)  
ode\_cpp, [3](#)