

NEWS for pracma version 1.1.6

July 20, 2012

NEWS

pracma News

Changes in Version 1.1.6 (2012-07-20)

- Removed 'Raphistory' from the tests directory (again) [and use "-as-cran" for the checks].
- disp() display text or array (Matlab Style), cat() with newline.

Changes in Version 1.1.5 (2012-07-18)

- Renamed functions with capital first letter to avoid name clashes: And/Or, mtrace -> Trace, mdiag -> Diag, strtrim -> strTrim, reshape -> Reshape, find -> Find, fix -> Fix, mode -> Mode, real -> Real, imag -> Imag, hadamard -> Hadamard, toeplitz -> Toeplitz, poly -> Poly.

Changes in Version 1.1.4 (2012-06-26)

- gammainc() (lower and upper) incomplete gamma function, also the regularized gamma function, all allowing negative x values.
- polylog() the polylogarithm functions for $|z| < 1$ and $n \geq -4$.

Changes in Version 1.1.3 (2012-06-17)

- fminsearch() implements Nelder-Mead (similar to optim), and Fletcher-Powell when "dfree=FALSE" is chosen.
- Test functions rosenbrock(), rastrigin(), and many more.

Changes in Version 1.1.2 (2012-06-13)

- nelder_mead() implements Nelder-Mead for nonlinear optimization.
- hooke-jeeves() Hooke-Jeeves algorithm for direct search.
- fletcher_powell() Davidon-Fletcher-Powell method for function minimization (alternative to BFGS approach).
- steepest_descent() minimization of functions using steepest descent.

Changes in Version 1.1.1 (2012-06-10)

- `fminbnd()` implements Brent's function minimization algorithm with golden section search and parabolic interpolation (same as `optimize`).
- `transfinite()` transformation function between bounded and unbounded (box constraint) regions.
- renamed `brentDekker()` to `brent_dekker`

Changes in Version 1.1.0 (2012-06-06)

- `hurst()`, `hurstexp()` calculate the Hurst exponent of a time series.
- Updated the NEWS.Rd file.

Changes in Version 1.0.9 (2012-06-03)

- `lsqnonneg()` solves nonnegative least-squares problems by using the trick " $x \rightarrow \exp(x)$ " and applying `lsqnonlin()`; example function `lsqcurvefit()` for nonlinear curve fitting.
- Renamed `ridder()` to `ridders()`, thanks to Robert Monfera for pointing it out (he also suggested a multi-dimensional variant).

Changes in Version 1.0.8 (2012-05-22)

- `movavg()` moving average of types "simple", "weighted", "modified", "exponential" (EMA), or "triangular".
- `modlin()` solves modular linear equations.

Changes in Version 1.0.7 (2012-05-11)

- `lsqnonlin()` solves nonlinear least-squares problems using the Levenberg-Marquardt approach.
- renamed `froots()` to `findzeros()`, and `fmins()` to `findmins()`.

Changes in Version 1.0.6 (2012-04-21)

- `fornberg()` finite difference (i.e., polynomial) approximation of derivatives for unevenly spaced grid points – Fornberg's method.

Changes in Version 1.0.5 (2012-04-15)

- `randsample()` randomly sampling, alias for `sample` (Matlab style).
- `rands()` generates uniform random points on an N-sphere.
- Added `tic()`, `toc()` measuring elapsed time (Matlab style).
- `previousPrime()` finds the next prime below a number.

Changes in Version 1.0.4 (2012-04-01)

- `invlap()` computes the inverse Lapacian numerically.
- `ppfit()` piecewise polynomial fitting procedure.

Changes in Version 1.0.3 (2012-03-21)

- `cubicspline()` interpolating cubic spline (w/ endpoint conditions).
- `mkpp()` and `ppval()` for piecewise polynomial structures.

Changes in Version 1.0.2 (2012-03-17)

- `accumarray()` resembles the related Matlab function more closely.
- `invperm()` returns the inverse of a permutation.
- `randperm()` changed to make it more Matlab-like.

Changes in Version 1.0.1 (2012-03-09)

- `agm()` example computes pi to an arbitrary number of decimal digits using the Rmpfr package for variable precision arithmetic.
- `plotyy()` corrected right ordinate, prettying the labels.
- `peaks()` peaks function (Matlab style).

Changes in Version 1.0.0 (2012-03-01)

- Updated the NEWS.Rd file.

Changes in Version 0.9.9 (2012-01-29)

- `qrSolve` solves overdetermined system of linear equations.
- `DSCsearch()` removed, now in package ‘pracopt’.
- `randp()` found a better, non-selective approach.

Changes in Version 0.9.8 (2012-02-23)

- `gramSchmidt()` modified Gram-Schmidt process.
- `householder()` Householder reflections and QR decomposition.
- `givens()` Givens rotation and QR decomposition.
- corrected a small error in `ridder()` (thanks to Roger Harbord).

Changes in Version 0.9.7 (2012-02-17)

- `erf()` corrected, `erfc()` and `erfcx()` as new functions, including their inverses `erfinv()` and `erfcinv()`.
- `hypot()` now numerically more stable (thanks to Jerry Lewis).

Changes in Version 0.9.6 (2012-01-25)

- Changed third example for `dblquad()` [new Windows toolchain problem].
- Deactivated the test for `gammaz()` because of problems on Solaris.

Changes in Version 0.9.5 (2012-01-16)

- `kmeanspp()` kmeans++ clustering algorithm.
- `savgol()` and `hampel()` with new options, fuelled by a blog entry of Ron Pearson in his ExploringDataBlog.

Changes in Version 0.9.4 (2012-01-08)

- DSCsearch() Davies-Swann-Campey search in one dimension.
- Improved modpower() through modular exponentiation. Added lehmann_test() Lehmann's primality test as example.
- Corrected polar() and andrewsplot().

Changes in Version 0.9.3 (2011-12-27)

- direct1d() one-dimensional version of the DIRECT algorithm for global function minimization.

Changes in Version 0.9.2 (2011-12-26)

- ApEn() approximate entropy of a time series.
- cirshift() circularly shifting arrays (Matlab Style).

Changes in Version 0.9.1 (2011-12-12)

- plotyy() plots curves with y-axes on both left and right side.
- fplot() plots components of a multivariate function.

Changes in Version 0.9.0 (2011-12-11)

- errorbar() routine for plotting error bars in both directions.
- Whittaker-Henderson smoothing ** Not yet running** .
- rref() reduced row echelon form.

Changes in Version 0.8.9 (2011-12-08)

- cutpoints() automatically finds cutting points based on gaps.
- hausdorff_dist calculates the Hausdorff distance / Hausdorff dimension.
- nnz() number of non-zeros elements (Matlab style).

Changes in Version 0.8.8 (2011-12-06)

- polar() for polar plots (Matlab style), see the example plots.
- andrewsplot() plots Andrews curves in polar coordinates.
- Vectorized: cart2sph(), sph2cart(), cart2pol(), pol2cart().

Changes in Version 0.8.7 (2011-11-30)

- deg2rad(), rad2deg()
- figure() Matlab style, and pltcross() plotting crosses.

Changes in Version 0.8.6 (2011-11-21)

- ridder() Ridder's method for zero finding of univariate functions.

Changes in Version 0.8.5 (2011-11-19)

- `sqrtm()` matrix square root, based on Denman-Beavers iteration, `rootm()` matrix p-th root, computing a complex contour integral, `signm()` matrix sign function.
- `fzero()` now uses the new `zeroIn()` function, i.e., a Brent-Dekker approach instead of referring to `uniroot()`.
- `twinPrimes()` twin primes in a given interval, and `nextPrime` will find the next higher prime.

Changes in Version 0.8.4 (2011-11-14)

- Transformations between cartesian, spherical, polar and cylindrical coordinate systems: `cart2sph()`, `sph2cart()`, `cart2pol()`, `pol2cart()`.
- `polar()` uniformly random points in the unit circle (till Matlab 5).

Changes in Version 0.8.3 (2011-11-11)

- `accumarray()` grouping elements and applying a function to each group.
- `uniq()` Matlab-style ‘unique’ function, `allsums()` in the examples.
- small correction to `fsolve()`, mentioned on the ‘check summary’ page.

Changes in Version 0.8.2 (2011-11-04)

- `newmark()` Newmark’s method for solving second order differential equations of the form $y''(t) = f(t, y(t), y'(t))$ on $[t1, t2]$.
- `cranknic()` Crank-Nicolson ‘ivp’ solver, combining the forward and backward Euler methods for ordinary differential equations.

Changes in Version 0.8.1 (2011-10-30)

- Corrected `pinv()` for (nearly) singular matrices.
- Renamed `ifactor()` to `factorize()`.

Changes in Version 0.8.0 (2011-10-27)

- Minor corrections and improvements to the ‘pracma.pdf’ manual, incl. `numdiff()`, `reFindall()`, `trigApprox()`, and `subspace()`.

Changes in Version 0.7.9 (2011-10-22)

- `spinterp()` monotonic (and later on shape-preserving) interpolation following the approach of Delbourgo and Gregory.

Changes in Version 0.7.8 (2011-10-17)

- `bvp()` solves boundary value problems of the following kind:
 $-u''(x) + c1 u'(x) + c2 u(x) = f(x)$ for x in $[a, b]$.

Changes in Version 0.7.7 (2011-10-14)

- `primes2(n1, n2)` will return all prime numbers between $n1$ and $n2$ (without storing the numbers from `sqrt(n2)` up to $n1$).

Changes in Version 0.7.6 (2011-08-05)

- gaussNewton() for function minimization and solving systems of nonlinear equations. fsolve() as a wrapper for it.
- fzsolve() for root finding of complex functions.
- softline() Fletcher's inexact linesearch algorithm.

Changes in Version 0.7.5 (2011-07-26)

- Put NEWS.Rd in the /inst subdirectory (and NEWS.pdf in /doc), thanks to Kurt Hornik; slightly changed the version numbering.

Changes in Version 0.7.4 (2011-07-22)

- rortho() generate random orthogonal matrix of size n.
- Titanium data set for testing fitting procedures.

Changes in Version 0.7.3 (2011-07-15)

- erf() and erfc() error and complementary error functions (Matlab style) as (almost) aliases for pnorm().
- erfz() complex error function.

Changes in Version 0.7.2 (2011-07-11)

- broyden() quasi-Newton root finding method for systems of nonlinear equations.

Changes in Version 0.7.1 (2011-07-09)

- cross() has been vectorized (remark on R-help).

Changes in Version 0.7.0 (2011-07-07)

- Sigmoid and Einstein functions.

Changes in Version 0.6.9 (2011-07-06)

- Runge-Kutta-Fehlberg method of order (5,4).

Changes in Version 0.6.8 (2011-07-05)

- triquad() Gaussian quadrature over triangles.
- cotes() Newton-Cotes integration formulae for 2 to 8 nodes.

Changes in Version 0.6.7 (2011-07-04)

- lagrangeInterp(), newtonInterp() Lagrange and Newton polynomial interpolation, neville() Neville's methods.
- tril(), triu() extracting triangular matrices (Matlab style).

Changes in Version 0.6.6 (2011-07-02)

- `charpoly()` computes the characteristic polynomial, the determinant, and the inverse for matrices that are relatively small, applying the Faddejew-Leverrier method.
- `froots()` to find **all** roots (also of second or higher order) of a univariate function in a given interval. The same with `fmins()` to find all minima.

Changes in Version 0.6.5 (2011-07-01)

- Adams-Bashford and Adams-Moulton (i.e., multi-step) methods for ordinary differential equations in function `abm3pc()`.

Changes in Version 0.6.4 (2011-06-30)

- Changed the description to be more precise about the package.
- `droplet_e()` generation of digits for the Euler number. (Should be followed by a function `droplet_pi()`.)

Changes in Version 0.6.3 (2011-06-28)

- `rationalfit()` rational function approximation
- `ratinterp()` rational interpolation a la Burlisch-Stoer.

Changes in Version 0.6.2 (2011-06-26)

- `pade()` Pade approximation.

Changes in Version 0.6.1 (2011-06-25)

- `quadgk()` adaptive Gauss-Kronrod quadrature.

Changes in Version 0.6.0 (2011-06-24)

- `muller()` Muller's root finding method.
- Added differential equation example to `expm()`'s help page.
- Changed NEWS file to become simpler (no subsections).

Changes in Version 0.5.9 (2011-06-23)

- `quadl()` recursive adaptive Gauss-Lobatto quadrature.
- `simpadpt()` another recursively adaptive Simpson's rule.
- Added testing procedures for all integration routines; corrected, refined some of these procedures.

Changes in Version 0.5.8 (2011-06-20)

- `quadgr()` Gaussian Quadrature with Richardson extrapolation, can handle singularities at endpoints and (half-)infinite intervals.

Changes in Version 0.5.7 (2011-06-18)

- `expm()` for matrix exponentials.
- `clenshaw_curtis()` the Clenshaw-Curtis quadrature formula.

Changes in Version 0.5.6 (2011-06-17)

- `simpson2d()` as non-adaptive 2-dimensional Simpson integration.
- `dblquad()` twofold application of internal function `integrate()`.

Changes in Version 0.5.5 (2011-06-15)

- `gaussHermite()` and `gaussLaguerre()` for infinite intervals.
- Fresnel integrals `fresnelS()` and `fresnelC()`.

Changes in Version 0.5.4 (2011-06-12)

- `gaussLegendre()` computes coefficients for Gauss Quadrature, and `quad2d()` uses these weights for 2-dimensional integration.
- `quadinf()` wrapper for `integrate()` on infinite intervals.
- Added a version for rapid pi computation to the `agm()` examples.

Changes in Version 0.5.3 (2011-06-06)

- `ode23()` solving first order (systems of) differential equations.
- `barylag2d()` 2-dimensional barycentric Lagrange interpolation.

Changes in Version 0.5.2 (2011-06-04)

- `interp2()` for two-dimensional interpolation.
- `gradient()` now works in two dimensions too.

Changes in Version 0.5.1 (2011-06-01)

- `fzero()`, `fminbnd()`, `fminsearch()`, `fsolve()` as aliases for `uniroot()`, `optimize()`, `optim()` with Nelder-Mead, `newtonsys()`.

Changes in Version 0.5.0 (2011-05-31)

- Corrections to help pages.

Changes in Version 0.4.9 (2011-05-30)

- `romberg()` and `gauss_kronrod()` for numerical integration.
- Richardson's extrapolation in `numderiv()`, `numdiff()`.
- Discrete numerical derivatives (one dimension): `gradient()`.

Changes in Version 0.4.8 (2011-05-28)

- Numerical function derivatives: `fderiv()`, `grad()`.
- Specialized operators: `hessian()`, `laplacian()`.
- Application: `taylor()`.

Changes in Version 0.4.7 (2011-05-27)

- plot vector fields: `quiver()` and `vectorfield()`.
- `findintervals()`.
- Corrections in `deval()`, `deeve()`, using `findintervals()`.

Changes in Version 0.4.6 (2011-05-26)

- Laguerre's method `laguerre()`.
- `rk4()` and `rk4sys()` classical fourth order Runge-Kutta.
- `deval()`, `deeve()` evaluate ODE solutions.

Changes in Version 0.4.5 (2011-05-24)

- Lebesgue coefficient: `lebesgue()`.
- `poly2str()` for string representation of a polynomial.

Changes in Version 0.4.4 (2011-05-23)

- Dirichlet's `eta()` and Riemann's `zeta()` function.
- `rmsserr()` different accuracy measures; `std_err()` standard error.

Changes in Version 0.4.3 (2011-05-22)

- `polypow()` and `polytrans()` for polynomials.
- `polyApprox()` polynomial approximation using Chebyshev.
- `trigPoly()`, `trigApprox()` for trigonometric regression.

Changes in Version 0.4.2 (2011-05-17)

- `segm_intersect()` and `segm_distance()` segment distances.
- `inpolygon()`.

Changes in Version 0.4.1 (2011-05-13)

- `polyadd()` polynomial addition.
- `conv()` and `deconv()` time series (de)convolution.
- `detrend()` removes (piecewise) linear trends.
- `ifft()` for normalized inverse Fast Fourier Transform.

Changes in Version 0.4.0 (2011-05-10)

- Added tests for functions since version 0.3-7.

Changes in Version 0.3.9 (2011-05-09)

- `and()` and `or()`.

Changes in Version 0.3.8 (2011-05-06)

- `pchip()` and option ‘cubic’ for `interp1()` interpolation.
- The complex gamma functions `gammaz()`.
- `hadamard()` and `toeplitz()` matrices.

Changes in Version 0.3.7 (2011-05-04)

- Rank of a matrix, `mrnk()`, and `nullspace()` for the kernel.
- `orth()`, orthogonal basis of the image space, and `subspace()` determines the angle between two subspaces.
- `normest()` for estimating the (Frobenius) norm of a matrix, and `cond()` determines the condition number of a matrix.

Changes in Version 0.3.6 (2011-04-30)

- `fact()`, more accurate than the R internal function ‘factorial’.
- `ezplot()` as an alias for `curve()`, but with option “fill = TRUE”.
- `aitken()` for accelerating iterations.
- Renamed `polycnv()` to `polymul()`.
- Renamed `outlierMAD()` to `hampel()`.

Changes in Version 0.3.5 (2011-04-23)

- `agm()` for the arithmetic-geometric mean.
- Lambert W function `lambertWp()` for the real principal branch.
- “Complex Step” derivation with `complexstep()` and `complexstepJ()`.

Changes in Version 0.3.4 (2011-04-21)

- Barycentric Lagrange interpolation through `barylag()`.
- `polyfit2()` fits a polynomial that exactly meets one additional point.
- Added more references to the help entry ‘pracma-package.Rd’.

Changes in Version 0.3.3 (2011-04-19)

- `hornerdefl()` for also returning the deflated polynomial.
- `newtonHorner()` combining Newton’s method and the Horner scheme for root finding for polynomials.
- `jacobian()` computes the Jacobian of a function $R^n \rightarrow R^m$ as simple numerical derivative.
- `newtonsys()` applies Newton’s method to functions $R^n \rightarrow R^n$ with special application to root finding of complex functions.
- `newton()` renamed to `newtonRaphson()`.

Changes in Version 0.3.2 (2011-04-17)

- Sorting functions: `bubbleSort()`, `insertionSort()`, `selectionSort()`, `shellSort()`, `heapSort()`, `mergeSort()`, `mergeOrdered()`, `quickSort()`, `quickSortx()`, `is.sorted()`, and `testSort()`.
- Functions from number theory: `eulersPhi()`, `moebiusFun()` and the `mertensFun()`, `sigma()`, `tau()`, `omega()`, and `Omega()`.

Changes in Version 0.3.1 (2011-04-16)

- Chebyshev polynomials of the first kind: `chebPoly()`, `chebCoeff()`, and `chebApprox()`.

Changes in Version 0.3.0 (2011-04-09)

- New version of `news.Rd`, `news.pdf`.
- More test functions for root finding and quadrature.

Changes in Version 0.2.9

- `fnorm()` and the Runge function `runge()`.
- `contfrac()`, `rat()`, and `rats()` for continuous fractions.
- `meshgrid()` and `magic()`.

Changes in Version 0.2.8

- `quad()` adaptive Simpson quadrature.
- Minimum finding with `fibsearch()` and `golden_ratio()`.
- Root finding with `newton()`, `secant()`, and `brentDekker()`.

Changes in Version 0.2.7

- Regular expression functions `regexp()`, `regexpi()`, `regexprep()` and `reindall()`.

Changes in Version 0.2.6

- String functions `blanks()`, `strtrim()`, `deblank()`, `strjust()`, and `strep()`.
- `interp1()` one-dimensional interpolation (incl. spline)

Changes in Version 0.2.5

- Matlab functions `mode()`, `clear()` and `beep()`.

Changes in Version 0.2.4

- `primroot()` finds the smallest primitive root modulo a given n ; needed functions are `mod-power()` and `modorder()`.
- `humps()` and `sinc()`: Matlab test functions.
- Root finding through bisection: `bisect()`, `regulaFalsi()`.
- `outlierMAD()`, `findpeaks()`, and `piecewise()`.
- `polycnv()` for polynomial multiplication.
- Functions `extgcd()`, `gcd()`, and `lcm()` have been renamed to `extGCD()`, `GCD()`, and `LCM()` respectively.

Changes in Version 0.2.3

- `strfind()`, `strfindi()`, and `findstr()`.
- `circlefit()` fitting a circle to plane points.
- `mldivide()` and `mrdivide()`, emulating the Matlab backslash operator.

Changes in Version 0.2.2

- `vnorm()` vector norm
- Warning about a nasty “non-ASCII input” in the `savgol.RD` file has been resolved.

Changes in Version 0.2.1

- `horner()` implementing the horner scheme for evaluating a polynomial and its derivative.
- `savgol()` Savitzki-Golay smoothing and needed pseudoinverse `pinv()`.

Changes in Version 0.2.0

- Package renamed to ‘`pracma`’ to avoid name clashes with packages such as ‘`matlab`’ that are sticking closer to the original.
- Added ‘`pracma-package`’ section to the manual.

Changes in Version 0.1.9

- `reshape()`, `repmat()`, and `blkdiag()` matrix functions.
- `combs()` chooses all combinations of `k` elements out of `n`, and `randcomb()` generates a random selection.
- `perms()` generates all permutations, `randperm()` a random permutation.
- Pascal triangle as `pascal()`; `nchoosek()` returns binomial coefficients.
- Some string functions: `strcmp()`, `strcmpi()`, `strcat()`.

Changes in Version 0.1.8

- `std()` as refinement of the standard deviation function.
- `ceil()` and `fix()` as aliases for `ceiling()` and `trunc()`. [`floor()` and `round()` already exist in R.]
- Modulo functions `mod()`, `rem()` and integer division `idiv()`.
- Integer functions related to the Euclidean algorithm: `extgcd()`, `gcd()`, `lcm()`, `coprime()`, and `modinv()`.
- `distmat()` and `crossn()`, the vector product in `n`-dimensional space.

Changes in Version 0.1.7

- `size()`, `numel()`, `ndims()`, `isempty()`, and `find()`.
- `eye()`, `ones()`, `zeros()`.
- Functions returning random numbers: `rand()`, `randn()`, `randi()`.
- `linspace()`, `logspace()`, and `logseq()` for linearly, logarithmically, and exponentially spaced sequences.
Note that the functions in the ‘`matlab`’ package are not exactly mimicking the corresponding Matlab/Octave functions.

Changes in Version 0.1.6

- Matrix functions `mdiag()` and `mtrace()` added. `inv()` is introduced as an alias for `solve()` in R.
- Generate special matrices `hankel()`, `rosser()`, and `wilkinson()`. `kron()` is an alias for the R function `kronecker()`.
- Renamed `factors()` to `ifactor()` to distinguish it more clearly from `factors` as used in R.

Changes in Version 0.1.5

- Added functions for flipping or rotating numeric and complex matrices: `flipdim()`, `flipud()`, `fliplr()`, and `rot90()`.

Changes in Version 0.1.4

- Added basic complex functions `real()`, `imag()`, `conj()`, and `angle()` which are essentially only aliases of the R functions `Re()`, `Im()`, and `Conj()`.
`angle()` returns the angle of a complex number in radians. The R function `Mod()` is here only available as `abs()`.

Changes in Version 0.1.3

- Added `compan()` function for the ‘companion’ matrix; the `eig()` function is an alias for the R `eigen()` values function.
- Added the polynomial functions `poly()`, `polyder()`, `polyfit()`, `polyint()`, and `polyval()`.
- `roots()` returns real and complex roots of polynomials.
- Simplified the `trapz()` function.

Changes in Version 0.1.2

- Added functions from number theory: `primes()`, `isprime()` and `factors()`.
- The corresponding function for `factors()` in Matlab/Octave is called `factor()`, but that name should not be shadowed in R!
- Added the `polyarea()` and `trapz()` functions.

Changes in Version 0.1.1

- Added some simple functions such as `nthroot()`, `pow2()`, and `nextpow2()`.
- `dot()` and `cross()` functions for scalar and vector product.
- Generate matrices through `vander()` and `hilb()`.

Changes in Version 0.1.0

- Installation
‘pracma’ will be a pure R package without using source code in C or Fortran. Therefore, installation will be immediate on all platforms.
- Intention
This package provides R implementations of more advanced math functions from Matlab and Octave (and the Euler Math Toolbox) with a special view on optimization and time series routines.
- Remark: Typeset this document as:
`R CMD Rd2pdf NEWS.Rd --title="NEWS for pracma version 1.1.0".`

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