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LLUVMerger 2 User Guide

LLUVMerger version 2 is a command line tool for merging any kind of LLUV source (Total, Radial, Elliptical).

Command line tools run in a Terminal window and require some basic unix scripting (bash,perl,…) knowledge.

LLUVMerger can be used for:

Temporal Averaging	Merge vectors over time. Vectors within the –closeness distance will be merged according to –method to one output vector. If –coverage and –outinterval are specified, the sources are merged into multiple output files.
Spatial Stitching	Merge different locations into one output. The origin can be specified; otherwise, the first file specified is used. All relative columns (range, bearing, x, y) will be adjusted to the output origin.
Spatial Averaging	Smooth one or more sources can velocity merged using with radius given by –closeness parameter
Bearing Averaging	Average one or more radial or elliptical sources with reduction of bearing resolution. Can equivalently convert short–time radials into merged final radial.
Spatial Transformation	Convert to any reference grid or another lluv's vector locations.

LLUVMerger is used by the SeaSonde Radial Suite to generate a 25hour radial for the RadialWebServer. LLUVMerger is also used by the SeaSonde Extended Combine Suite to stitch multiple totals together into one output.

The files to merge can be specified as:
1. A folder with a time span starting from last alphabetical file name.
2. A file within a folder to start from with an optional time span.
3. A text file that contains a list of pathed files to merge.
4. One or more individual files.

When LLUVMerger is run from the command line without any options (or with '–h' or '–help' option) it will list all the options that can be set. Each option needs to be separated by at least one space. Options that require a string or file path that contain spaces must be wrapped in quotes (example –source="/A Test Radial.rv")

The following is the help info shown and afterwards are details on how to use each option.

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Usage: LLUVMerger [–option[=value]]

-diag=<verbocity>      -- Output diagnostics to stdout. <verbocity> 0=quiet,
                          1000=all.
-version               -- Output version.

-span=<hours>          -- If source is folder, set how far back in hours of
                          source files to use. (Default All)
-startwith=<string>    -- If source is folder, optionally use only sources
                          that start with <string>.
-source=<folder/file>  -- Set source folder or file to start with. Can be
                          absolute or relative to current path. Must set -span
                          and -startwith before -source.
-list=<file>           -- Use sources specified in <file>. One posix pathed
                          file per line. Can be relative to -source or current
                          path.
-single=<file>         -- Single source file. There can be multiple of these
                          keys. Can be relative to -source or current path.

Specify a reference grid in order to change the spatial resolution of a total
vector.
Specify a LLUV file with limited set of points if you want use a limited
area.
-reference=<file>      -- Optional lluv or grid file to use for output
                          origin and reference location vectors to merge. If
                          not specified first source is output origin and
                          sources are used for merge locations.

-method=<type>         -- Merge method, average/median/minimum/maximum/
                          overlay/underlay/smallest/largest. (Default Average)
-minvect=<num>         -- Minimum vectors for each source point required to
                          reach the output. (Default 1)
-closeness=<meters>    -- Merge all vectors within this radial distance in
                          meters. (Default 1.0)
-overlap[=<0/1>]       -- Optional, specifies whether source vectors can be
                          overlapped for merging. If spatially merging vectors,
                          set -overlap to overlap source vectors into merging
                          circles. Default is -overlap=0 which is quicker for
                          temporal merging.
-angwidth=<deg>        -- Optional, if specified, an annulus segment of -
                          closeness height and -angwidth degree width area
                          around each merge location is used instead of
                          standard -closeness. This will use range and bearing
                          of vector from reference/source origin instead of x,y
                          closeness.
```

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-sourceflags[=<v>]        -- Filter out source vectors with vector flags <v>.
                             If <v>=0, use all source vectors. If <v> not
                             specified filter do not process flags. Default is to
                             filter out do not process flags.

Specify -angres=5 and -angmethod=short to merge short-time 1deg radials into
5deg final radials.
-angres=<deg>             -- Merge all points within this angular resolution
                             from origin.
-angalign=<deg>           -- Alignment for angular resolution. Radial/
                             Elliptical alignment typically is antenna bearing
                             modulo of angular resolution.
-angmethod=<kind>         -- Method when using angres: all/short. all=merges
                             all velocities. short=first average merge source to
                             angres then merge result. Default is short.

-output=<folder/file>     -- Where to put the merged radial. If folder use
                             standard naming with lluvtype,lluvsuffix. (Default
                             ".")
-lluvsite=<site>          -- Output LLUV site code to use for filename and
                             metadata
-lluvorigin=<loc>         -- Output LLUV origin to use. <loc> is a lat,lon
                             string in common DMS format. (Default uses first
                             source origin)
-lluvtype=<char>          -- Output LLUV char type. (4th char of filename)
                             (Default uses first source type).
-lluvsuffix=<suffix>      -- Output LLUV filename suffix inserted before
                             extension (Default "")
-moremeta                 -- Include source full path in output metadata.

-velcount                 -- Set the output velocity count column to number
                             merged for each output vector.
-setcontributors          -- Set contributor vectors columns to sum of number
                             of each source contributing to merge. (Self limits to
                             first 24 sources.)
-mergelocation            -- Also apply the merge method to each vector's
                             location; otherwise, the location of the vector (plus
                             radial & ellipicals the vector direction) is the
                             first vector in merge grouping used.
-medianbias=<kind>        -- Method bias when using median with even number of
                             points: low/balance/high. low=lower mid point,
                             high=higher mid point, balance=average two mid
                             points. Default is balance

-openSD                   -- Tell SeaDisplay to open the merged output file.
-showprogress             -- Outputs a progress message during merging.

Specifying -coverage and -outinterval options causes multiple file output
where sources are merged in groups according to specified timing.

-coverage=<min>           -- Coverage time in minutes for multi-output.
-outinterval=<min>        -- Output time in minutes for multi-output.
-offset=<min>             -- Offset time of output interval for multi-output.
```

Option -diag controls diagnostic output messages.

-diag=<verbocity> where <verbocity> is a number 0 to 1000. Sets how much information LLUVMerger outputs to stdout during processing. 0=quiet, 4=general information, 1000=most detailed. Set this to a high value to help debug LLUVMerger. Set to 0, so that only failure messages are output.

If you set to diag to 100 or greater it will output the source velocities for each vector being merged. You can save this by redirecting the standard output to a file (append " >/MergeInfo.txt" to your command to create the file MergeInfo.txt onto the root of the drive)

Options -startwith -span -source -list -single control what sources to merge.

Only valid LLUV files will be used.

-startwith=<string> will only use filenames in –source that start with <string>

-span=<hours> will merge all sources back in time from the starting source file.

Note: You must specify **-span** and optionally **-startwith** before **-source**. If you do not, only the single file specified by –source will be used. You can optionally have more than one set of –span, –startwith, and –source keys which will add more sources to merge.

You must specify at least a **-source** or a **-list** or a **-single** parameter; otherwise, there is nothing to merge. You can specify all of these if desired.

-source=<folder/file> sets the source folder path or a file path in a folder to start with.
If a folder then LLUVMerger starts with the last alphabetical filename in the folder.
If a file and –span is 0 or not specified then that single file will be used.
If a file and –span >0 then LLUVMerger will start with that file and go back reverse alphabetical filename in the folder until the span is satisfied.

-list=<file> is a path to a text file which contains a list of paths (one per line) of each source file to merge. (If **-source** is used the files paths can be relative to the –source path; otherwise the list paths are relative to the current path or need to be absolute paths.

–single=<file> is a pathed LLUV file to merge. You can specify this key as many times as you want for each source file to merge.

Option –reference

–reference=<file> is a path to a reference LLUV or grid file to use place all output vectors at. This can be useful to shift vectors around to a desired set of grid points, keeping in mind that you might be spatially averaging different amounts across your new reference depending on how different the sources.

Options –output –lluvsite –lluvtype and –lluvsuffix control the output folder and filename.

–output=<folder/file> is a path to the output folder or file. If a folder is used, then a standard LLUV filename is generated using the first source type and a center timestamp of the merged data. If a file is specified then that filename is used.

–lluvsite=<site> specifies the output 4 character site code to use in the filename and metadata. If you do not supply this key, then the first source site code will be used.

–lluvtype=<char> specifies the fourth character of the output filename to set. Example for Radials this is typically set to 'i' for ideal and 'm' or measured pattern.

–lluvsuffix=<suffix> will insert <suffix> into the filename before it's normal extension.

–lluvorigin=<loc> will set the lat,lon origin of the output. If not specified the the origin of the –reference or the first merge source will be used. <loc> may be a wide variety of DMS formats. If <loc> includes a space, it must be wrapped in quotes. Example –lluvorigin=" 37N23', 127W52' "

Options –method –medianbias –minvect –mergelocation and –closeness control the merging process.

–method=<type> controls how vectors within –closeness distance are merged to one output vector. <type> is one of the following average, median, minvel, maxvel, overlay, underlay, largest, smallest.
    average averages the velocities. (default)

median will select the median velocity. If even number of points it will use the smaller velocity. For radials & ellipticals it will auto generate temporal or spatial uncertainties depending on source.

        minvel will select the minimum velocity.

        maxvel will select the maximum velocity.

        overlay will select the vector from the last merge item in source or list. (Note because of reverse alphabet order this will be earliest file with standard LLUV naming.)

        underlay will select the vector from the first merge item in source or list. (Note because of reverse alphabet order this will be latest file with standard LLUV naming.)

        largest will select the maximum absolute velocity.

        smallest will select the minimum absolute velocity.

For Radials and Elliptical using the **average** or **median** method, LLUVMerger will calculate temporal or spatial uncertainties depending on source as well as max/min vel and spatial/temporal counts.

-medianbias=<kind> controls how the median method handles a even number of points.

        low will select the lower center velocity.

        high will select the upper center velocity.

        average will average the two center points. (default)

-minvect=<num> sets the minimum number of vector required within -closeness in order to output a vector.

-closeness=<distance> merges all points within radial <distance> in meters.

-overlap[=0/1] if specified as -overlap or -overlap=1, allows source vectors to spatially overlap (same vectors can be used in multiple output vectors. If you're doing a spatial average, you'll probably want to enabled this. The default is 0(off) so that temporal averaging runs much quicker.

-angwidth=<deg> if specified turns the circular areas to average into a angular slice that is <deg> wide and -closeness times two high from the output origin. This more useful for radial and elliptical where one might want to reduce the angular resolution.

-sourceflags[=<v>] if -sourceflags is specified, then will filter out all do-not-process flags from the sources which is the default. If -sourceflags=0, then will not filter out any sources. If -sourceflags=<v>, will filter out any flags that contained within <v>.

–mergelocation causes the merging process to apply the merge method to the vector location and direction instead of just velocity. This is really only meant if you want to find the center of a group of vectors. If this parameter is not supplied, LLUVMerger will merge only the velocities for Radials & Elliptical else merge velocity and direction for Totals and the vector location output will be the first vector found for each area grouping. This parameter is ignored if –reference is used.

Options **–coverage –outinterval** and **–offset** are specified only to temporally merge groups of source LLUVs into multiple outputs. Note that both –coverage and –outinterval must be specified to get multiple outputs.

–coverage=<min> specifies the coverage time in minutes for each group of source LLUVs. This should be a multiple of the source intervals plus coverage time.

–outinterval=<min> specifies how often the grouped LLUVs are outputted. This should be a multiple of the source intervals.

–offset=<min> sets an offset from the **–outinterval** for the output time. If you have use standard radial shorts which each coverage 15 minute and are output every 10minutes. The final output is typically merged 75min coverage with output every 60minutes on the hour. If –offset=30, then the output would be every hour on the half hour.

Options **–angres –angalign** and **–angmethod** control bearing resolution reduction

Note: Only useful for radials and ellipticals. For Ellipticals make the –closeness large enough to include variation in distance over –angres bearing but smaller than range spacing.

–angres=<deg> when not zero tells LLUVMerger to reduce vector velocities whose bearing are within this <deg> resolution and within –closeness of the vector's range. The output bearing will be a multiple of this <deg> with **–angalign** offset. LLUV Radials will have their velocity direction recalculated to conform to the new bearing; other LLUV types will have their velocity direction averaged.

–angalign=<deg> is an offset alignment for **–angres**. For example if –angres=5 and –angalign=1 then output bearings will possibly be 1,6,11,16...

(default is 0 if key is missing) If reducing radials to 5degrees, then this should match the antenna bearing alignment from every 5degrees.

-angmethod=<kind> controls how LLUVMerger applies the -angres reduction. If kind is "short", then -angres reduction is first applied as a velocity average using -angres reduction to the LLUV source before doing a final merge with other LLUVMerger settings (This technique copies the radial merge processing of short-time into final radials). If kind is "all", then only a single merge is done for all vectors within the bearing, closeness and all sources.

Miscellaneous Options

-version or **-v** will output LLUVMerger version to standard out.

-velcount will add the number of source vectors merged for each output. (Works only for Radial & Ellipticals) The velocity count is an indication of the coverage of vectors over the merge.

-setcontributors will add contributor columns up to first 24 sources where which each contributor column is the number of source vectors that went into the merge vector for that particular source. If not specified, total vectors contributors will be the sum of source contributors. Radials and ellipticals typically do not have source contributor columns.

-openSD will tell SeaDisplay to open the output file(s). (Note that if SeaDisplay is not currently open, OS X will open it as hidden; click on SeaDisplay's icon in the doc to show.)

-showprogress will output a repeating "Progress <seconds> <percent complete>" during merging.

The Merged Output:

For radials and Ellipticals, the vectors will be in order of closest to origin and increasing bearing.
For totals, the vectors will ordered in North to South columns from West to East.

The output timestamp is set to be the center of the merged time and the output timespan to the time span merged.

If **-minvec i**s used then key **%RadialMinimumMergePoints:** <minvec> is changed or added as needed.

Adds or changes key **%MergeCount:** <number> to number of merged sources or the sum of %MergeCount: from sources.

LLUVMerger will add a source info 'MRGS' data table near the end of the file. See LLUV document for details. The source file column will be the full path if -moremeta is specified; otherwise only the source filename.

LLUVMerger will add extra metadata to the output near the end of the file.

%MergeMethod: 0 average
%MergeCloseness: <distance> km
%MergeMinimumVectors: <minvectors>
%MergeVectorsLocation: <False/True>
%MergeSources: <numberMerged>
%ProcessingTool: "LLUVMerger" 2.0.0

Here's an example command which will merge the last 6 hours of ideal radials to the root folder. The output file name will be a typical LLUV RDLs format with timestamp from the mid time of the 6hrs.

./LLUVMerger -diag=100 -span=6 -source="/Codar/SeaSonde/Data/Radials/IdealPattern" -method=average -output=~/desktop/

Here's an example command which will convert entire folder short-time radials into 5deg final radials.

./LLUVMerger -source="/Codar/SeaSonde/Data/RadialsShorts/MeasPattern" -method=median -output=~/desktop/FinalRadials/ -angmethod=short -angres=5 -coverage=75 -outinterval=10

Revision History

First Draft Nov 14, 2016

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