

»Stereo PIV«

# Flownizer 2D3C

## Two-dimension and three-component Particle Image Velocimetry

<Stereo PIV>Flownizer2D3C is the two-dimension and three-component fluid analysis software for measuring the velocity in the depth direction (Z) in addition to two-dimensional velocity information (X and Y).

Velocity of three components within a laser sheet side is computed by processing the particle image obtained by two sets of stereo cameras arranged with an angle.

In addition to the user friendly operation via a tree structure menu, data collection became very efficient by the high-speed processing through compatibility with multi-core CPU, 64bitOS, and a SSE2/SSSE3 extension command.

It can be used in three-component fluid measurement in various fields, including wind tunnel experiments and tank experiments.

It corresponds to not only the stereo PIV, but conventional products' two-dimensional mode for single cameras (PIV, PTV).

Physical quantity calculation like vorticity, turbulent energy, Reynolds stress, etc. also comes as standard as well as vector calculation, a streamline, streakline, pathline, and a uniform line display.

● **STANDARD DIRECT CROSS CORRELATION, IMAGE DEFORMATION, AND RECURSIVE METHOD IS SUPPORTED FOR CALCULATION**

● **VARIOUS FUNCTIONS, SUCH AS ENSEMBLE CORRELATION, CBC TECHNIQUE, PARTICLE MASK CORRELATION, CORRELATION AVERAGE, CORRELATION COEFFICIENT MAP**

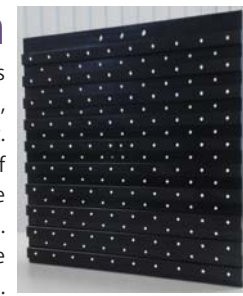
● **CORRECTION OF MISREGISTRATION FROM CALIBRATION PLATE TO LIGHT SHEET BY MISALIGNMENT CORRECTION TECHNIQUE**

Compatible with  
**64-bit OS**  
and **SIMD**

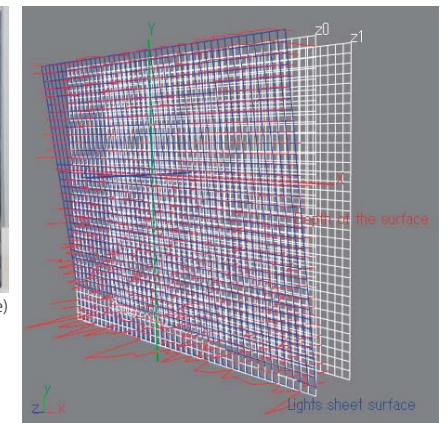
## Measurement of three-component velocity vectors in a 2D planar domain based on stereoscopic Particle Image Velocimetry.

### Calibration

- Using flownizer's a grid calibration, it is possible to correct lens distortion, and together with two-dimensional projection conversion, obtain a more precise analysis result.
- When using a single plane calibration plate, the picture taken by each of the two cameras, which carries out parallel movement of the plate in the direction of a z axis (a total of four sheets) is required.
- When using a double plane calibration plate (right photograph), the picture from each camera (a total of two sheets) is required.



Calibration plate (double plane)



Misalignment correction



### Scheimpflug Photography

In case of the stereo PIV, since each camera is not correct position relative to the laser sheet side (measurement plane), it can't focus to the whole particle of a measurement plane in a usual photo shooting. Therefore, vectors may be unable to be computed correctly. A Scheimpflug adapter (left photograph) is the optimal tool for such stereo PIV photography. By shifting the optic axis, a focus becomes possible at the whole plane and in depth, and this makes highly precise PIV measurement possible.

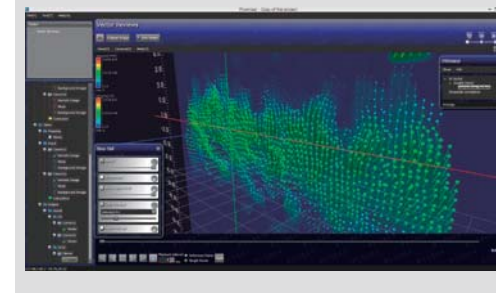
### Preprocessing function

- The masking function will keep you free from unnecessary areas that will cause error vector. Preprocessing tools such as background differencing technique, filters and arithmetic will help you modify bad original images to analyzable images.



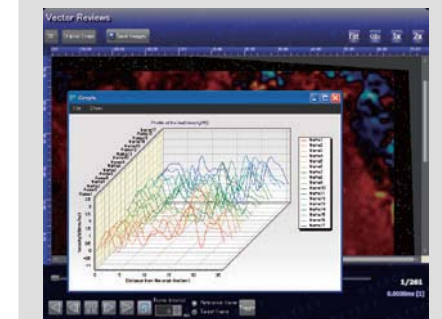
### Display results

- Analysis items, such as raw vectors, mean vectors, angles, streamlines, vorticity, turbulent energy, Reynolds stress, RMS speed, velocity standard deviation, the velocity gradient tensor, etc. can be easily displayed by using our intuitive analysis result page. Display results can be exported easily.



### Measurement results

- Abounding result items such as raw vectors, average, angles, stream lines, streak lines, path lines, vorticity, turbulent kinetic energy, Reynolds stress, velocity gradient tensor, standard deviation, velocity gradient tensor can be visualized. Vector distance and velocity can be shown graphically in points/lines/areas.



### Main spec

Measuring method	PIV / PTV 2D2C, PIV 2D3C
Calculation method	Standard (direct cross-correlation), Image Deformation, Recursive
Calculation option	Correlation-based correction (CBC), Particle Mask correlation method, Correlation average
Preprocessing	Filter, Arithmetic, Brightness and contrast, H-dome filter, Inter-image, Mask
Post processing	Remove, Replacement, Smoothing
Vector output	Resultant (UVW), (UV), U(x), V(y), W(z)
Analysis item	Raw vector, invalid vector, corrected vector, mean vector, instant-mean vector, ensemble correlation, correlation coefficient, flow lines, vorticity, turbulent kinetic energy, Reynolds stress, velocity gradient tensor, standard deviation, velocity gradient tensor
Graph display	Point, Line, Area (distance/velocity)
Supported image format	AVI, WMV(video), BMP, JPEG, TIFF, PNG (sequential still image)
Supported data format	binary (di5), CSV

### Operating Environment System requirements

OS	Windows Vista-32bit, Windows7, Windows8 / 8.1, Windows10 (32 or 64bit)
CPU	Intel Pentium4 or more processor (Multi-core is recommended)
HD	2GB or more (10 GB or more recommended)
Memory	1GB RAM (3GB or more recommended)
Monitor	The display which supports the resolution of 1024 x 768 or more.
Graphic board	The graphics board corresponding to Shader Model 2.0 is required.



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