

Analysis software

Motion Analysis

■ DIPP-Motion V

2D

3D

Particle Analysis

■ Flownizer

2D (PIV, PTV)

2D3C (PIV, Stereo PIV, PTV)

3DPTV

Image Processing

■ DIPP-Macro II

DIC software

■ DIPP-Strain



If you have any questions, please feel free to contact us.
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Price, technical specification, and appearance are subject to change without prior notice.

DIPP-Motion V

Versatile, easy-to-use motion analysis software

- ◆ Retrieve coordinate values from various video formats by image-processing.
- ◆ Variation, angle, velocity and other physical information can be obtained from the coordinate data.

Analysis procedure

1. Import Image

Using video converter tool, any video formats are available to use for analysis.

Robust and accurate image tracking by image pre-processing.

2. Image Tracking

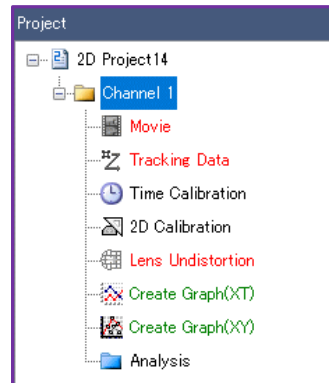
Place marker points, track, and adjust.
A variety of tracking techniques are available.

3. Calibration

Convert pixel data into real-space coordinates.
Scale jigs (tools) for 2D and 3D.

4. Analysis

Straightforward analysis results with graphical view.
Export to CSV file, output as graphs and animation images / movies.



Remarkable features of DIPP-Motion V

Image Tracking "Binarization"

As well as the basic functions such as noise removal, these functions below are available.

Luminance weighted average

Luminance information is added to the COG (center of gravity) calculation.

Circle detection

Input circles into the binarized image and make the center of those circles to the coordinates.

Image Tracking "Correlation"

The method to register the pattern of markers as a template and search for this pattern in the image.

Offset

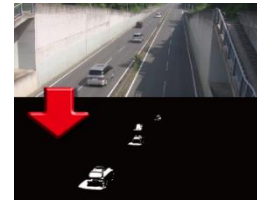
Not just the center of the template, but it can also output the coordinate for the selected point in the template.

Template updates

Register the image with tracking result as a new template, and continue tracking.

"Pre-processing"

Remove the background pattern that could be noise.
Register the background image to subtract from each frame, and make the background black.



"Auto-registration of tracking markers"

Particle tracking

Tracking target (s) that only exist in the second frame or later can be automatically tracked when it appears.

Auto registration

Binarization, correlated tracking, checker markers are automatically registered to the system. Available to add and delete manually.

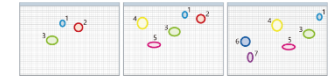
Grid lines

Place several measuring targets and parts in the grids.

"Project management"

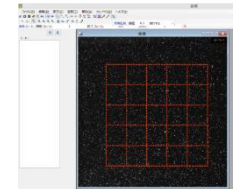
Registering the project as a base, similar analyses can be processed more effectively.

↓ Particle tracking



Grid lines

→



"Analysis functions"

XT Graph

Create graphs from various analysis items such as moving distance, angles between 2-points, etc.

Synchronized play back/Output movies

Available to view graphs, animation, and raw movies in parallel

Offset

Set an arbitrary frame as an initial status, it offsets the whole image and make it into a graph.

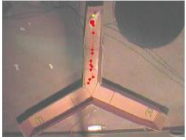
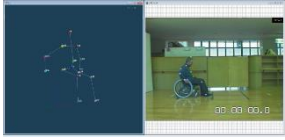
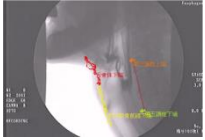



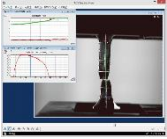


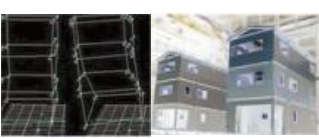
Set the frame subtraction in Velocity/Acceleration calculation

Not just the difference between two sequential frame, it can calculate the difference between selected frames.

Output/Input

All data such as trajectory data from tracking and processed graph data can be output as CSV files.

Applications

Animal Behavior Analysis	Human Motion Analysis Gait Analysis	Swallowing Mastication Eye Movement	Athletics	Crash Test Dummy Dolls
				
Automotive Parts Test	Materials and Strain	Robotic Arm	Hydraulics Experiment Transportation Construction	Shaking Table Test
				

Choice of Camera

Any types of images/movies taken by smartphone, camcorder, and industrial camera can be used for analyses with DIPP-Motion V.

Please be aware that the final quality of analysis results will be highly dependent on the camera performance you choose.

Accuracy

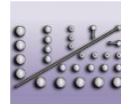
The accuracy of obtained coordinates will be affected by the camera resolution.

Time Resolution

In order to analyze the chronological change in data more finely, time resolution is the key. In other words, it will depend on the fps (frame per second) of the camera.

Optional Products

- ◆ Ring light
- ◆ LED Strobe lighting
- ◆ Reflective markers
- ◆ Calibrator



Operational Environment	
OS	Windows 7 32bit, 64bit Windows 8.1 32bit, 64bit Windows 10 32bit, 64bit
CPU	Intel® Core i5 or higher
HDD	10GB of available memory
Memory	4GB RAM (8GB or larger is recommended)
Monitor	1336 x 768 resolution
Graphics card	OpenGL 2.0 or higher

Specifications

Tracking	Auto/Manual
Lens distortion correction	Z. Zhang model
Max. measurement point	Unlimited on the software
Max. measurement frame	Unlimited on the software
Compatible format	PNG/TIFF/GIF/JPEG/BMP (Sequential) AVI/MPEG, etc. (8bit mono chrome, 24bit color)
2D calibration	Standard/2D Projective transformation/Grid
3D calibration	DLT method/Cuboid scale auto detect/Dynamic
Analysis	Graphs/Animation view/Multi-graphs synch play-back/Variation/Manual measurement
Save	Whole screen/Create movie file for the working area/Output data as CSV file

DIPP-Motion V 2D

Various ways of calibration

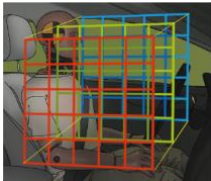
2D Projective Transformation (Keystone correction)

When the optical axis of camera is not facing in front of the measuring plane, you can convert this plane so that you can obtain the numerical data as if the image was taken from above.



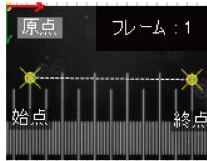
Multiplane Calibration

When there are multi-plane in the depth direction from the camera, you can calibrate each plane.



Simple Calibration

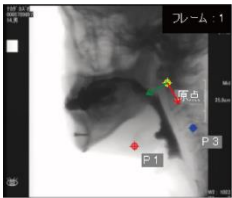
When the optical axis is facing perpendicular to the measuring plane, calibration could be done by having two points with known length in the image.



Special features

Relative motion measurement by coordinate conversion

Measuring a point as a base and making it to an origin, it enables to analyze the relative motion.



Multiplane distortion correction

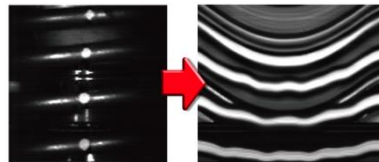
Obtaining lens distortion as a parameter that causes measurement errors, it corrects the multi-plane distortion. All you need is put and capture the 3D checker board.



Chronological change

Suitable for analyses which are usually difficult to detect the edge with the general tracking algorithm.

- ◆ Liquid crystal, Blood
- ◆ Ignition, Combustion
- ◆ Moving droplets
- ◆ Vertical movement of liquid surface



DIPP-Motion V 3D

Various ways of calibration

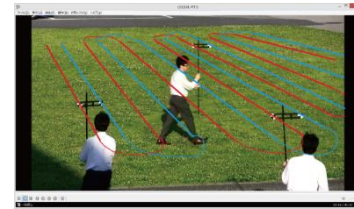
Calibration of large area

Arbitrary point calibration
Having multiple points with known distance in between in the image, calibration can be done.

Dynamic calibration

By swinging a wand calibrator, calibration can be completed for multi-cameras. When using several cameras, or capturing at a large space, this is a common calibration method.

↓ Dynamic calibration

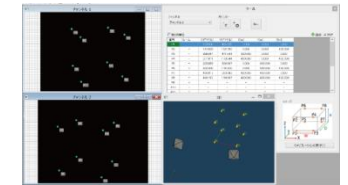
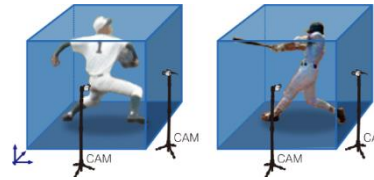


Composite correction of multi-space

Capture a measurement area by multi-cameras separately.

Rectangle calibration

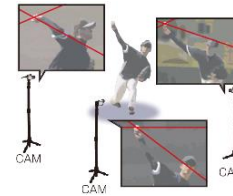
Use 8-vertices of a rectangular for calibration. Having the lengths of each edge, coordinates can be obtained.



Special features

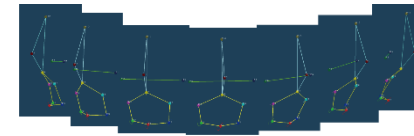
Create 3D data

Automatically match the markers. Matching 2D data among multi-cameras, 3D data can be generated.



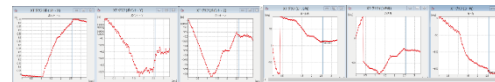
3D animation view

Locus of the measurement point in the 3D space will be showed in animation.



Rigid body settings and 6 degrees of freedom (6DoF) calculation

Marking 3-points on the target and set the "rigid body", 6-degrees of freedom (6DoF) calculation with 3-translational components and 3-rotational components is available.



Relative motion data by a moving origin

Coordinate conversion
Selecting a point and making it to an origin, the motion relative to that origin is calculated.

Free layout and synchronized playback
Raw image, locus on the image, analysis graphs, 3D animation can be placed in the window and play and analysis simultaneously.

FlowNizer

User-friendly, high speed processing, flow analysis software

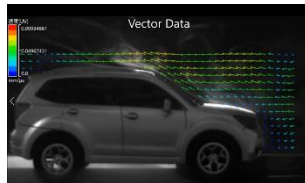
- ◆ Helps you with understanding the characteristics of your products further and with detailed observation of invisible events.
- ◆ Vector calculation, stream line, streak line, path line, vorticity, turbulence energy, Reynolds stress, etc. are the basic analysis items of FlowNizer.

Applications

Air flow measurement / Wind tunnel experiment

Air flow around buildings, cars, front grille
 Air flow around the wings of insects and flying objects
 Air flow of air conditioning, combustion

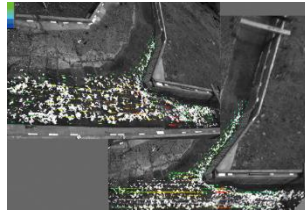
↓ Wind tunnel



Water flow / Water tank experiment

Fluid flow analysis around an object
 Flow velocity measurement of Cavitation
 Hydraulic engineering experiment
 River model experiment

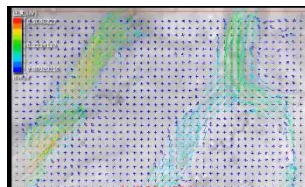
↓ River model experiment



Microscopic analysis

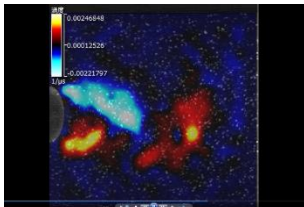
Blood flow observation
 Movement of microorganisms

↓ Blood flow observation



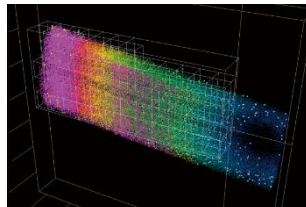
Vorticity

→
 Vorticity behind an object in the water



Water circulation in a cylinder (3D)

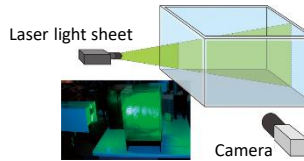
→
 Circulation in a cylinder



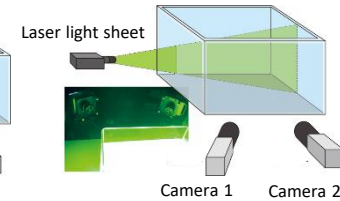
System configuration example

2D		2D3C		3DPTV	
High speed camera	1	High speed camera	2	High speed camera	3
Camera lens	1	Camera lens	2	Camera lens	3
Laser light sheet	1	Laser light sheet	1	Laser light sheet	1
FlowNizer 2D software	1	FlowNizer 2D3C software	1	FlowNizer 3D PTV software	1
		Scheimpflug adapter	2	Calibration plate	1
		Calibration plate	1	Calibration plate movement method	1

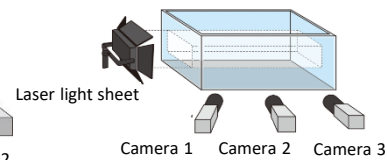
● 2D (PIV/PTV)



● 2D3C (Stereo PTV)



● 3DPTV



Scheimpflug adapter

Under the normal conditions to shoot for the Stereo PIV, sheet laser plane and the camera is not facing perfectly each other and thus it makes difficult to focus sometimes.

Scheimpflug adapter works to shift the optical axis and helps to focus to the depth direction.



Calibration plate



Multi-planes plate
 Consists of multi-planes to the direction of Z-axis. Markers are placed staggered on each plane.

Single plane plate
 Markers are placed as Lattice points

→
 Multi-plane plate



Flownizer series comparison chart

		2D	2D3C	3DPTV
Overall specification 	Target area	Plane/Pseudo plane For the surface flow, measured as projection plane	Plane The area that is the same as the thickness of laser light sheet	3D space
	Vector components	2D (X, Y)	3D (X, Y, Z)	3D (X, Y, Z)
	Measurement methods	PIV or PTV	PIV	PTV
	Number of cameras	1	2	2+ (3+ recommended)
	Scheimpflug adapter	Not use	Recommended to use	Not use
	Calibration methods	Calibration plate Simple calibration	Multi-plane calibration	Move a calibration plate for a certain amount
	Compatible image/movie formats	Movie: AVI, WMV Sequential still images: BMP, JPEG, TIFF, PNG		
	Output format	CSV data, Movie data (AVI, WMV), Still images (BMP, JPEG)		
	Velocity components	X, Y	X, Y, Z	X, Y, Z
	Output values	Correlation function, Velocity gradient tensor, Vorticity, Turbulent energy, Reynolds stress		Average flow velocity
	Streamline result view	Stream line, Streak line, Path line		N/A
	Graphs	Selected points, Line, Area		N/A
Error vectors	Luminance, Correlation function, Velocity value filter, Velocity angle filter, Upper and lower limits of velocity		N/A	
Required PC specification 	OS	Windows 7, 8.1 (32bit/64bit), 10 (64bit)		Windows10 (64bit)
	CPU	Intel Pentium4 Processor		
	Memory	1GB of RAM (3GB+ recommended)		2GB of RAM (4GB+ recommended)
	Storage	2GB+ of free space		10GB+ of free space
	Monitor	XGA resolution or higher (1280x800 or higher recommended)		SXGA resolution or higher

*Flownizer 2D3C is upward compatible with Flownizer 2D. Flownizer 2D3C includes the functions of Flownizer 2D. It is available to upgrade from 2D to 2D3C when necessary.

FlowNizer 2D / 2D3C

- ◆ Easy operation with project tree structure
- ◆ Support three modes, 2DPIV, 2DPTV, and Stereo PIV (only 2D3C)

Basic function of FlowNizer 2D / 2D3C

Configuration

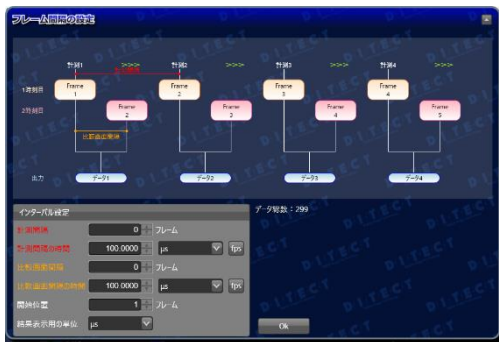
● Correlation coefficient map

Correlation coefficient map helps to set an inspection area and a search area which will have an influence on measurement results. This is very helpful for the users that are not familiar with flow velocity measurement. Spatial direction and time direction can be investigated easily by simple user interface.



● Time calibration

Easily set up for the various measurement methods, such as continuous emission laser and double pulse laser.



Preprocessing

● Masking

Select an area which you want to exclude from vector calculation.

● Image processing

Filtering, convex extraction, luminance transformation, image calculation and other methods are available and can be processed simultaneously.

● Background subtraction

When there is non-moving background is included, it's more likely to have vector errors.

You can create a background from a movie file that contains particles.

Calibration

● Simple calibration

Easily convert from pixels to an actual length by selecting two points of known length.

● Point calibration

When a camera is not placed in front of the measurement plane, projective transformation takes place.

● Using calibration plate

Whole calibration process till the lens distortion correction will be automatically completed.

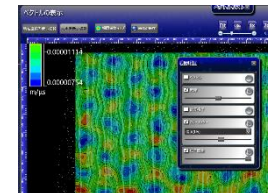
Results

● Vector, Contour, Streamline

Select to create raw vector, mean vector, interpolating vector, smoothing vector.

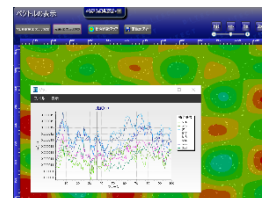
Select to overlay streamline, streak line, path line, and adjust a level of transparency.

Each data can be output as CSV file.



● Graphs

Each profile (such as a selected line) is shown in a graph with the X-axis as time.



FlowNizer 3DPTV

- ◆ Track the tracing particles in the 3D space and calculate 3D vectors (X, Y, Z)
- ◆ Shooting with synchronized stereo cameras

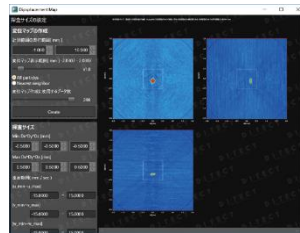
Special features of 3DPTV

Particle mask correlation method

No special technique is necessary for particle extraction. Small, tiny particles and dark particles in images are automatically extracted by existing virtual particles.

Displacement mapping

Displacement of all the particles at all the time is displayed as contour lines. More optimal search area can be selected.

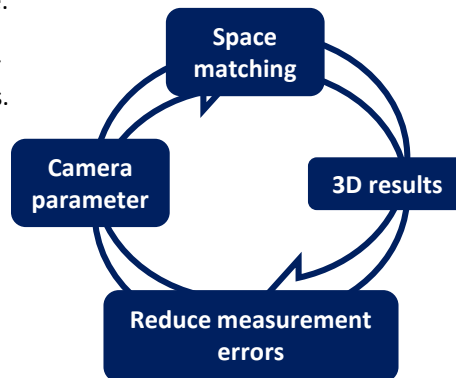


Volume self calibration

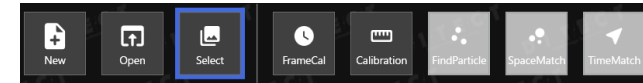
Project an obtained 3D result data on 2D image. The gap between projected 3D result and actual image of particles provides you the error tendency and finely adjusts camera parameters. With the new camera parameters, space matching is reprocessed and you can get new 3D data.

Repeating this process, it can minimize measurement errors.

You can initially set up this process and all the associated calculation and processing will be competed automatically.



Analysis procedure



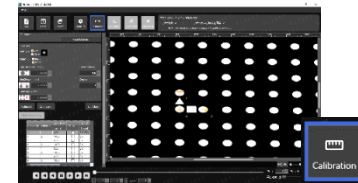
1. Select an image

Import analyzing movie and calibration image



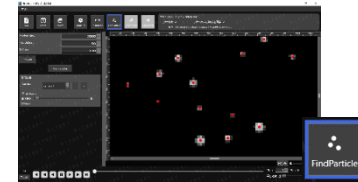
2. Camera calibration

With a specific calibration plate, dot pattern markers will be automatically extracted by clicking on the origin and the markers to the X and Y directions.



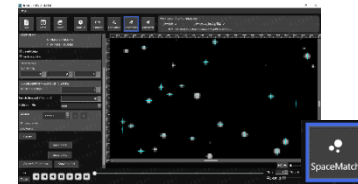
3. Particle extraction

After calibration is completed, "Find Particle" button becomes available to click.



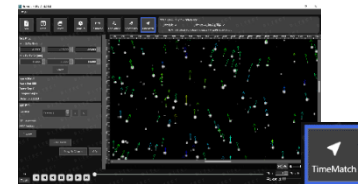
4. Space matching

Particles captured by several cameras will be matched based on images by each camera. 3D position or particles at each time will be converted to numerical values.



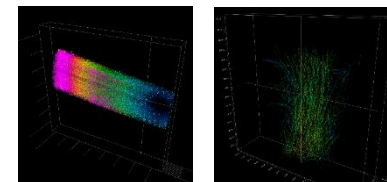
5. Time series (Vector calculation)

3D coordinate group is connected to the time axis direction and "displacement / time = flow velocity" is obtained.



6. View a result

Contour lines of velocity distribution / trajectory of particles / velocity contour lines of cut-out time axis and space.

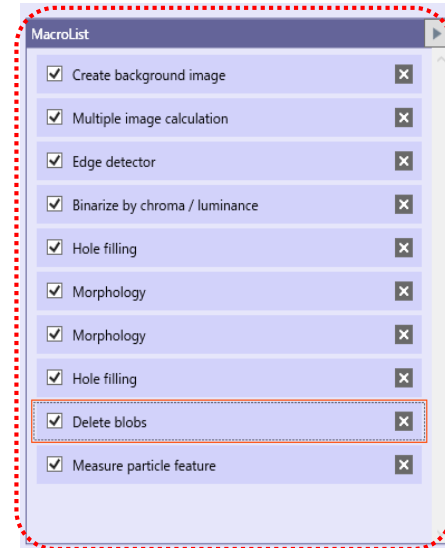
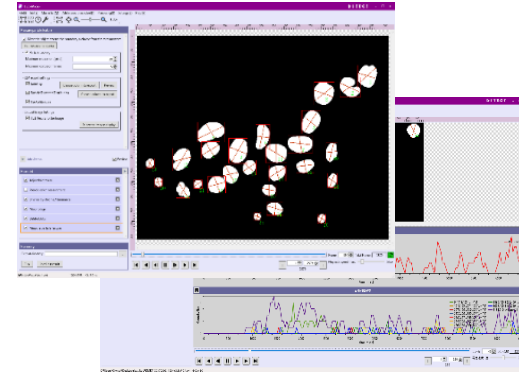
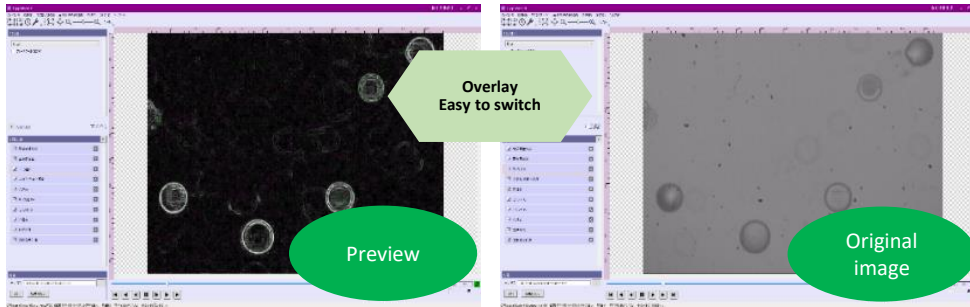


DIPP-Macro II

- ◆ Image analysis software that saves time and effort of users
- ◆ Easy to select and set process menu, parameters, and processing order
- ◆ Supporting you to analyze multiple sequential images and frames in a movie

Main features

The entire process just takes a few clicks, and all of the particle data is immediately displayed in MACRO II's measurement window.



User friendly MACRO list.

Quick and simple overview of process order changes, process modifications and results.

Results can be exported in CSV format. Movies and graphs can be displayed and saved as well.

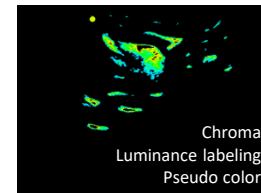
▲ Time series analysis, Multiple graph displays

▲ MACRO list

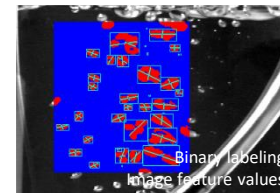
Image processing features

Frame arithmetic	Color	Smoothing/Noise	Filtering	Morphology
Create background image Multiple image calculation Import slots/files	Adjust brightness/color Bayer demosaicing Color matrix Grayscale/Normalize	Smoothing Gaussian blur Bilateral filter Median filter Emboss	Custom Convex extraction Sharpening Edge detection	Dilation/Erosion OPEN/CLOSE Top-hat/Black-hat Gradient
Transform	Binarize	Binary image	Measurement	Basic measurement
Enlarge/Reduce/Rotate Translate Flip horizontal/vertical	Binarize by luminance/hue Chroma filtering	Delete blobs Fill holes Extract outlines Thinning	Particle-size distribution Labeling Overlay images RGB distribution Pseudo color measurement	Actual length calculation by calibration Time calibration ROI settings

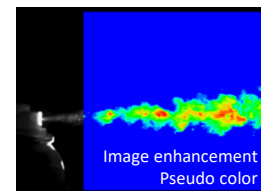
Contamination detection



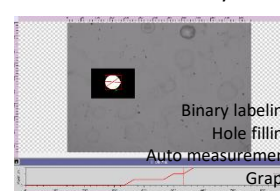
Particle-size distribution



Particle visualization



Time series analysis



DIPP-Strain

Easy to use, low-priced strain analysis software

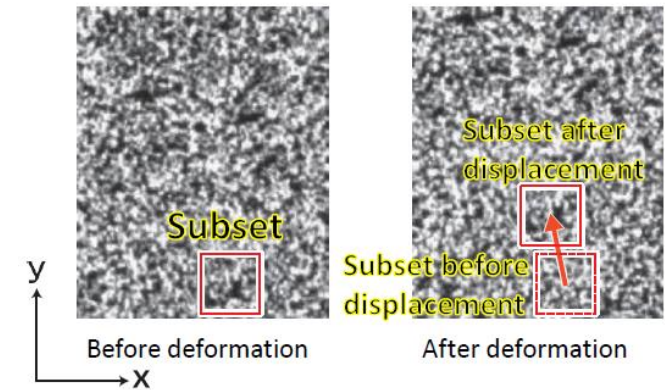
- ◆ When black and white random patterns are being applied to the object, the software is able to measure the displacement and strain by using the DIC method.
- ◆ Various materials such as metal, resin, wood, concrete, glass, rubber and others can be measured.
- ◆ Both 2D and 3D DIC (stereo) are available. 2D measurements can be done with 1 camera, and for 3D full-field measurement, 2+ cameras are required.

What is "Strain"?

A force tending to pull or stretch something to an extreme or damaging degree is called "Strain". Strain has no unit but ϵ (epsilon) and % (percent) might be used instead.

Digital Image Correlation (DIC)

The subset set at the frame 1 is searched at the frame 2 among the surrounding pixels. The area with the highest correlation coefficient is set as a new subset after displacement. Software repeats this process and outputs the coordinates accordingly.

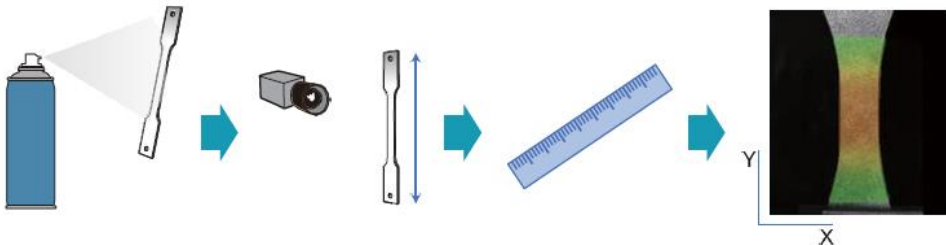


Analysis procedure

2D strain analysis (Displacement of a plane surface)

The object is recorded with one camera and the strain can be measured from the change of the random patterns on the object's surface.

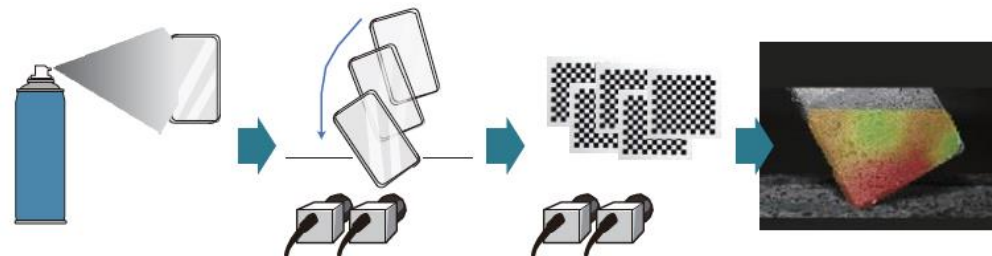
- ① Paint black and white
- ② Record
- ③ Calibration
- ④ Result



3D strain analysis (3D full-field measurement)

The object is recorded with two cameras and the 3D displacement can be measured, as well as 3D strain distribution.

- ① Paint black and white
- ② Record
- ③ Calibration
- ④ Result

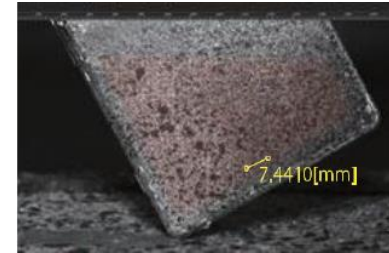
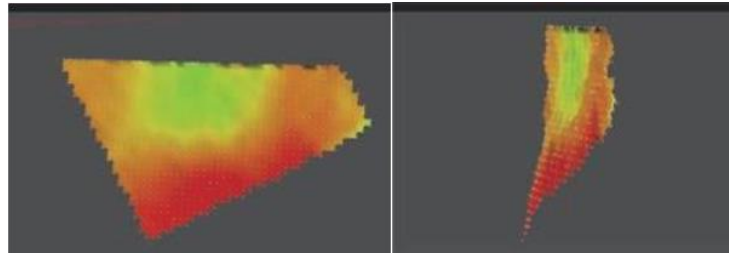
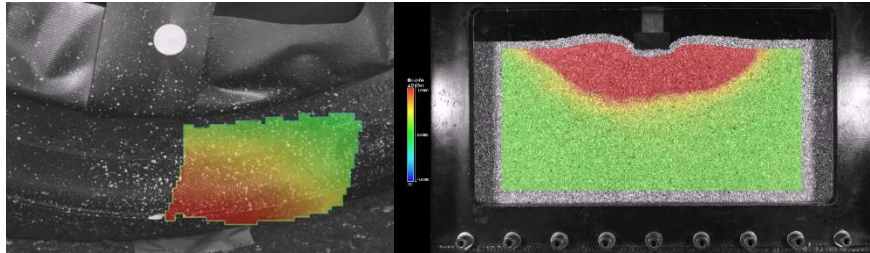


Output data types

● Strain color contour

● 3D animation

● Two point calibration





● CSV file



● Movie file



		2D	2D/Stereo	Stereo
Overall specification 	Features	2D measurements	2D measurements 3D stereo analysis	3D analysis extension (for users of 2D version)
	Deliverables	Set-up CD, USB license key, Manual (PDF)	Set-up CD, USB license key, Manual (PDF)	Set-up CD, USB license key (to replace 2D version), Manual (PDF)
	Optional items	Additional USB key	Additional USB key, Calibration plate	Additional USB key, Calibration plate
	Main outputs	X-direction strain, Y-direction strain, shear strain, major strain	2D: X-direction strain, Y-direction strain, shear strain, major strain Stereo: Volumetric strain, logarithmic strain, deformation gradient tensor	Volumetric strain, logarithmic strain, deformation gradient tensor
	Input formats	AVI, WMV, MPEG, CINE, JPEG, BMP, GIF, TIFF, PNG		
	Output formats	AVI, MP4, WMV, JPEG, PNG, BMP		
Required PC specification 	OS	Windows 10/11 Home/Pro (64bit)		
	CPU	Intel Core i5 or higher (multicore)		
	HDD	10GB+ free space		
	Storage	8GB+		
	Monitor	Full HD or higher (1920x1080 or higher recommended)		