The prehistory of PIV

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During the seventies, the availability of powerful, stable and single-mode lasers made possible the development of a new range of metrology techniques based on the use of coherent laser beams. These experimental methods were used to measure deformations and stresses of solid surfaces by exploiting the displacement or correlation of wavefronts or speckle patterns scattered by the surface (holographic interferometry, speckle photography, speckle interferometry).

The techniques were adapted to also probe transparent 3-D objects. In particular, some optical experimenters tried, sometimes just for fun, to estimate the displacement of particles carried by fluid flows. A simple double-exposure of a flow illuminated by a laser light sheet would show pairs of particle images whose displacement could be measured by optical techniques. Although the recording of the images was pretty conventional, the breakthrough was the use of analysis methods inherited from speckle photography.

At a time when efficient digitisation of the photographic image– not to say direct digital recording of the particle field -was not credible, laser illumination of the photographic negative produced systems of optical fringes that could be processed in a much easier way. Young's fringe production –in fact analog Fourier transformation- proved to provide a simple displacement measurement method, that could be used to explore the performance of the technique for various types of fluid flows.

During the years 1980-1985, the technique, initially called speckle velocimetry because of the similarity of its image processing with that of speckle photography, was further developed: different types of pulsed or chopped lasers were used for various types of liquid and gas flows, particle insemination techniques were refined and, even, some primitive form of fringe digitisation and automatic processing were introduced. Quite a few fluid mechanics metrologists started getting interested in a technique that could provide instantaneous velocity fields. What was initially an optical laboratory curiosity became part of the palette of established measurement techniques available to "serious" experimenters and, a bit to the surprise of the author, the subject of commercial product developments.