VSPARS Real-Time

System Overview:

VSPARS Real-Time is a sail shape recognition system which uses customised industrial cameras to capture sail shape and rig deflection in real-time. The software interprets images sent from the cameras approximately every 3secs, and automatically finds coloured stripes on each sail.

By knowing information about the camera location and orientation, and the length and height of each stripe, the software calculates the true stripe shape. In addition, the deflection of the stripe luff from the “unloaded” condition is determined, resulting in the full 3D coordinates of each stripe on each sail. This allows the mast bend and sag, the forestay sag and the flying luff position of downwind sails to be measured at each stripe location. The system can also be used on multi-element wing sails.

Camera Units:

The VSPARS hardware includes a range of wired and wireless IP cameras. The wired cameras are run via a single Ethernet cable and the cable length can be up to 50m per camera. All cameras are provided in fully waterproof custom housings and the domes are unbreakable and solvent-proof.

There is a range of lenses featuring narrow through to wide angles, suitable for any type of sail. All camera units are individually calibrated for lens distortion and the calibration files are installed with your software.

The cameras can be either on-deck, or in-deck mounted. The on-deck version can be velcroed to the deck, suitable for a temporary setup. For permanent use, they are mounted in-deck which gives them a much lower profile and allows the cables to be run below decks.

Each camera and basic 10m cable unit weighs approximately 400grams. We use and recommend a water repellent polish for the domes, which allows most water drops to roll off. The only limitation is when a light spray builds up, which can easily be wiped off, or easily clears when the dome is immersed. Customised protective covers can be made to minimise this effect.

Sail Stripes:

The software tracks fluorescent stripes on the sails. The stripes must be either fluorescent orange, yellow or green. This can be either a stickyback cloth (eg. Insignia) or a paint / ink system. For example, the following inks by Printcolor (www.printcolor.ch) are suitable:
Pc660-42 Neon orange
PC660-40 Neon yellow
PC660-47 Neon luminous green

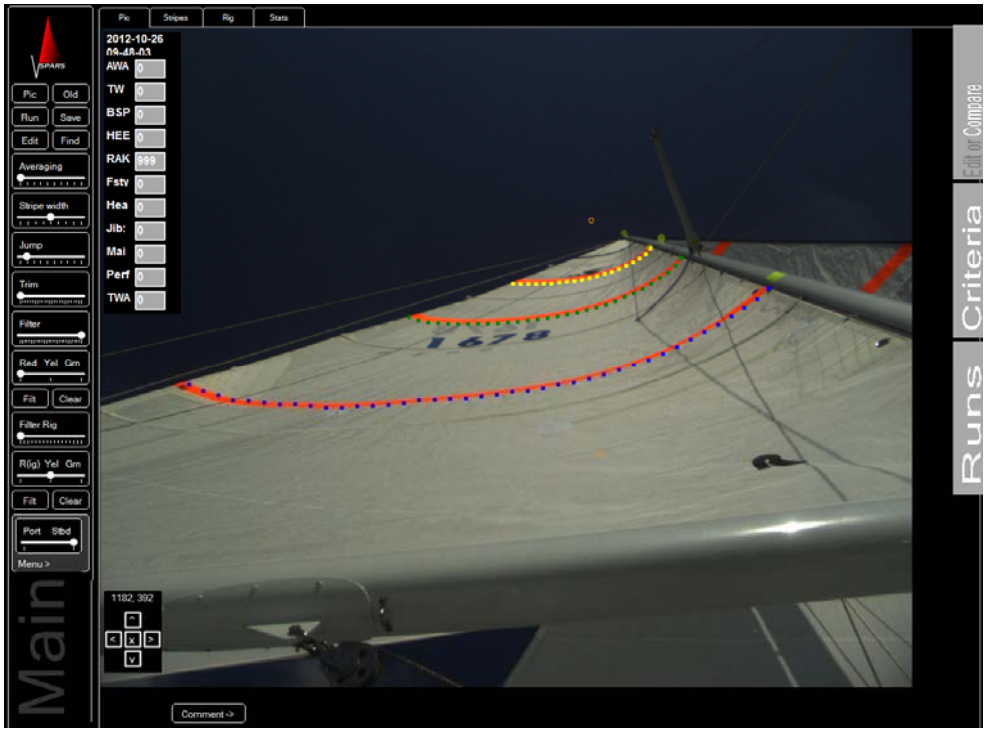
The stripe thickness must be approximately 2.5% of the height above deck (e.g. a stripe at 10m above deck would be 250mm thick). Whilst the software will find stripes thinner than this in optimum conditions, this size of stripe represents a minimum for robust stripe finding over 90% of the time.

The stripe colour must be chosen so that it doesn't conflict with logo colours on the sails (i.e. no orange or red in logos if using orange stripes). For more information, contact a VSPARS consultant.

PC:

A laptop or standard Windows PC is required to run the software, with a network card if using the wired cameras. A minimum of a dual core 1.6GHz processor and 2GB RAM is recommended (i.e. not a lightweight multimedia notebook). The software is designed to be displayed on almost any remote wired or wireless display module as well as the main laptop screen. An Android phone app is freely available for data display.

For example, the system can be run on a low-power Fitlet PC using an iPad as a remote screen and displaying data to a sail trimmer on a waterproof Android phone.



Integration and databasing:

VSPARS accepts UDP data streams via Ethernet from many different sources (Deckman, Expedition, Racing Bravo, Faro, Onboard Assistant etc.), or serial custom NMEA streams. We are happy to integrate with other systems on request. This enables VSPARS to be able to save boat data with each sail shape and subsequently compare shapes from similar conditions. In this way, all environmental variables (e.g. speed, TWS, forestay load, etc) can be stored with each sail shape. A powerful filtering database can then be used to find sail shapes for particular sails in particular conditions during specified testing periods. These resulting sail shapes can be selected and averaged if necessary (by selecting multiple shapes) and then used as real-time trimming targets. All of this can be done via a remote display with a few simple clicks, enabling targets to be changed easily on deck.

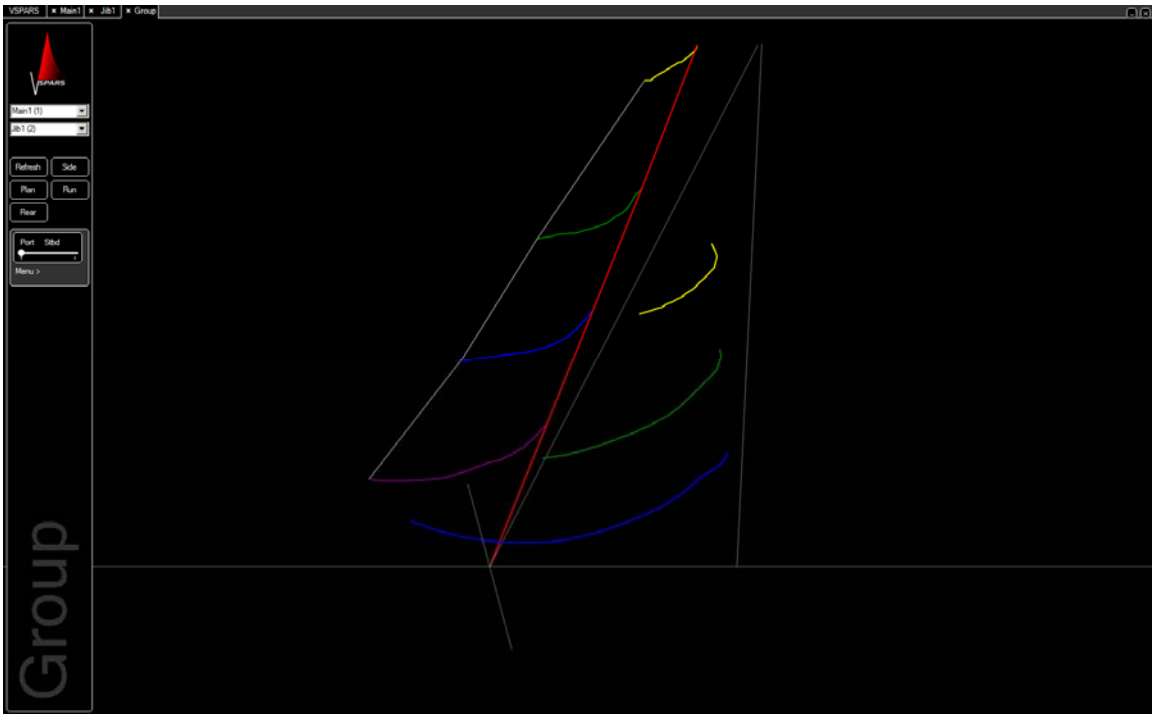
Outputs include 3D geometries suitable for direct import to Rhino, etc. and PDF files of multiple sail comparisons and dynamic effects. Criteria can be invoked to ensure that stripes which are not correctly found can be eliminated from the database.

Automation:

VSPARS can be run fully automatically. When the PC is switched on, VSPARS can be configured to start up, stream the cameras and load multiple sail tabs. Then the input UDP stream will determine which sail tabs are running, when to trigger saving them and any comments to save at the same time. VSPARS outputs all sail information in real time over UDP, allowing sail data to be fed back to on-deck displays or the VSPARS app on Android phones.

Installation:

The installation is as simple as mounting the cameras on the deck and measuring their position away from the base of the mast and their angle to the centreline, which is all detailed in the user manual. The cameras are pre-configured and the software is straightforward to install. Once the cameras are mounted, it should be easy for an untrained operator to set up in 3-4hrs following the user manual, or one of the VSPARS team can install the system and demonstrate its use.



Software and outputs:

An annual software license package comes with 1yr full email support and includes software updates. The software features:

- real-time tracking of multiple stripes per sail
- integration with boat data - filterable database for loading target sail shapes
- real-time comparison with targets
- criteria to eliminate bad stripe results
- real-time 3D rotatable shape comparison with targets
- real-time rig deflection and twist, even for rotating masts
- automatic and manual offline stripe analysis
- de-warping module to generate an undistorted stripe picture
- also available in look-down, or leeward side configurations

Outputs include:

- stripe camber, draft, entry, exit, twist relative to CL – output to file and displayed on screen
- plots of rig bend, sag, sag offset and twist
- mast deflection and twist and forestay deflection
- full 3D sail stripe coordinates (X, Y, Z) suitable for IGES file creation.
- Standardised PDF presentation of sail comparisons and dynamic effects

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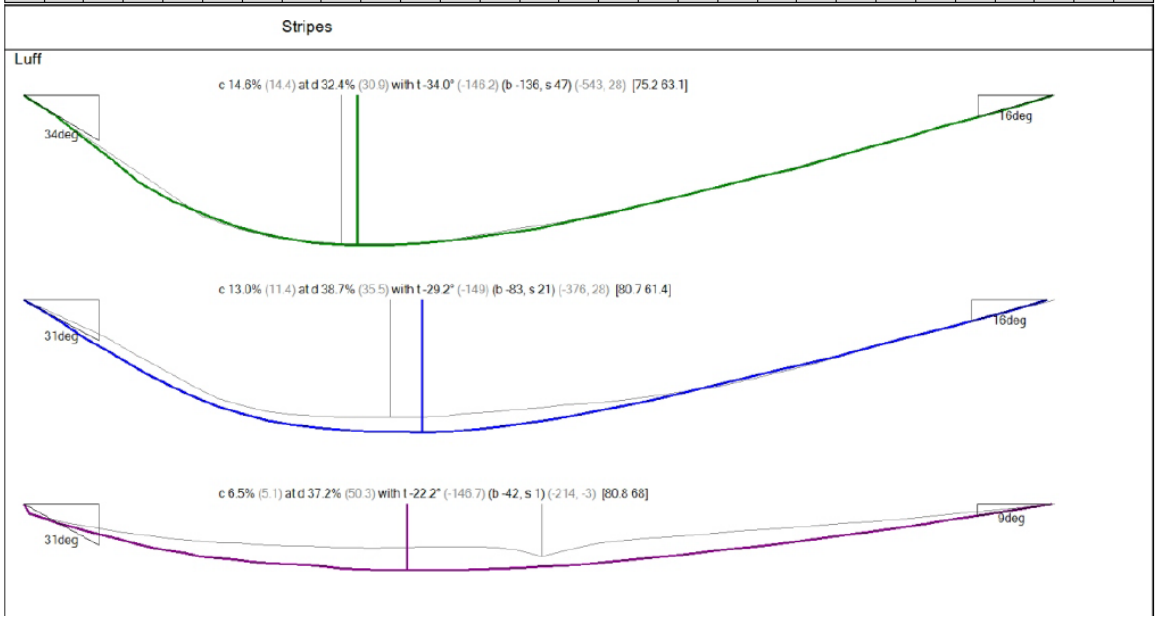
AWA	TWS	Vs	Heel	Perf%	Foresty	Tack	Time	Avg of	Comments
0	0	0	0	0	0	Stbd	2012-01-26_09-27-18	6	Javelin1 Main1:

Entry (°)	Exit (°)	DEPTH % Mean	min	max	StDev	Var%	DRAFT % Mean	min	max	StDev	Var%	Front (%)	Back (%)	TWIST ° Mean	min	max	StDev	Var%	BEND mm Mean	min	max	StDev	Var%	SAG mm Mean	min	max	StDev	Var%
35.8	15	10.2	9.8	10.4	0.2	2	34.2	30.3	41.7	4.2	12	81.5	64.6	-29.7	-26.4	-33.3	2.2	7	-150	-117	-175	17	11	105	71	151	34	33
34.2	16	14.6	14.4	14.9	0.2	1	32.4	31.7	35.3	1.3	4	75.2	63.1	-34.0	-30.8	-37.1	2.3	7	-136	-116	-168	17	12	47	26	103	27	56
30.8	16	13.0	12.5	13.3	0.3	2	38.7	33.9	41.9	3.5	9	80.7	61.4	-29.2	-25.6	-32.4	2.3	8	-83	-76	-90	6	7	21	18	26	3	14
31.3	8.8	6.5	6.2	6.9	0.2	3	37.2	34.6	42.2	2.6	7	80.8	68.0	-22.2	-18.1	-26.6	2.6	12	-42	-37	-48	5	11	1	0	3	1	69



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