

Laser Weld Seam Tracking Sensing Technology Based on Swing Mirror

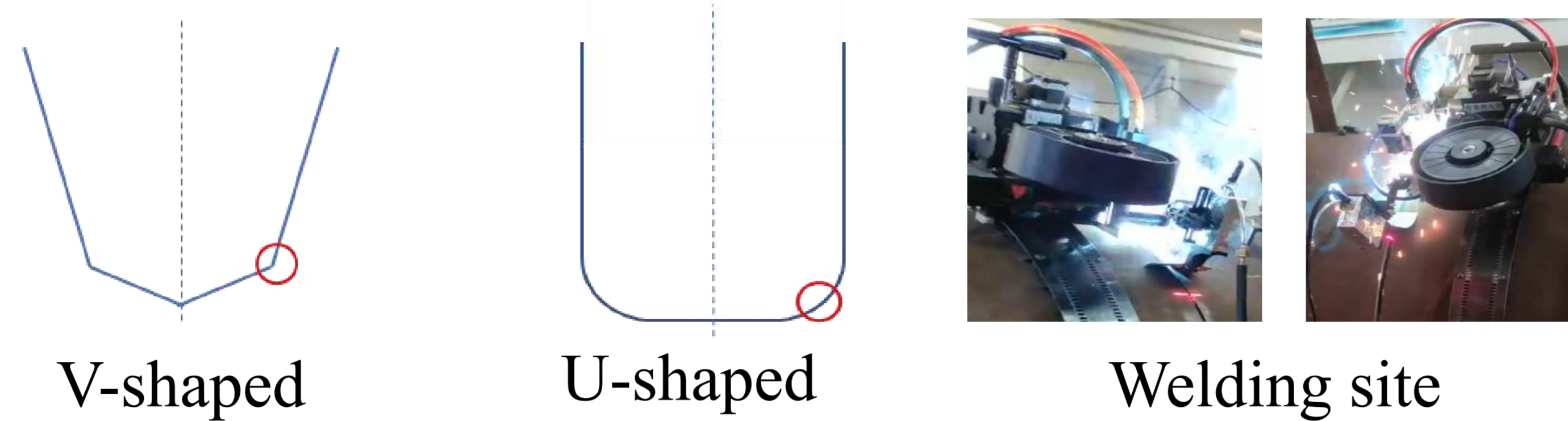
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Abstract—Based on the principle of laser triangulation measurement, a laser welding seam tracking sensor is developed to track U-shaped, V-shaped and flat bottom grooves of pipeline welds in real time. Aiming at the problems of reflection of pipeline welding groove and strong welding arc, which affect the accuracy of U-shaped groove feature recognition, a laser welding seam tracking sensing technology based on swing mirror is developed. The image sensor collects the weld features of the spot-shaped area in a cycle, and connects them to form a cross-sectional weld feature, which can effectively improve the signal-to-noise ratio of the weld feature identification. The actual machine test of pipeline weld tracking is carried out. In the identification test of U-shaped, V-shaped, flat bottom groove, extremely deep and wide weld (40mm depth&30mm width) and extremely deep and narrow weld (40mm depth&12mm width), the sensor has good recognition accuracy and stability.

Keywords—Pipe Welding; Vision Sensing; Laser Seam Tracking; Swing Mirror

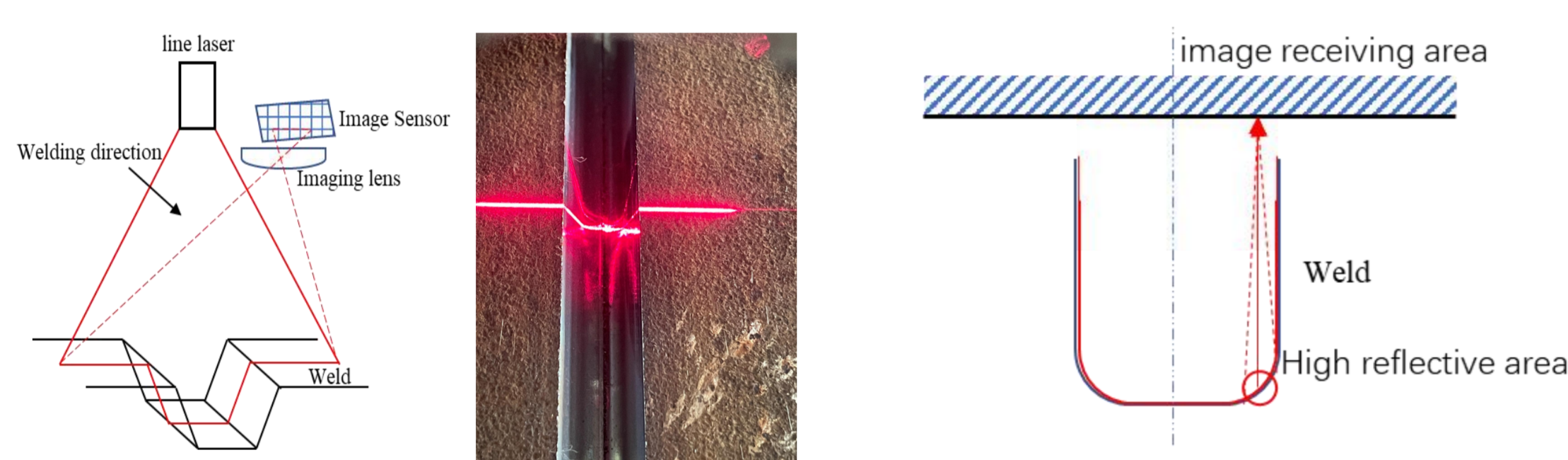
Background

U-shaped/V-shaped weld feature identification under the influence of welding arc and smoke



Method

Line Laser Sensing Technology



Line laser reflection
Gray saturation caused by stray light

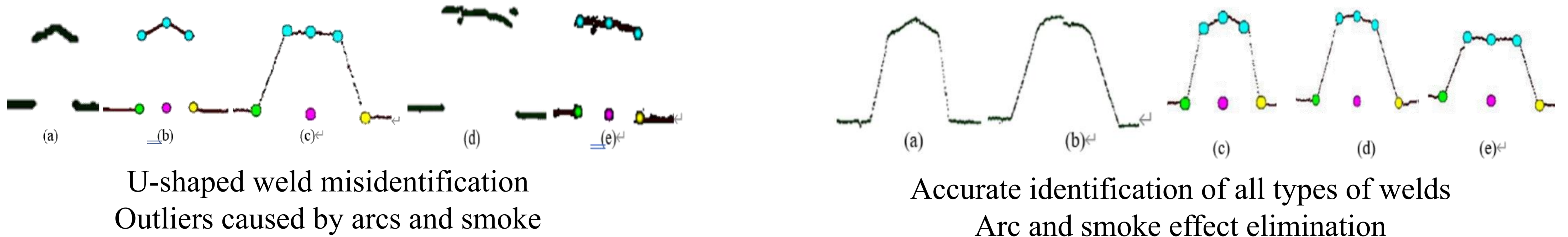
Weld seam tracking sensing technology based on Swing mirror



Point-like laser reflection based on Swing Mirror
Higher laser brightness, higher signal-to-noise ratio

Results

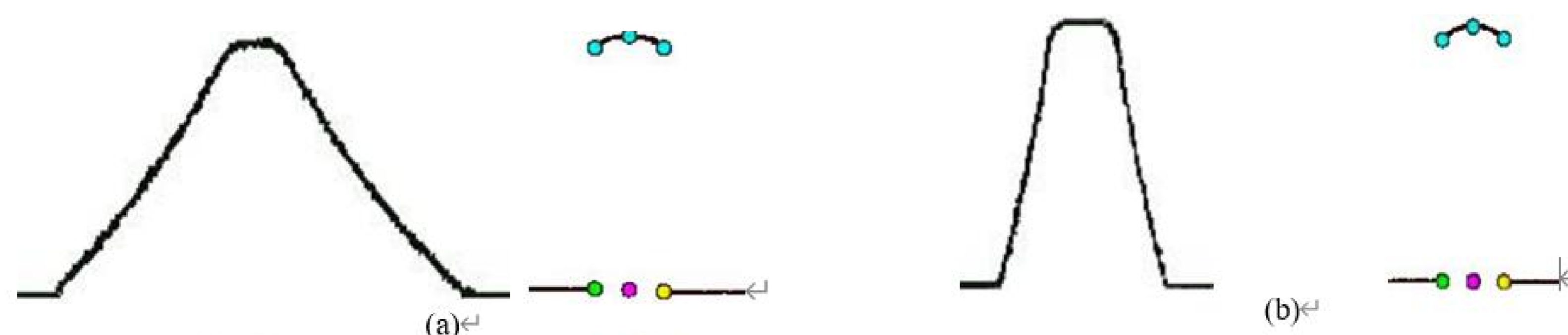
(1) Comparison of the recognition effect of two technologies



(2) Identification ability of weld seam tracking sensing technology based on Swing mirror

WELD FEATURE IDENTIFICATION DATA

Groove Form	Weld Feature		
	Weld width(mm)	Weld depth(mm)	Weld bottom width(mm)
V-groove	7.789	14.643	4.531
U-groove	13.289	17.733	6.598
Fill groove(irregular flat bottom)	7.779	7.066	4.890



LIMIT SIZE WELD FEATURE RECOGNITION DATA

Groove Form	Weld Feature		
	Weld width(mm)	Weld depth(mm)	Weld bottom width(mm)
40mm weld depth 30mm weld width	30.179	40.398	5.923
40mm weld depth 12mm weld width	11.970	40.673	5.790

