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Coordinates transformation method for pointer gauge reading by machine vision

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In this report we present a machine vision algorithm for pointer gauge reading based on coordinates transformation. Since a pointer gauge is a polar representation of a linear scale, it is possible to transform its polar reading to the original linear counterpart. Once the picture of a pointer gauge is captured digitally, we can assign the polar positions to each pixel of the image. Those polar coordinates can be plotted on a rectangular frame to form a transformed image. The scale lines and the pointer are transformed to point vertically (or horizontally). Locations of the scale lines and pointer can be obtained from their pixel histograms maxima. An advantage of our algorithm is that we can avoid the complication of the conventional algorithm, e.g., Hough transformation, to find the orientation of pointer and scale lines. We have tested the algorithm with the ideal and real image of pointer gauges. In the latter case, even though there are some noises on the transformed image, the locations of pointer and scale lines can still be easily found from their histogram maxima. The other advantage of the algorithm is that, due to the polar structure of the gauge, the algorithm does not strongly depend on the orientation of the gauge with respect to the camera. We have tested the case where the camera is not pointed perfectly perpendicular to the gauge panel. Our algorithm still works quite well. Again, we can avoid the difficulty of the conventional algorithm that can strongly depend on the configuration of the camera and the pointer gauge.

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