KAWASAKI STEEL TECHNICAL REPORT
No.27 (November 1992)
Hot-Rolled, Cold-Rolled and
Surface Coated Steel Sheets
and Electronics and Instrumentation

Automatic Thickness Measuring System by Image Processing for Brake Shoes of Traveling Rolling Stock

Hitoshi Sato, Hisao Nishii, Shigetoshi Adachi

Synopsis :

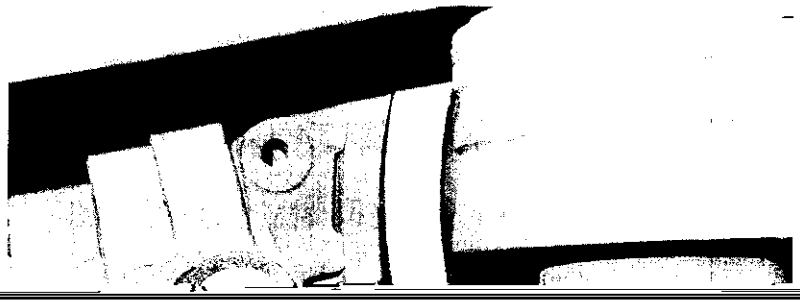
An automatic system for measuring the thickness of brake shoes on moving rolling stock was developed using a unique image processing technique. Initially, more than 80 brake shoes on a series of moving cars were photographed stroboscopically as reference (memory) images. The positions of the shoes were then extracted and the remaining thickness of the shoes was automatically measured across a 60-mm width a resolution of 1 mm and an accuracy of ±3 mm. This information was incorporated in the system database. The system makes it possible to estimate the interval between shoe changes and contributes to more efficient inspection and expendable control. A unique algorithm was developed for the system, permitting the extraction of shoe images regardless of their position within the picture and reconstruction of the outline of the shoe, which may be obscured by dirt. A multi-purpose image processor, Dr. IMAGE, which was also developed by Kawasaki Steel, plays an importal8.5e)-1.r

KAWASAKI STEEL TECHNICAL REPORT No. 27 November 1992

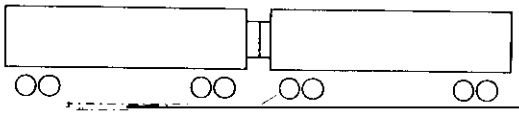
Automatic Thickness Measuring System by Image Processing for Brake Shoes of Traveling Rolling Stock*

Synopsis:

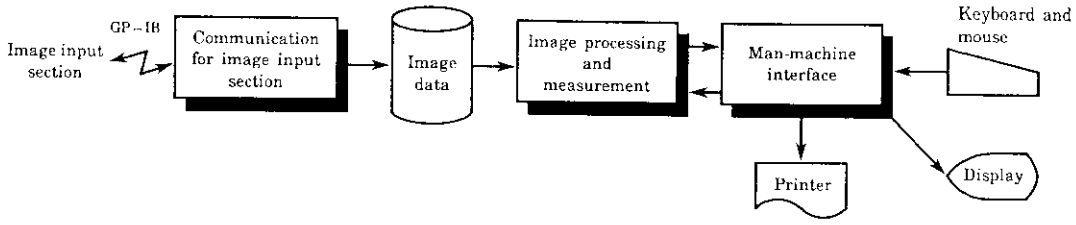
An automatic system for measuring the thickness of brake shoes on moving rolling stock was developed using a unique image processing technique. Initially, more than



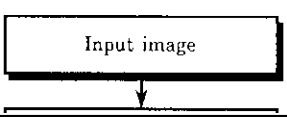
Series 205 electric cars

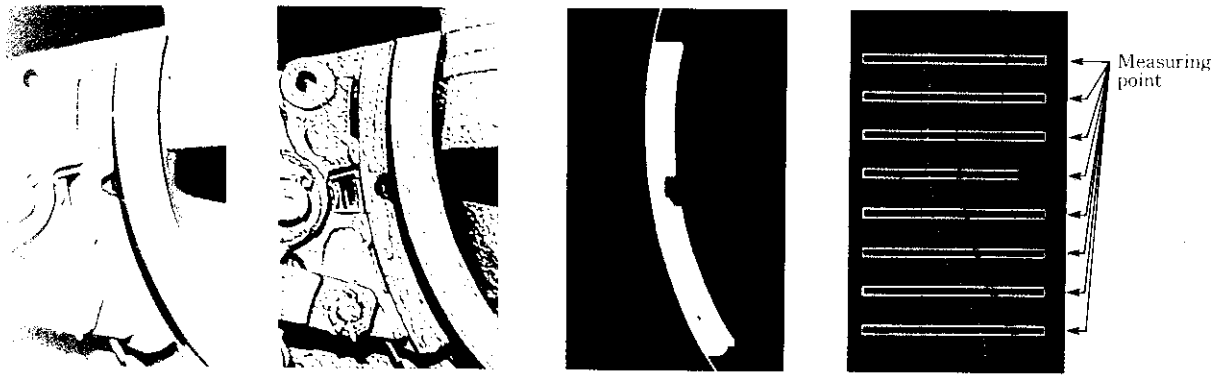


shoes on each bogie, two on the left and two on the right. Therefore, in a train composed of ten cars, there


GP-IB
Image input section
Communication for image input section
Image data
Image processing and measurement
Man-machine interface
Keyboard and mouse
Printer
Display

close proximity such as the wheel, axle spring, metal parts supporting the brake shoe, and the bogie frame, besides the brake shoe itself, as shown in Photo 1. To extract only the brake shoe from this image and to





(a) Original image (b) Binary image (c) Extracted brakeshoe (d) Measurement of thickness

Photo 3 Progress of image processing

(a) shows a case for radius r of circular arc C_n being dif-

without blurring outdoors and under changing illu-

radius r_n are described with their centers on circular arc

(2) The brake-shoe in a picture is detected by applying