The Measure of the Length of the Slabs by Artificial Vision

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Abstract : This work consists in automate the measurement of the length of the slabs in the continuous casting machine in a steel mill. This automation will be done by an artificial vision system that implements a camera matrix and embedded vision software. First, we have to make a rigorous selection of attributes such as the margin of the field of vision, the distance between the camera and the slab, the geometric landmarks of the measure, the detection landmark of the arrival of the slab and the optical reference landmark for measure. We also established a relationship between the real length of an object and the number of pixels occupied by its image after a serie of precise tests in order to integrate it in the measure program. The measuring principle is divided into two steps: First, we make a segmentation of each image with a program developed in this sense which aims to differentiate between the slab and the roller train by reading the brightness of each pixel of the acquired image. This segmentation uses the histogram of gray levels of the slab and the roller table which were obtained after the analysis of their images in their real lighting conditions. Then, the slab is measured with another developed program which calculates the abscissa of the detection landmark of the arrival of the slab, tests the value of the gray level of the pixel of this abscissa, gives a decision signal to blowtorches, then retest the value of gray level of the same abscissa to detect the end of the slab and wait the arrival of the next slab. Both programs operate in a loop until the end of the cut of all of the slabs. At each new cutting plane of the slabs we introduce new data according to the customer's command. A study was necessary to establish a criterion for detecting the slab because the value of one pixel can not be a reference and so we chose the reading of 15 points of twenty and this criterion has yielded concrete and reliable results. A simulation with the camera matrix TVC500 and the image processing map PIP was realized in the process laboratory with success and all programs were developed with the C language. On the ground, it will require ensure a stable lighting within the cut area and a good braking system of the carriage or consider a second camera for measuring the lag of the carriage because it represents the origin landmark and thus adjust the measure. Our work will allow a better measure reliability, the possibility of its exploitation for the optimization of the cut and also the improvement of working conditions of the workers.

Keywords : Artificial vision, pixel, histogram, real time, image, gray level.