

Technical Specification

Glass Width Measure and Control System

Shanghai Gaozhun Automation System Co., Ltd.

I . Steps required for measuring the width of glass plate

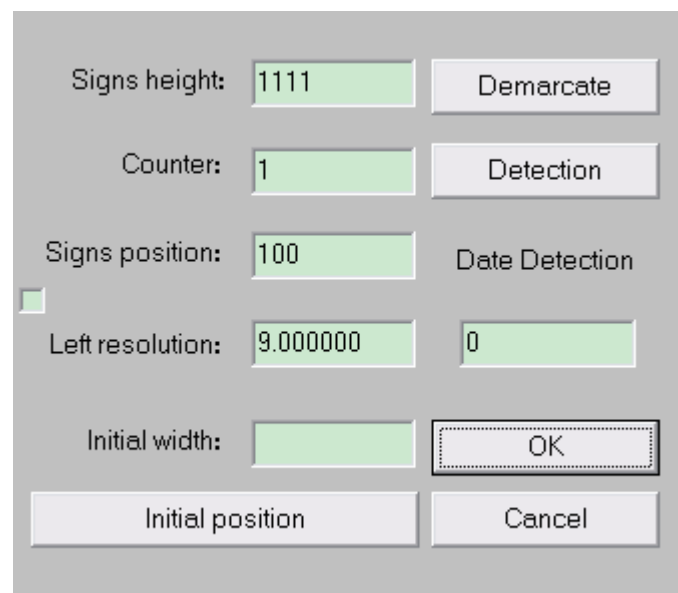
This system calculates the raw ribbon width through the image of the glass ribbon edges picked up by the two camera lens on the lift out rolls. The Implementing procedures are as follows:

1. Calibrate the screen of lift out rolls
2. Measurement of achieving the length of the raw glass plate
3. Calculate the real-time width of raw glass plate basing on the glass edges tracked automatically by the image.

II . Principles to achieve every step and the methods of operation

1. Calibrate the screen of lift out rolls

This step aims at calibrating the image screen through a marker. Make the pixels on the image corresponding to the actual length unit (mm) in order to get the engineering unit conversion from the pixel unit to the length unit (mm) to facilitate automatic measurement. The specific operation to calibrate the lift out rolls is as follows:



The image shows a software calibration interface with the following fields and buttons:

Signs height:	<input type="text" value="1111"/>	<input type="button" value="Demarcate"/>	
Counter:	<input type="text" value="1"/>	<input type="button" value="Detection"/>	
Signs position:	<input type="text" value="100"/>	<input type="button" value="Date Detection"/>	
<input type="checkbox"/>	Left resolution:	<input type="text" value="9.000000"/> <input type="text" value="0"/>	
	Initial width:	<input type="text" value=""/>	<input type="button" value="OK"/>
	<input type="button" value="Initial position"/>	<input type="button" value="Cancel"/>	

Calibrated Interface for Width Measure

First to introduce the above illustration of calibrated interface for width measurement, which is divided into the calibrated interfaces of the left and that of the right lens; those at the bottom are the buttons to regulate

brightness and contrast of both the left and the right camera lenses, and finally the initial width of the raw glass plate.

Left lens calibration method is as follows:

In need of calibration, firstly let the centre of the marker (already well prepared and its actual width value established) aim at the lens right under its bottom, vertical to the glass edge, and close to the glass surface, and also let the image of the marker can be seen legibly on the screen of the left lens; then fill the actual height h (mm) of the marker into the corresponding textbox; then click the "left calibration select" button in the left lens interface, thus a small horizontal line "——" can be moved on the screen, that is executed with the up and down keys on the keyboard, till the horizontal line "——" reaches the top edge of the marker. Then click the "calibration" button (till then, 2 appears in the textbox of the counter, which is 1 initially); the next step is to click the button of the downward direction on the keyboard to move the small horizontal line "--" to the bottom edge of the marker, then click once more the "calibration" button (till then, 1 appears in the textbox of the counter, indicating a successful calibration.) At this moment, the unit resolution under the current interface will automatically display in the textbox corresponding to the resolution; finally click "Affirm" button to complete the calibration of the left lens. If the actual width (i.e. 10 mm) on the display of the distance for the specified width (i.e. 50 mm) is already measured, only require to fill the distance (i.e. 50 mm) of the specified width into the textbox corresponding to the height of the marker. Then select "left calibration select", thus the small horizontal line"——" can be moved in the interface, at this point, press "calibration" button and then move downward the horizontal line "——", the distance moved is the actual width (10 mm) on the display of the distance of the specified width. Finally click the "calibration" button to complete the calibration.)

Right lens calibration method is as follows:

In need of calibration, firstly let the centre of the marker (already well prepared) aim at the lens right under its bottom, vertical to the glass edge, and close to the glass surface, and also let the image of the marker can be seen legibly on the screen of the right lens; then fill the actual height h (mm) of the marker into the corresponding textbox; then click the "right calibration select" button in the right lens interface, thus a small

horizontal line "--" can be moved on the screen, that is executed with the up and down keys on the keyboard, till the horizontal line "—" reaches the top edge of the marker. Then click the “calibration” button in the right lens interface (till then, 2 appears in the textbox of the counter, which is 1 initially); the next step is to click the button of the downward direction on the keyboard to move the small horizontal line "—" to the bottom edge of the marker, then click once more the “calibration” button (till then, 1 appears in the textbox of the counter, indicating a successful calibration.) At this moment, the unit resolution under the current interface will automatically display in the textbox corresponding to the resolution; finally click "Affirm" button to complete the calibration of the right lens. If the actual width (i.e. 10 mm) on the display of the distance for the specified width (i.e. 50 mm) is already measured, only require to fill the distance (i.e. 50 mm) of the specified width into the textbox corresponding to the height of the marker. Then select "right calibration select", thus the small horizontal line"—" can be moved in the interface, at this point, press "calibration" button and then move downward the horizontal line "—", the distance moved is the actual width (10 mm) on the display of the distance of the specified width. Finally click the "calibration" button to complete the calibration.)

By now, the screen calibration for the lift out rolls is fully completed.

2. Implementation of the length measurement of the raw glass plate

2.1 Principle:

Since the glass plate is not shown in one image plane, they are two images planes picked up by two lenses, it is necessary to know the actual length of the glass plate, used for the initial value

2.2 Operation means:

Open the width measurement panel on the above illustration, wait until the glass plate width is relatively stable, press the "left calibration select" and the "right calibration select" buttons on the width measurement panel, move on the screen a small horizontal line "—" to the positions of the finished glass edges on the left and right lenses, then click the "initial position OK" button, and at the same time give a mark on the glass when it just runs onto the lift our rolls, then find this mark just given at the marked-place at the cold end and measure to achieve the width of the raw plate. Put the width value so measured into the edit box

of "width measurement", and click "Affirm" button to complete the operation.

2.3. Calculate the real-time width of the raw glass plate basing on the glass edges which are automatically tracked by the image (two cross cursors are available at the locations of the finished glass edges to pick them up automatically) and print out the length of the raw glass plate to the screen. (Use the difference between the auto-tracked edges and the raw glass plate, and through the engineering unit converted obtained at the first step, plus or minus the actual width of the raw plate we measured at the first step, thus the real-time width of the raw glass plate is achieved). Program is available to complete this step automatically.

2.4. Detection button is used to test anywhere in the image whether the ratio of pixels corresponds to the actual widths one by one. Mobile a small horizontal line "--" on the screen to detect whether any two adjacent pixel values are equal or not; and also whether the pixel value of each grid is equal to the value of the resolution.

III. Operational matters

When the image can be seen of the glass edges on both sides, and two cross cursors are available on the image to capture the edge of glass automatically, but they fail to do so, press the width measuring button on the interface, and a dialog box pops up, adjust the button inside the dialog box for regulating contrast and brightness levels of the image to achieve more satisfactory results, so as to ensure steady capture of the centre position of the glass edges by the cross cursors, otherwise there will be too much deviation in width measurement.