HOLDTECS
术有科技

PYTHON CIS Linear Camera

PYTHON CISC

Overview

HOLDTECS CAMERA

Brand Introduction

HOLDTECS is a high-tech company,focusing on machine-vision products design and promotion.HOLDTECS CAMERA department is accumulating and promoting CIS camera in industrial production-line applications for years,and produces the series of PYTHON CIS linear array camera(PYTHON CISC),which is the only integral wide-format industrial linear array camera product in China.PYTHON CISC is in a world-wide leading position.

Product Advantage

PYTHON CISC series has the following advantages：

- The structure is simple and compact,needs small installation space.
- The reaction is rapid and needs no preheating,can start or stop immediately.
- The output image has no distortion,needs no additional image processing.
- The price is cheaper than a traditional model of CCD/CMOS with external camera lens.

PYTHON CISC uses an integral single CIS (contact image sensor) as the scanning module. Comparing with the usual wide-format scanning model of multiple CIS splicing, the output image is more accurate. The user do not need to consider the installing parallelism problem of multiple sensors splicing model, and also without the complex problems of image splicing or synchronizing.

PYTHON CISC uses camera link interface, can works in a speed of 480MB/s as the highest with video capture card. It fully meets the industrial online detection applications.

PYTHON CISC uses full closed design with alloy, effectively avoids external impact or damage to the camera, such as dust or other particles, splashing liquid, electromagnetic interference, and has a long service life.

Major Parameters

Subject	Parameter	Subject	Parameter
Effective scanning width(mm)	400/658/800/940	Control interface	RS232 (built in data interface)
Working distance(mm)	15	Trigger mode	Internal/external
Resolution(DPI)	300/600/800/1200	Image color	Mono
Line frequency(Hz)	8k/15k/24k	Pixel depth	8 bit
Data interface	Camera Link Medium	Continuous working time	≥20,000 hours

Application Field

PYTHON CISC can be used in the detection requirements of print, PCB, metal, glass, sheet, textile, film, ceramic tile, paper, panel display screen and all other flat objects. PYTHON CISC can achieve the functions like visual guiding, size measurement, appearance inspection, image recognition, engineering drawing scanning, etc.

Applications

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Python-625BW application case

High precision wide-format PCB hole inspection imaging system

Application

As a part of automatic online production line, PCB hole inspection machine is widely used in PCB manufacturing. It’ s suitable for the procedures between PCB drilling and packaging. It inspects the quantity, diameter and quality of the hole (such as jam, foreign matter, over length or over shortness,etc.), and automatically gives OK/NG judgment.

As a high precision wide-format linear camera, Python-652BW is the imaging module of the PCB hole inspection machine. It achieves the functions of PCB image capturing, image data pre-processing and data transmitting to host computer. It determines the inspection precision and efficiency.

Solution and advantage

PCB hole inspection machine consists of 4 key units: motion control, LED illumination, image capture and data process.

- Motion control unit: Including conveyor belt, PCB transporting platform, synchronous wheels of stepper motor, CIS focusing system, external trigger rotary encoder, etc.
- LED illumination unit: Providing suitable illumination for system to locate the target accurately. This can ensure sufficient image contrast and clarity.
- Image capture unit: Python-652BW captures the image of PCB, and transmits the image data to computer system by video capture card.
- Data process unit: Computer do some algorithm analyses to the captured images, to judge the quality of PCB.

PCB hole inspection machine

Hole inspection procedure:

Set the PCB on transportation platform;
Conveyor belts transport the PCB to the scanning location, right under the Python-652BW camera;
CIS scanning module captures the lights through the holes on PCB from the light source below platform;
Image data is transmitted to computer through video capture card;
Computer do algorithm analyses to the captured images, then compares with standard images to judge the quality of PCB.

The maximum inspection format of hole inspection machine is 610mm * 650mm. There are many harmful factors in the traditional application with CCD cameras:

- View field distortion: Limited by the view field angle, the images captured by CCD camera will have large distortions at the edges. This will increase the complexity and reduce the precision in the after procedures.
- Difficulties of assembly with multiple CCD cameras: To achieve a 1200mm scanning width, multiple CCD cameras will be used. The cameras should be triggered synchronously, and images captured by each CCD camera need adjustment. The key difficulties including:
  - All the cameras need to be set on the exactly same height, and need to adjust the focal length each camera, to make sure the view field range of every camera is the same.
  - Every image captured by any camera should have no deflection. Otherwise, image splicing can not be done.
  - All the view fields of every camera should be on a same single line.
  - Affected by assembly precision, shock, vibration and temperature, the device should have regular adjustment.

Compared to the traditional mode with CCD cameras, there is no long imaging optical path, no view field angle limit, 1:1 zero distortion imaging, by using Python-652BW camera. The camera accepts control of 5V or 3.3V TTL external synchronous trigger signals through video capture card, can effectively overcome the longitudinal distortion causing by mechanical vibration. It’ s convenient in hole inspection applications. It greatly reduces the costs and enhances the market competitiveness of product.

Key characteristics

- High efficiency

Super high speed Camera Link Medium MDR26 standard interface is used. Up to 480MBps.

- High resolution & multiple precision modes

1200DPI optical resolution, 800DPI and 600DPI are also can be chosen.

- Wide-format & far working distance

658mm scanning width, with no limit in length;

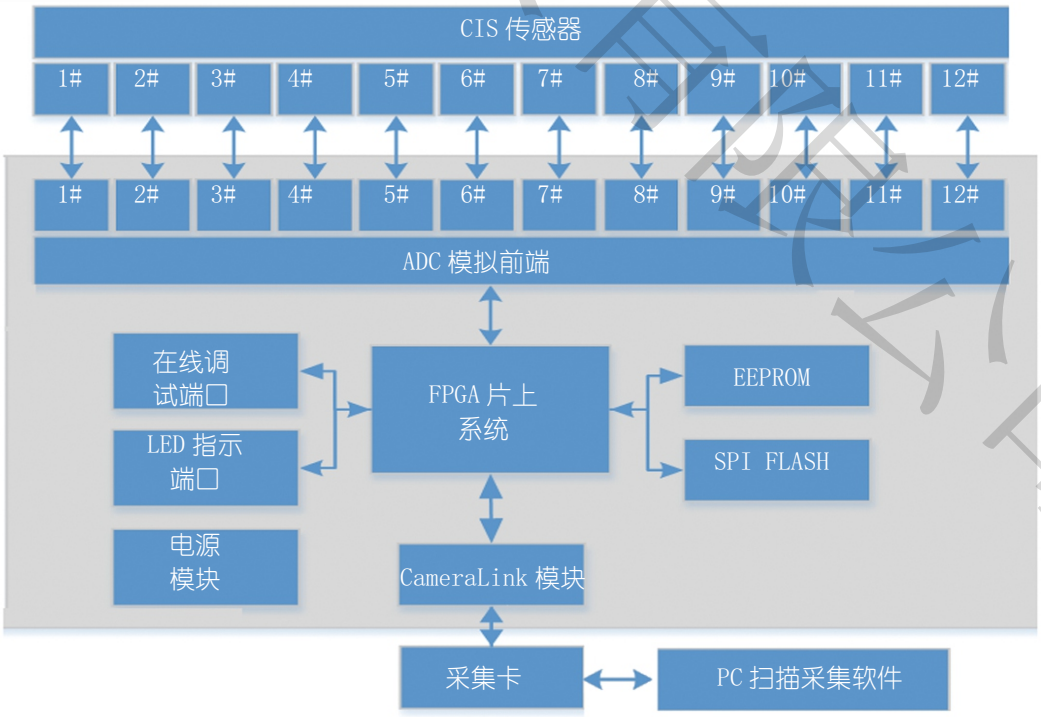
10.5mm±0.3mm working distance, avoid physical abrasion.

- High stability

Passed 200h temperature and humidity environment reliability test.

Aluminum alloy shell with fully closed design, provides dustproof, antistatic and anti EMC electromagnetic interference.

- External trigger control, overcomes the longitudinal distortion causing by mechanical vibration.
- Structure of 12 AFE + FPGA + Camera Link Medium + Customized integration CIS module.



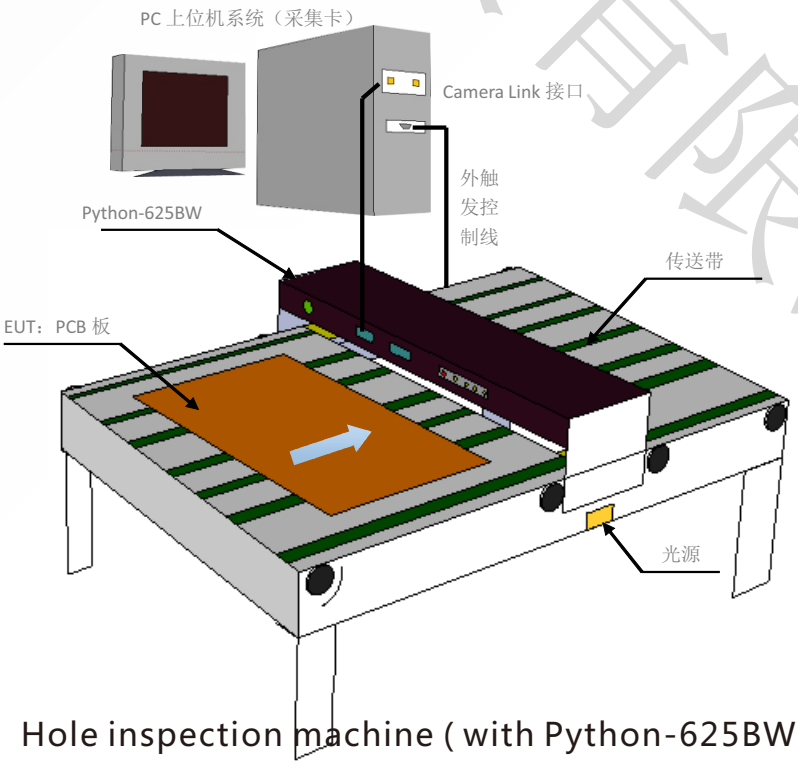
Python-625BW schematic

Specification

Item	Parameters	Item	Parameters
Product series	Python wide-format CIS linear camera	Sensor type	CIS (Contact Image Sensor)
Scan mode	Direct lighting	Image color	8bit gray level, binary
Resolution	1200DPI, 800DPI, 600DPI	Scan width	658mm
Focal length	10.5mm±0.3mm	Scan speed	120us/line Max: 480MBPS@80MHz
Data interface	Camera Link Medium MDR26	Control interface	RS232 (Compatible, built in data interface)
Camera size	732mm * 89mm * 85mm	Scan length	No limit
Power supply	DC +12V, 1A	Indicator LED	Power,Busy,Idle,Scan Speed

Key units of application

- Python-625BW camera
- PC host system (including video capture card)
- Motion control platform
- LED back lighting source

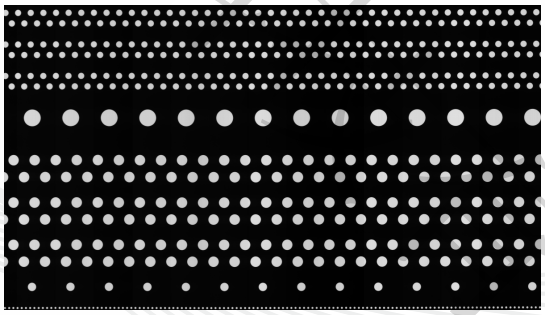


Hole inspection machine (with Python-625BW) working net

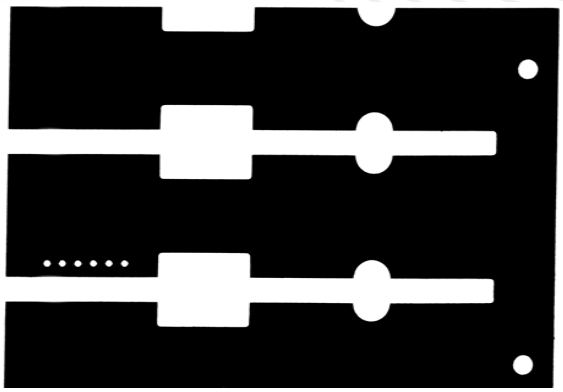
Application effect

Software on host computer automatically analyzes the defects on PCB, and gives a OK/NG judgement.

- Over large & over small: Problems on drilling bit, such as cutting edge is excessively abraded, principal axis shakes, filings are not removed well.
- Wrong number drilling: Bugs on drilling program.
- Jam (filings in the hole): Vacuum of CNC drilling machine is not enough;turning speed or lower speed is set improperly; upper pad, lower pad or PCB substrate quality problems.
- Inner wall of hole is rough, dirty, or has burr on the surface: Wrong setting parameters or drilling bit is excessively abraded without change; slow turning speed with fast lower speed, or fast turning speed with slow lower speed.
- Miss drilling: The surface of machine tool is not in horizontal position.



(a) Image of standard test board scanning in 1200DPI



(b) PCB appearance inspection image

Parameter

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Python wide-format CISC (CIS Camera) contact camera series

Product name	PYTHON CIS linear camera			
Product model	Python-400BW-CLM	Python-658BW-CLM	Python-800BW-CLM	Python-940BW-CLM
Product type	Super high speed & high precision wide-format camera	Super high speed & high precision wide-format camera	Super high speed & high precision wide-format camera	Super high speed & high precision wide-format camera
CIS basical parameter				
Single CIS length (mm)	400	658	800	940
Number of CIS	1			
Resolution	300dpi/600dpi/1200dpi	600dpi/800dpi/1200dpi	600dpi/800dpi/1200dpi	300dpi/600dpi
Line frequency (Hz)	24k/15k/8k	8k	8k	24k/15k
Power supply	DC +24V,1.0A	DC +24V,2.0A	DC +24V,1.5A	DC +24V,2.0A
Illumination	Built-in LED light source			
LED parameter	R：λp = 630nm ± 15nm 80×2mA G：λp = 520nm ± 15nm 110×2mA B：λp = 465nm ± 10nm 110×2mA	R： λp = 630nm± 15nm 140×2mA G: λp = 520nm± 15nm 280×2mA B: λp = 465nm± 10nm 280×2mA	R： λp = 630nm± 15nm 160×2mA G: λp = 520nm± 15nm 220×2mA B: λp = 465nm± 10nm 220×2mA	R： λp = 630nm± 15nm 200×2mA G: λp = 520nm± 15nm 400×2mA B: λp = 465nm± 10nm 400×2mA
Focal length	15mm±0.3mm from the surface of camera glass	15mm±0.3mm from the surface of camera glass	15mm±0.3mm from the surface of camera glass	15mm±0.3mm from the surface of camera glass
Scan width	400mm	658mm	800mm	940mm
Scan length	No limit			
Service life	20，000 hours continuous working time			
Image capture PCB				
Sensor	Contact image sensor (CIS with lens array)	Contact image sensor (CIS with lens array)	Contact image sensor (CIS with lens array)	Contact image sensor (CIS with lens array)
Control interface	RS232 (compatible, built in data interface)	RS232 (compatible, built in data interface)	RS232 (compatible, built in data interface)	RS232 (compatible, built in data interface)
Pixel depth	256 grey level	256 grey level	256 grey level	256 grey level
Image color	Monochrome	Monochrome	Monochrome	Monochrome
Valid pixel number	4752/9504/18896	15552/20736/31104	19008/25344/38016	11102/22204
Max clock frequency	80MHz	80MHz	80MHz	80MHz
Line trigger	Internal/External	Internal/External	Internal/External	Internal/External
Scan speed	39μs/line @300dpi 66μs/line @600dpi 120μs/line @1200dpi	120us/line	120us/line	39μs/line @300dpi 66μs/line @600dpi
Data interface				
Interface type	Camera Link Medium	Camera Link Medium	Camera Link Medium	Camera Link Medium
Video capture card				
Attached or not	No (need camera link video capture card to use)	No (need camera link video capture card to use)	No (need camera link video capture card to use)	No (need camera link video capture card to use)
Product exterior				
Camera size (length*width*height)	478*65*83.7mm	734*65*83.7mm	878*65*83.7mm	1030*65*83.7mm
Working mode & environment				
Scan mode	Direct lighting with back illumination/Reflective lighting with built-in illumination	Direct lighting with back illumination/Reflective lighting with built-in illumination	Direct lighting with back illumination/Reflective lighting with built-in illumination	Direct lighting with back illumination/Reflective lighting with built-in illumination
Working environment temperature	5℃~45℃	5℃~45℃	5℃~45℃	5℃~45℃
Storage environment temperature	-25℃~70℃	-25℃~70℃	-25℃~70℃	-25℃~70℃
Working environment humidity	10%RH~90%RH	10%RH~90%RH	10%RH~90%RH	10%RH~90%RH
Product characteristic				
Python camera characteristic	Wide-format, high precision, high resolution, no distorsion	Wide-format, high precision, high resolution, no distorsion	Wide-format, high precision, high resolution, no distorsion	Wide-format, high precision, high resolution, no distorsion
Product application				
Application field	Print, PCB, board, paper, liquid, etc.	Print, PCB, board, paper, liquid, etc.	Print, PCB, board, paper, liquid, etc.	Print, PCB, metal, glass, sheet, textile, film, ceramic tile, paper, panel display screen, etc.
Usage purpose	visual guiding, size measurement, appearance inspection, image recognition, engineering drawing scanning, etc.	visual guiding, size measurement, appearance inspection, image recognition, engineering drawing scanning, etc.	visual guiding, size measurement, appearance inspection, image recognition, engineering drawing scanning, etc.	visual guiding, size measurement, appearance inspection, image recognition, engineering drawing scanning, etc.
Application case		PCB wide-format hole inspection machine	PCB wide-format hole inspection machine	
Product weight				
Weight (kg)	< 4.5	< 7	< 8.5	< 10