MACHINE VISION POSITIONING AND DETECTION SYSTEM

Field of the Invention

The present invention relates to the technical field of object detection, specifically to a machine vision positioning and detection system.

Background to the Invention

A detection system based on machine vision is a highly practical and meaningful system. It utilizes image processing and pattern recognition technologies in machine vision to achieve intelligent object detection, enabling barcode tracing and defect detection of objects, such as missing parts, wrong parts (R, C, and L), measurement of pin bending, and inspection of solder feet alignment. This system offers advantages such as fast detection speed, high positioning accuracy, and strong practicality. It can be applied in the engineering field of object detection and assembly line operations.

Currently, object detection generally relies on manual inspection, which is prone to high error rates and inaccuracies. It also increases labor intensity and production costs, making it imperative to develop improved solutions.

Statement of Invention

The purpose of the present invention is to provide a machine vision positioning and detection system to solve the problems mentioned in the background technology.

To achieve the above objective, the present invention provides the following technical solution: a machine vision positioning and detection system, comprising an operating platform, a contact sensor, centering plates, and transmission rods. First device bracket and second device bracket are symmetrically installed at the top of the operating platform. A first lead screw is connected inside second device bracket, which extends to the front side of second device bracket and is equipped with second motor. Bidirectional threads are symmetrically connected to the outer surface of the first lead screw, with each

bidirectional thread sleeved by a moving block. Guide rods are arranged inside the top portions of the two moving blocks and are fixed above the first lead screw. The bottom portions of the two moving blocks are connected to sleeve blocks. Transmission rods are symmetrically hinged on the inner sides of the sleeve blocks, and the outer ends of the transmission rods are hinged to guide blocks. Centering plates are symmetrically arranged between the two sleeve blocks, and the sides of the centering plates that are farthest from each other are symmetrically connected with guide grooves that match the guide blocks. A contact sensor is installed on the side surface of the contact sensor. Expansion tension springs are hinged to both the top and bottom of the sleeve blocks, with the other ends of the expansion tension springs hinged to the surfaces of the transmission rods.

Preferably, a conveyor belt motor is installed on the front side of the operating platform, and the conveyor belt motor is electrically controlled by the contact sensor.

Preferably, a second lead screw passes through the top of first device bracket, with first motor installed at the upper end of the second lead screw. A unidirectional thread is connected to the lower end of the second lead screw, and a moving cylinder is sleeved on the outer surface of the unidirectional thread. A monitoring camera is installed at the bottom of the moving cylinder. A guide sliding sleeve is connected to the top of one side of the moving cylinder, and a guide sliding rod is arranged inside the guide sliding sleeve. The upper end of the guide sliding rod is fixed to the top inside first device bracket.

Preferably, the monitoring camera includes an image acquisition device, and a display is arranged between first device bracket and second device bracket. The display is electrically connected to the image acquisition device.

Preferably, the monitoring camera is electrically connected to the contact sensor, and the contact sensor is electrically connected to first motor.

The beneficial effects of the present invention compared to the existing technology are:

(1) The machine vision positioning and detection system assists the two moving blocks in driving the centering plates to move toward each other through the combination of second motor, bidirectional threads, moving blocks, and the guiding function of the guide rod. The

expansibility of the expansion tension springs, together with the guiding blocks connected to the front ends of the transmission rods, allows for guided sliding along the guide grooves, enabling the two centering plates to maintain long-term clamping on the object. This facilitates the centering operation of the object and makes it convenient for the monitoring camera to position and collect data on the object, thereby improving detection accuracy and stability.

(2) The machine vision positioning and detection system adjusts the height range of the monitoring camera through the combination of first motor, second lead screw, guide sliding sleeve, guide sliding rod, and unidirectional thread. The guide sliding sleeve provides sliding guidance along the guide sliding rod while limiting the movement of the moving cylinder to a linear up-and-down motion along the unidirectional thread. This height adjustment improves the precision of object detection.

(3) The machine vision positioning and detection system utilizes the contact sensor to sense and determine the positioning status of the object. Upon detecting an object, the contact sensor transmits a signal to stop the conveyor belt motor and controls first motor to adjust the monitoring camera to the appropriate height. The monitoring camera then conducts the positioning detection of the object, and the image acquisition device inside the monitoring camera transmits the collected data to the display for presentation. This enhances the sensitivity of the machine vision system, thereby improving efficiency. Not only does it achieve higher detection accuracy, but it also significantly reduces detection time.

Brief Description of the Drawings

FIG. 1 is a front structural schematic diagram of the present invention, wherein: 1. Operating platform; 2. First device bracket; 3. First motor; 4. Display; 5. Second device bracket; 6. Second motor; 7. Conveyor belt motor.

FIG. 2 is a side structural schematic diagram of the connection between second device bracket and the operating platform of the present invention, wherein: 1. Operating platform; 5. Second device bracket; 6. Second motor; 7. Conveyor belt motor; 8.

Bidirectional thread; 9. Sleeve block; 10. Guide groove; 11. Contact sensor; 12. Centering plate; 13. Guide block; 14. Expansion tension spring; 15. Moving block; 16. First lead screw; 17. Transmission rod; 25. Guide rod.

FIG. 3 is a side structural schematic diagram of the connection between first device bracket and the operating platform of the present invention, wherein: 1. Operating platform; 2. First device bracket; 3. First motor; 18. Second lead screw; 19. Guide sliding sleeve; 20. Guide sliding rod; 21. Monitoring camera; 22. Unidirectional thread; 23. Moving cylinder.

FIG. 4 is a first schematic diagram of the system connection structure of the present invention, wherein: 3. First motor; 7. Conveyor belt motor; 11. Contact sensor; 21. Monitoring camera.

FIG. 5 is a second schematic diagram of the system connection structure of the present invention, wherein: 4. Display; 21. Monitoring camera; 24. Image acquisition device.

Detailed Description

The technical solutions in the embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings. Based on the embodiments of the present invention, all other embodiments obtained by those of ordinary skill in the art without creative efforts shall fall within the protection scope of the present invention.

Referring to FIGs. 1–5, one embodiment provided by the present invention is a machine vision positioning and detection system, which comprises an operating platform 1, a contact sensor 11, centering plates 12, and transmission rods 17. First device bracket 2 and second device bracket 5 are symmetrically installed on the top of the operating platform 1. A first lead screw 16 is connected inside second device bracket 5, and the first lead screw 16 extends to the front side of second device bracket 5 and is equipped with second motor 6. Bidirectional threads 8 are symmetrically connected to the outer surface of the first lead screw 16, and each bidirectional thread 8 is sleeved with a moving block 15. The cooperation of second motor 6, bidirectional threads 8, moving blocks 15, and the

configuration of the first lead screw 16, in cooperation with the guiding function of the guide rod 25, assists the two moving blocks 15 in driving the centering plates 12 to move toward each other.

Guide rods 25 are arranged inside the top portions of the two moving blocks 15, and the guide rods 25 are fixed above the first lead screw 16. The bottom portions of the two moving blocks 15 are connected to sleeve blocks 9. Transmission rods 17 are symmetrically hinged on the inner sides of the sleeve blocks 9, and the outer ends of the transmission rods 17 are hinged to guide blocks 13. Centering plates 12 are symmetrically arranged between the two sleeve blocks 9, and the sides of the centering plates 12 that are farthest from each other are symmetrically connected with guide grooves 10 that match the guide blocks 13. A contact sensor 11 is installed on the side surface of the contact sensor 11 for sensing objects. When the positioning status of the object is detected, the contact sensor 11 transmits a signal to stop the conveyor belt motor 7 and controls first motor 3 to adjust the monitoring camera 21 to a suitable height, whereupon the monitoring camera 21 performs positioning and detection of the object.

Expansion tension springs 14 are hinged to both the top and bottom of the sleeve blocks 9, and the other ends of the expansion tension springs 14 are hinged to the surfaces of the transmission rods 17. The expansion function of the expansion tension springs 14, combined with the guiding function of the guide blocks 13 connected to the front ends of the transmission rods 17, allows for guided sliding along the guide grooves 10. This assists the two centering plates 12 in maintaining long-term clamping on the object, facilitating the centering operation of the object and enabling the monitoring camera 21 to position and collect data on the object. This improves detection accuracy and stability. The image acquisition device 24 inside the monitoring camera 21 transmits the collected data to the display 4 for presentation, enhancing the sensitivity of machine vision and increasing efficiency. It not only achieves higher detection accuracy but also significantly reduces detection time.

The other end of the expansion tension spring 14 is hinged to the surface of the transmission rod 17.

A conveyor belt motor 7 is installed on the front side of the operating platform 1, and the conveyor belt motor 7 is electrically controlled by the contact sensor 11.

A second lead screw 18 passes through the top of first device bracket 2, and first motor 3 is installed at the upper end of the second lead screw 18. A unidirectional thread 22 is connected to the lower end of the second lead screw 18, and a moving cylinder 23 is sleeved on the outer surface of the unidirectional thread 22. The bottom of the moving cylinder 23 is equipped with a monitoring camera 21, and a guide sliding sleeve 19 is connected to the top of one side of the moving cylinder 23. A guide sliding rod 20 is arranged inside the guide sliding sleeve 19, and the upper end of the guide sliding rod 20 is fixed to the top inside first device bracket 2. The cooperation of first motor 3, second lead screw 18, guide sliding sleeve 19, guide sliding rod 20, and unidirectional thread 22 assists the guide sliding sleeve 19 in providing sliding guidance along the guide sliding rod 20, limiting and assisting the moving cylinder 23 in moving linearly up and down along the unidirectional thread 22. This is used to adjust the height range of the monitoring camera 21, making it convenient for adjustment and improving the precision of object detection.

The monitoring camera 21 includes an image acquisition device 24. A display 4 is arranged between first device bracket 2 and second device bracket 5, and the display 4 is electrically connected to the image acquisition device 24.

The monitoring camera 21 is electrically connected to the contact sensor 11, and the contact sensor 11 is electrically connected to first motor 3.

When in use, the contact sensor 11 is utilized to sense objects. When the object’s positioning status is detected, the contact sensor 11 transmits a signal to stop the conveyor belt motor 7 and controls first motor 3 to adjust the monitoring camera 21 to a suitable height. The monitoring camera 21 then performs positioning and detection of the object, and the image acquisition device 24 inside the monitoring camera 21 transmits the collected data to the display 4 for presentation. This enhances the sensitivity of machine vision, improving efficiency, achieving higher detection accuracy, and significantly reducing detection time.