

Design and Fabrication of Automatic Weight Sorting Machine

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Abstract: Sorting of items is an important action that is employed in many aspects of daily life for the benefit of convenience. Sorting was mostly done manually and reliant on human judgments until a few years ago. Sorting systems are a more practical and cost-effective way to automate. The main goal of the sorting system is to reduce manpower while improving product quality and efficiency. In the current context, most sorting systems use criteria such as colour, size, and material type, but they come with drawbacks such as environmental sensitivity, high cost, and complexity. Weight is used as a sorting criterion in this paper's proposed sorting system. The constructed machine tries to use mechanical and electronic components in conjunction with one another.

Keywords: Automatic sorting, Weighing mechanism, Load cells, Controller, etc.

I. INTRODUCTION

Sorting is the process of systematically arranging items. This procedure must be followed in different aspects of daily life. Consumers nowadays are looking for high-quality products. Sorting of new lots is done in the potato chip industry to assure the quality of raw materials utilised in the subsequent procedure. Size, colour, and weight are examples of sorting criteria. Unlike other factors, weight is one that cannot be predicted or calculated only by eye inspection. When the weight of the object is the design metric for sorting, the proposed system can be useful. Most sorting methods currently in use are based on principles such as machine vision, image processing, fuzzy logic, density difference, and others, all of which have limitations.

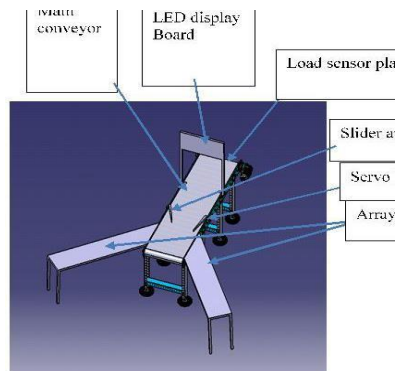
Machine vision technology can effectively classify fine things such as tablets, but it has downsides such as a costly initial investment and software needs. The image processing equipment includes expensive sensors and high-resolution cameras. Furthermore, the performance of such devices is influenced by the lighting conditions in the workplace. Complex programming is required for fuzzy logic, which necessitates a high level of competence. Density difference is used as the sorting parameter in fully mechanical systems, resulting in inaccuracy and low efficiency. For sorting things, certain electromechanical systems combine proximity sensors with a pneumatic system. Other systems based on weight necessitate expensive and energy-intensive components such as compressors and pneumatic auxiliaries.

The manufactured machine can achieve the goal of sorting the things according to their weights. Because the system is automatic, it does not require an operator, which removes the human errors that manual sorting might cause. The machine's efficiency significantly reduces the amount of time necessary for sorting.

The purpose of this project is to save the time for inspection and to reduce the efforts of the workers in material handling. An automatic sorting machine has main task of sorting components according to the sizes. This also consist of conveyor belt, which reduces the efforts of material handling. Also, both processes take place simultaneously viz material handling and inspection. A sorting machine is more practical and economical method of automation, which transfers material from one point to another. The design is quite simple and of flexible use, means only conveyor belt can be used for material handling.

The objective of the fabrication of the proposed machine is to overcome most of the above drawbacks and come up with an economical and simple system which is relatively easier to operate.

Construction:



The drive is given to the head pulley. The material is fed on to the conveyor at head pulley. The product used for testing is a cubical product. So now the cubical product is kept above head pulley. Now the switch which is situated at conveyor belt is made on. Now the conveyor will start. The sensor which is situated just before pushing mechanism, will sense the product and the signal is sent to micro controller. There the calculations will be done and the decision has taken that which type of the product is this. After that, the product will be travelled to tail pulley. The signal will be now given to pushing mechanism. After identifying the product, the conveyor will be get automatically switched off. So after stopping of the conveyor, corresponding mechanism will be get actuated as per received from the microcontroller, and the products will be get sorted.

Objectives:

1. To increase the lead time of the process.
2. To avoid errors that arise due to manual sorting and time lost due to errors.
3. To increase the production of the industry.
4. To avoid opting for high-cost consuming system.
5. To reduce the complexity of sorting systems.
6. To increase the economy, production and status of an industry with the current competitors.

Components used:

1. Conveyor belts
2. Load cell plate
3. Servo Motor
4. Weight Detection Sensor

Conveyor Belt:

A belt conveyor system's carrying medium is a conveyor belt (often shortened to belt conveyor). Conveyor systems come in a variety of shapes and sizes. A belt conveyor system comprises of two or more pulleys (also known as drums) that spin around an unending loop of carrying medium, the conveyor belt. The belt and the material on the belt are moved forward by one or both of the pulleys being powered. The drive pulley is the powered pulley, whereas the idler pulley is the unpowered pulley.

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There are two main industrial classes of belt conveyors; those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport large volumes of Resources and agricultural material as grain, sat, coal, ore, sand, overburden and more.

Load Cell Plate:

A sensor plate for use in a load cell for use in an electronic scale includes a planar first surface; a planar second surface opposite the first surface with a depression defining a flexure area; a load cavity formed in the second surface with a conical receptacle end for receiving a strut; and sensors disposed over the flexure area for generating a signal in response to a load applied to the loading cavity. The strut has a first conical projection end attached to the conical receptacle end of the loading cavity and a second end coupled to a footer member, and the strut mechanically floats between the two to provide the applied load at a fairly centre position at the load cavity.

Servo Motor:

A servo motor is a rotary or linear actuator that can control angular or linear position, velocity, and acceleration precisely. It is made comprised of an appropriate motor and a position feedback sensor. It also necessitates a complex controller, which is frequently a separate module created exclusively for servo motors. Here it will be used to move slider arms.

Weight Detection Sensor:

A gadget that measures force and load is a weight sensor. Weight is converted into an electrical signal that may be processed and used in a variety of applications. The majority of weigh sensors employed internal strain gauges to measure force and weight.

A weight sensor is a type of transducer, specifically a weight transducer. It converts an input mechanical force such as load, weight, tension, compression, or pressure into another physical variable, in this case, into an electrical output signal that can be measured, converted and standardized.

II. METHODOLOGY:

- Material selection Design calculation
- Finalizing concept 3D model and drafting
- Find out literature survey, gathered Research paper
- Learned about Design and Fabrication of Automatic Weight Sorting Machine
- Describe literature gap, Identify need of project.

III. LITERATURE SURVEY

RESEARCH PAPER	AUTHOR	REMARK
1] “Automatic Object Sorting Machine”	Prof. S. K. Latad, Pallavi Dhole, Rupali Sonare, Akshay Kukadkar, Pawan Mankar	This paper describes a working prototype designed for automatic sorting of objects based on the color.
2] “Design and Fabrication of Automatic Weight Sorting Machine	Yuvraj S. Kumbhar , Chaitrani M. Shete , Omkar M. Kulkarni , Ghansham B. Firame	. Sorting system is more practical and economical method of automation. Main aim of sorting system is to save man power and improve quality and efficiency of the product.
3] “Automatic Sorting Machine”	Aashika Prasad , M. Gowtham , S. Mohanraman , M. Suresh	. This paper aims at providing significant low-cost automation in packaging industries that calls for sorting and how the implication of pneumatics can yield a desirable solution..

IV. FUTURE SCOPE

The machine can be modified to serve as per the requirement for various applications. For the quicker sensing of an object proximity sensors can be used. Accuracy of the machine can be further improved by the use of load cells of different load ranges and better specifications. With little changes, this machine can be used for the sorting of smaller objects like capsules or industrial parts. It can also be used for the sorting of highly valuable objects like diamonds with an increase in accuracy and precision.

V. CONCLUSION

The objective of sorting the objects according to their weights can be accomplished by the fabricated machine. Since the machine is automatic, it does not require an operator which eliminates the human errors incurred by the manual sorting. The efficiency of the machine reduces the time required for the sorting operation to a great extent.

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