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Automatic Conveyor Belt System with Robotic Arm: A Review

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Abstract: Today is the world of technology and every company has need to increase their production rate with optimize the profit. Generally in production industry problems are identify in materially handling system, counting of finish product and etc. but most effective problems identify in material handling system its largely effecting the production rate of the industry's because of time consummation. Most of the company follows traditional material handling system and small sale industry's does not utilize material handling system. In traditional material handling system so many problems are identify so that to avoiding the problems "Automatic conveyor belt system with robotics arm" is solution on that. It is the automatically transporting the finish product from one place to another place as well as pick & place the finish product with the help of robotics arms. In which color detecting sensors are used for sorting the product according to its color code, motion predicts sensors with alarm also used for safety precaution for workers. Robotic arm will be control with help of microcontroller Automation mainly focuses on developing automations having low cost, low maintenance, long durability and to make systems user friendly as possible. Application of the system at production industries, small scale industries, automobile industry, thermal industry and etc.

Keywords: IR sensors, Motion predict sensors with alarm, microcontroller, developing automation having low cost, Robotics arm.

I. INTRODUCTION

The development of production industries is dependent upon research in manufacturing process and innovation in new products as well as automation. Today all over the industry's following new innovative ideas, technics, methods and etc. hence in result growth of production industry and manufacturing industries.

During processing raw material transported for produced product and give it new shape, size and value. The prize of finish product is more than raw material because so many operations are performs on the raw material to give it desert shape and size with less consummation of time. In last recent days manufacturing industry manufacture the products with different colour, size, shape and height. In old days it was possible to implement manual labour for sorting similar objects. but nowadays due to increased production and for minimizing the labour expenditure for such unskilled task, industries can't afford human errors for sorting these products as well as new technology every company need high production rate so that it will produce similar size in shape, height and colour its helps to production rate but during the transportation system it follow difficulty during counting the finish product, sorting product according to colour and pic and place. This reasons behind every company replace there company in atomize and give it new looks with less error in production and increase its profit. An economy factor is most considerable factors in industries so it's necessary to development low cost management during automation set up hence this system is most beneficial to economy.

In this project development the low cost automation system in which used the robotics arm, microcontroller, sensors, IR sensors ad etc. is used for transporting the finish product from one place to another place with automation. Before starting the project we are doing the internship at manufacturing company so during that observe workers is most time is wasted during the transporting the work piece from place to another place hence result ideal time will be increases that effecting the production rate of company. If this project is development in company in very low cost which beneficial to company as well as increases production rate. In this project two stations are develop first primary station and second is main station. In first station after completing the operation over work piece will come on conveyor belt system then it will me detecting the colour according to its coating and counting the work piece with help of sensor. The counting of work piece will be display over the LED display. After counting work will be comes on main station of conveyor belt, work piece comes toward storage house in which sorting that as per the colour coding with help of sensors. Robotics arm will be help to pick & place the work piece and store in container as per color. The robotic arm will be control by microcontroller and conveyor belt will be driven by D.C. motors. Again extra arrangement of IR sensors or human detecting sensors used which help to detecting human body as per the particular distance from conveyor belt system.

II. LITERATURE REVIEW

Some experimental on conveyer belt, robotic arm and sensor has been done in the last decades. Both the industrial and academic people have taken interest in this area. The following is a review of the research that has been completed especially on it.

Rudresh. H. G And Prof. Shubha.P [1], They studied on Colour Sensor Based Object Sorting Robot. Their Project deals with an automatic material handling system. It coordinates the movement of robotic arm pick the items moving on the conveyor belts. It aims in organizing the coloured objects which are approaching on the conveyor by picking and placing the objects in its separate located place. There by reducing the tedious work done by human, accomplishing accuracy and rapidity in the work. Their project includes colour sensors that senses the items color and lead the signal to the controller. The microcontroller guides signal to the motor driving circuit which drives the different motors of the robotic arm to grasp the object and place it in the correct location. Depending upon the colour sensed the robotic arm go's to the correct location to releases the object and comes back to the normal potion. Priyadharshini V, Saranya L, And Srinivasan R [2], they investigated experimentally analytically on robotic arm for pick & place operation using matlab based on offline surface clustering algorithm. The main objective of their research is to detect maximum objects within shorter duration for performing robotic arm pick and place task using offline surface clustering algorithm. The pick and place robot is a microcontroller based mechatronic system that detects the object, picks that object from source location and place it at desired location. An implementation of automatic robotic pick & place operation is a long term process as it requires a complex algorithm, sensors and processors for governing the robotic arm movement towards the detected object accurately. They developed the prototype of robotic arm movement. The foremost idea of their project is to perform Object detection by image processing algorithm using MATLAB software. The detected objects are transmitted to the microcontroller unit through zigbee to perform robotic arm pick & place task and the zigbee technology has been used to control the robotic arm movements. Dharmannagari Vinay Kumar Reddy [3], He studied on sorting of objects based on colour by pick and place robotic arm and with conveyor belt arrangement. This research aims at the problem he was attempting to solve was to create an autonomous robot that could identify objects when placed on the conveyor belt based on color sensing and then sort by relocating them to a specific location. It would be using a picking arm which uses a controller motor to pick the particular object from the conveyor belt and place it according to the color sensing. Micro controller (AT89S52) allows dynamic and faster control. Liquid Crystal Display (LCD) makes the system user-friendly. AT89S52 Micro controller is the heart of the circuit as it controls all the functions. Dhanoj M, Reshma K, Sheeba V and Marymol P [4], they studied on colour sensor based object sorting robot using embedded system. This research presents an application to sort colored objects with a robotic arm. They have a robotic arm which picks different colored cubes and sorts them placing in different cups. The detection of the particular colour is done by a light intensity to frequency converter method. The robotic arm is controlled by a microcontroller based system which controls DC servo motors. S. V. Rautu et.al. [5], They studied on sorting of objects based on colour, weight and type on a conveyor line using PLC. They have proposed an efficient method which uses load cell, inductive sensor and TCS 230 colour sensor for identifying and segregating on the basis of weight, colour and type (metal or non-metal) of object and Siemens 300 Series PLC to control the overall process of sorting two types of objects. The system rejects and discards objects that are not of required characteristics by pushing them out of conveyor line using a flipper mechanism. A circular container, having three partitions is used to collect objects of three different colours. Two conveyor belts were used, each controlled by separate DC motors. The first belt is for placing the product to be analysed by the load cell and inductive sensor, which also contains a colour sensor at the end for one type of segregated object and the second belt also, has a colour sensor for the components separated by the load cell and inductive sensor.

III. PROPOSED WORK

A. Block diagram: - project assembly line illustrate in given below fig.

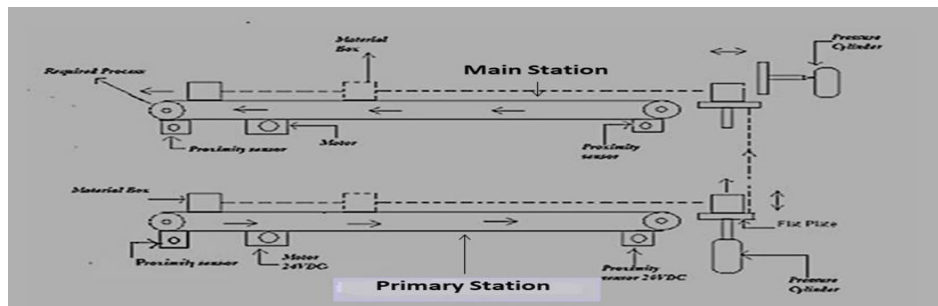


Fig.1: Block diagram conveyor system

B. Existing system

- 1) **Robot Base System:** The robotic arm is controlled using servo motors whose degree of rotation is controlled by the on timer of the pulse rail appearing at its control inputs. The programming of robotics arm is controls by microcontroller control the moments of arm. In this project robots play important role because it will help to pick and place the work piece from conveyor belt to storage house.



Fig.2: Robotic Arm

- 2) **Sensor Base System:** The advance system of carton sorting is according to weight, old system was based on sensor. There were some systems which counts that how many objects are going from the conveyor belt. Sensors are used in robotics system also as like tactile sensors, proximity sensors, range sensors and etc.



Fig.3: Sensor

- 3) **Microcontroller Base System:** The microcontroller based systems are having kind of artificial efficiency as microcontroller can be programmed as per the system requirement. The microcontroller is programmed to count the carton passing from conveyer and also to measure color of carton box. As this system has its drawback on microcontroller measuring.

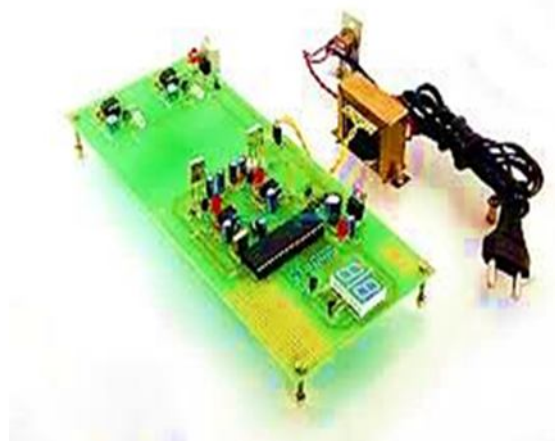


Fig.4: Microcontroller

- 4) **Motion Detecting PIR Sensors:** To develop a motion sensor alarm based on a Passive Infra-Red (PIR). This is aim to build a sensor system which is transmit and receive the signal. This is about the motion detection using Infra-Red sensor. With the help of buzzer, we can identify the motion of human which was detected by the sensor.



Fig.5: Motion detecting PIR sensors

C. Data required

- 1) Phase AC induction motor
- 2) Conveyor belt
- 3) DC geared motor
- 4) Different type of sensors
- 5) Microcontroller
- 6) LED display

D. Design calculation

- 1) Conveyor belt stand are of 63cm length
- 2) Width of stand is 24cm.
- 3) Conveyor belt is powered with a direct current supply motor of (12v).
- 4) Robotic arm's gripper movement is about 0 to 180 degree.
- 5) Robotic arm runs on a servo motor of 5 volt.

E. Selection parameter

- 1) *Robotic arm*: -Robotic arm will be used for pick and place the product with 4 to 5 degree of freedom. This robot is scara fixed type of robot because we need of assembly only give flexible motion from fixed position.
- 2) *Sensors*: -The sensors are used for color detecting and human distance from particular position. It also play important role in low cost.
- 3) *Microcontroller*: -With help of microcontroller programing is done which is help to give perfect motion and controlling speed of D.C. motor. This is only just prototype that's way PLC is replaced by microcontroller and PLC is hardware is system it is used for high performance.
- 4) *Conveyor belt*: -Conveyor belt used for transfer work piece one place to another place with D.C. motor. Conveyor belt speed is control by microcontroller programming. The dimension of conveyor belt is 24*63cm in length.
- 5) *IR sensors*: -An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

IV. CONCLUSIONS

This Project idea when implemented commercially will result in efficient monitoring and control of industrial automation i.e. monitoring and controlling of conveyor belt. Hence easily handling the martial does not required initial effort and save time as well as reduction in ideal time where wastage in traditional conveyor belt system.

V. FUTURE SCOPE

- A. It can be used in manufacturing industries and development in production line.
- B. It has a great scope in automation industries.
- C. It can be used in industrial level to sort material according to their colour.
- D. The system can be detecting the color of an object by sensing the light reflected by it.
- E. The system can be interface with a microcontroller to detect a wide range of colour shaded.



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