Pick and Place System for Parallel Conveyor

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Abstract— Automation in various forms constitutes the backbone of most major industries. An increase in production volume, product variety and manufacturing process complexity necessitates automation to ensure consistency and profitable production. In our project we design and develop the multiple gripper machines for the pick and place automation. For the packaging of the medicine, bottles etc. Now a day's mostly in all industry robotic arms is used for pick and place. The robotic arm uses the programmable logic controller and supervisory control. Therefore the cost of robotic arm is high and also the cycle time for the robotic arm is high. Our system is replacing the robotic arm system. This uses the multiple grippers, embedded system and sensors. It has some exotic features like timer, counter, mathematical operations, etc.

Key words: Gripper, Automation, Cost Reduction

I. INTRODUCTION

In industrial life time and cost are major factor for mass and quality production. Material handling is necessary in industrial production for moving material from one place to another place and for storage. Manual material handling system is time consuming and risky. It includes human error and difficult to handle heavy material. By adding automation in material handling reduces time, operational cost and human efforts. Pick and place is one of the advance system for automated material handling. Recently, automation technologies and advanced information technologies have been applied to logistics industries. For example, in distribution center computer-aided picking systems (CAPS) using light to pick or automated picking systems have been used. Using these systems, workers do not need picking lists to check the items and quantities of products. It could improve productivity of workers and operational efficiencies. However due to the variety of customer demand manual work remains still a important factor. There are some limitations of the automated systems such as abnormalities, extraordinary treated product while human workers can do with flexibility. However, conventional manual operations are performed without considering cognitive aspects for instance seeking the location and counting the quantity of items. To improve accuracy and productivity of order picking systems, it is recommended which use hybrid operation of manual works and automated works.

II. PROPOSED SYSTEM

Fig. shows block diagram of the system. There are two types of motors are used in our system. One DC motor of 5 Rpm and a DC motor of 10 Rpm. As per the specification of DC motor it gives continuous speed therefore Dc motor is used for conveyor belt. We are using two conveyors which are parallel to each other. There is one DC motors is used in gripper to move downward and upward. For all the DC motor we are going to use motor driver which is L293D.In between the both conveyor we are using a circular disk and for that We are using the 10 rpm DC motor for rotating the disk .On circular disk the gripper assembly and gripper will be fixed. One DC motor is used in gripper arm to pick the component and to drop the component. We are using IR sensor for detecting the object and its position for gripper who pick the object and placed it on second conveyor. All the components of the block diagram is controlled by a controller which is an ARM 7 controller in the replace of the PLC'S for the cost reduction of the project because, plc's are very costly. We are using 16x2 LCD for displaying total count of the picks and placed components.
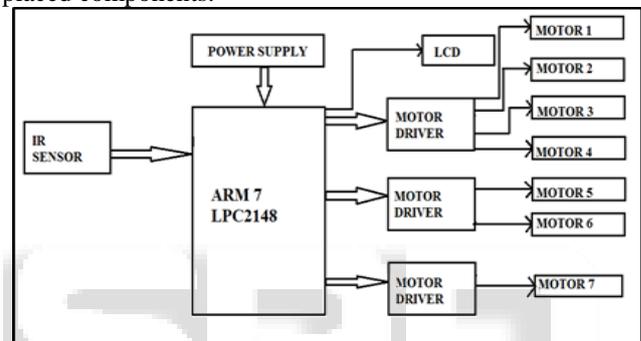

Fig. 1: Block diagram

A. Arm 7 (LPC 2148)

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer.

1) Features:

− 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory. 128 bit wide interface/accelerator enables high speed 60 MHz operation.

− In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.

− Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high speed tracing of instruction execution.

− USB 2.0 Full Speed compliant Device Controller with 2 kB of endpoint RAM. In addition, the LPC2146/8 provides 8 kB of on-chip RAM accessible to USB by DMA.

− One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 us per channel.

− Single 10-bit D/A converter provides variable analog output.

- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power real-time clock with independent power and dedicated 32 kHz clock input.
- Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 k bit/s), SPI and SSP with buffering and variable data length capabilities.
- Vectored interrupt controller with configurable priorities and vector addresses.
- Up to 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64 package.
- Up to nine edge or level sensitive external interrupt pins available.
- On-chip integrated oscillator operates with an external crystal in range from 1 MHz to30 MHz and with an external oscillator up to 50 MHz
- Power saving modes include idle and Power-down.
- Individual enable/disable of peripheral functions as well as peripheral clock scaling for additional power optimization.
- Processor wake-up from Power-down mode via external interrupt, USB, Brown out Detect (BOD) or Real-Time Clock (RTC).

Fig. 2: IC of LPC2148

B. Conveyor belt

A conveyor belt is the carrying medium of a belt conveyor system .A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or more pulleys with an endless loop of carrying medium the conveyor belt that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley. Those in general material handling such as those moving boxes along inside a factory and bulk material handling. In our project we are using two conveyor which are placed parallel to each other. It is an pick and place arrangement on conveyor which are parallel to each other.

.Fig. 3: Conveyor belt

C. DC Motor

DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. We are using two types of dc motors.

1) Dc motor 5 rpm.
2) Dc motor 10 rpm.

In our pick and place project we are using seven DC motor in which six motors are 5rpm DC motor and one 10rpm DC motor is used. The 5rpm DC motor are used in both conveyor belt and aso used for gripper assembly which is for gripper upward and downward motion. One motor is used for gripper for gripping the object. The 10rpm DC motor is used for rotating the circular disk
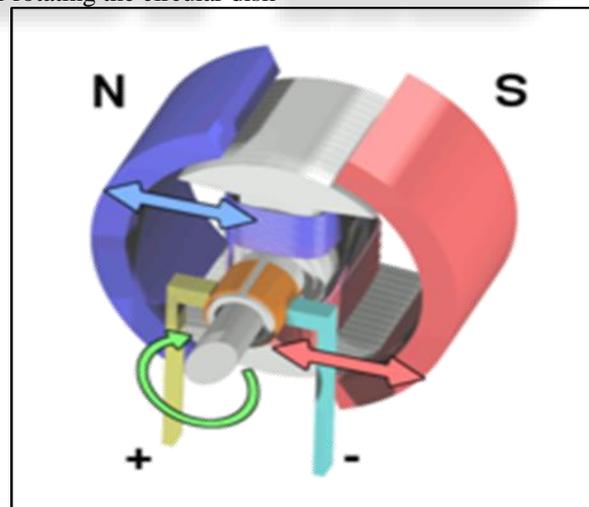

Fig. 4: DC Motor Concept

D. IR Sensor

The sensor works by detection reflected light returning from its own infrared light-emitting diode. By measuring the quantity of reflected infrared emission, it will observe light or dark lines or maybe objects directly ahead of it. AN onboard RED light-emitting diode is employed to point the presence of an object or notice line. Sensing vary is adjustable with intrinsic resistor. The device includes a 3-pin header that

connects to the microcontroller board via feminine to feminine or feminine to male jumper wires. A mounting hole for simply connect one or additional device to the front or back of your mechanism chassis
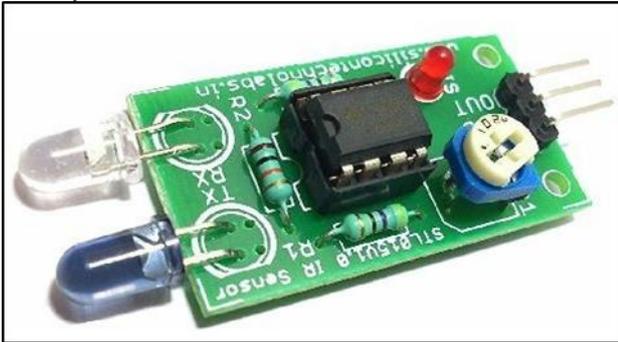

Fig. 5: IR Sensor Module

E. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.
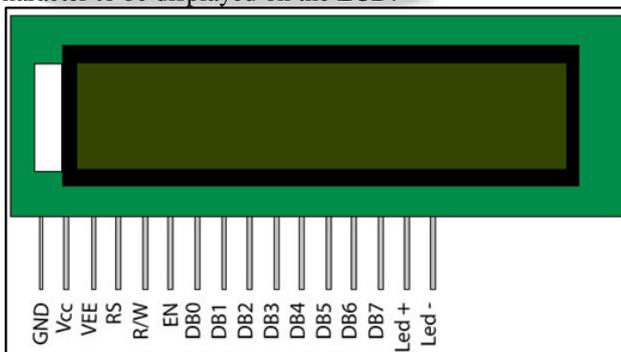

Fig. 6: LCD Display

III. ADVANTAGES

1) To reduce the cycle time.
2) Easily controlled movement.
3) To reduce the idle time.
4) To reduce the cost of operation.
5) Eliminate space consumption.

IV. CONCLUSION

This paper represents the pick and place system for parallel conveyor. Our project is able to reduce the cost and time for material handling system. Our project design and construction is simple.

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