

AUTOMATED CONVEYOR BELTS FOR OBJECT COUNTING IN SMALL-SCALE INDUSTRIES

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Abstract:

A product manufacturing involves huge analysis and quality management along with its quantity measurements. As there are two levels of manufacturing industries, they are basically classified as :

- **Small-scale industries**
- **Large-scale industries**

whose classification is purely based on production rate i.e. quantity factor. It can generally be achieved by manual labor in case of industry with low production rate. Even then it is completely impossible to make an accurate measurement throughout the production. The quantity of any product say it fruit, pen or any object is an important factor for estimating the economy growth and financial status of the industry. This paper aims in counting the number of objects placed on a moving conveyor that helps in improving the statistics of the production. This can generally be achieved by using IR sensors and micro-controller as key components and to provide a digital display of the count on a LCD screen [1]

Keywords: Industries, conveyors, IR sensors, LCD display

Introduction:

Industrial automation is classified based on Artificial Neural Networks(ANN), Distributed Control System(DCS), Supervisory control and data acquisition system (SCADA), Human Machine Interface (HMI), Programmable Logic Control (PLC), etc.....,Several cases result in failure due to lack of accuracy in the figures produced of the production rate. A direct implementation of any automated system may cost high and hence they are first tested through key elements or basic components like micro-controllers whose advanced version is implementation of PLCs, SCADA, etc., [3]And thus in order to achieve this accuracy and stability of the system they can first be tested. Up gradation of technology has provided a betterment in quality production by enabling the accurate measurement through keen monitoring of any moving objects on a conveyor system through IR sensors. This signal thus received is provided to a microcontroller to enable the count that is finally displayed through a LCD display. [4] As the paper does not seem to be too specific for any object, it could be applicable for products like soaps, vegetables, water bottles, fruits, tea leaves from waste, containers, etc., And in case of large-scale industries it can be based on both weight and counting depending on the amount of production required as an outcome.[5]

Existing vs Proposed System:

Though there are other existing systems with approximate measurement of values, they lack factors like Low Power Consumption, Accuracy, Low Distance sensing and other key factors.[6] The existing methodologies include using of Aurdino, Photo-diodes, Lasers. As taken the case of countable objects, it is important to maintain the accuracy throughout the production as well as to sustain the energy in possible forms. [8]And in case of small scale industries it is important to look at the machinery setup cost. Thus the proposed system employs IR sensors

that measure an object moving at a distance of 35-300 cm thus providing a detection resolution for a moving object and also an accurate count with the help of micro-controller. [1]The IR sensors used in the project result in lower power consumption and accuracy as every object on the conveyor have to cut the IR rays coming from the sensor, the count becomes accurate.

Components:

HARDWARE MODULES:

1. Micro-controller
2. LCD display
3. 2-IR Sensors
4. Conveyor Plank
5. Power Supply
6. Buzzer

1.MICROCONTROLLER

AT89C51 is a 8-bit microcontroller with the 4kb Flash which is more than enough for any small scale industry for memory storage. The number of IO's provided by this controller is enough for interfacing external peripherals and the interface can internally modified by using LED indication for the purpose of debugging. The operating frequency of the controller is around 11.059MHz is a crystal oscillator also known to be a 3 pin resonator. It works for a supply of +5v on pure DC.

2.LCD DISPLAY:

As per the idea developed, it is sufficient to interface a seven segment or a four segment display to display the count of the objects. And hence LT542, which is Common Anode Type whose anodes are connected to one that can be lightened up using the cathodes. This is generally

achieved by providing a supply of +2v. In general, BC557 transistor is referred to drive the display.

For the microcontroller used resistor R2 and R9 are limiting resistors used in protecting the display segment.[5]

3.IR SENSORS

TSOP1736 is said to have a photo detection response of 36KHz. This sensor is known to produce a **LOW output** on detection else in an idle state. This sensor is also driven by BC557 transistor for biasing and then provided to the input of a micro-controller. The inputs of these microcontroller are external which can internally be modified to internally trigger the controller from the sensor. They are also said to contain the 555 timer astable multivibrator ticking at 36KHz which is the response frequency of the IR receiver. The range allocation of this sensor is 35-300cm.[2]

4.CONVEYOR PLANK:

The conveyor plank is laid over a roller and a motor for the purpose of its motion as it has to carry the finished products to the packing departments of the industry. The speed and direction of this conveyor plank can be controlled by varying the parameters of the motors used.[3]

5.POWER SUPPLY:

It uses IC regulators that provides a divided supply of 36V and +5V separately to the controller, conveyor plank, and the sensors. So the overall current inferred for the circuit can be of 3A. It is best to use a transformer that is capable of handling the fluctuations caused if any and produce a desired output of 36V (dc) and 3A.[1]

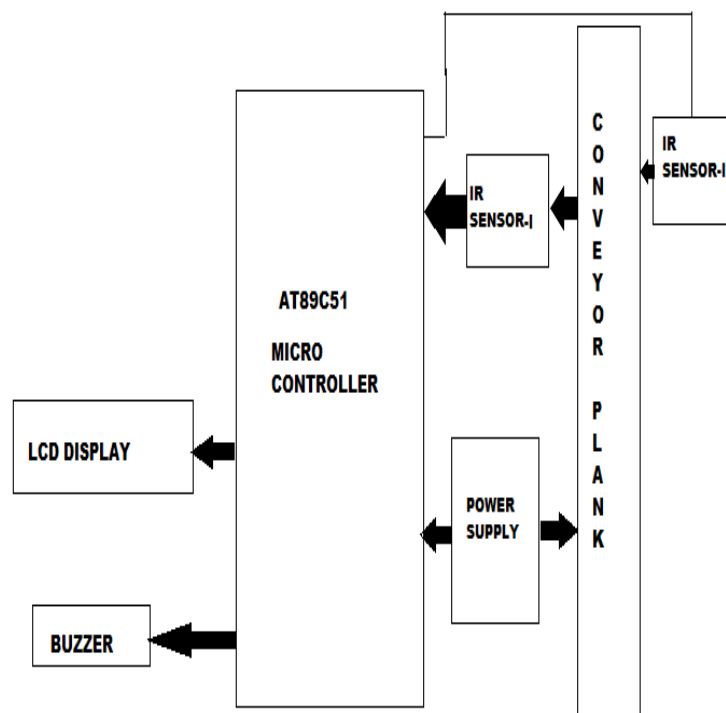
6.BUZZER ALARM:

An electronic buzzer operating at a frequency of 50Hz 75dB and for a power supply of 20V DC. Electronic Buzzers are considered to be of high quality and to work for a long lasting time with no electromagnetic interference.[7]

SOFTWARE MODULES:

Keil software

Block diagram:



Working:

This idea is developed to monitor the conveyor belts moving with objects for counting operations in industries. The main principle behind the paper is **IR interruption**. [1] There are two pair of IR sensors that

are placed on either side of the conveyors at the measurable or sensing distance for an object that are placed in opposite direction with respect to each other. As they are both transmitter and receiver, the **IR transmitter** is known to emit a modulate IR light that is to be received on the other end, i.e receiver. And thus fed to the controller.[6]

The object moving on the conveyor belt has to pass through these sensors due to which a signal gets transmitted to the microcontroller,(i.e gets an interrupt signal from IR sensors)[3] and generates an increment to the count and that is in turn displayed on **LCD display** placed at the end of the conveyor. This system can also be provided with the **Buzzer** to indicate the limit exceeded.[4]

Future Scope of Implementation:

- In large scale industries for the counting purpose of objects under sorting systems that is also known as machine vision[3]
- Also in schools and colleges for number students in the class with display outside the classrooms[1]
- In public transportation system like buses, to count the number of passengers and providing an indication through buzzer for exceeding limit of passengers entering.[5]

Applications:

In industries producing water bottles, sugar packets, medicines, and many other finished products this system can save a lot of time increasing the production rate.[2]

Advantages and Disadvantages:

There are advantages like

- Time saving
- Low power
- Easy debugging and Correcting
- Accuracy

Disadvantages can be replacing the manual labor and the short circuits caused due to lack of monitoring and irregular power supply that can cause the damage of the components to an extreme level.[1][2]

Conclusion:

When the Industrial Revolution took place in North-Eastern Countries it also laid a high demand for workers or labor for cutting, drilling, etc., But as soon as technology replaced the need of humans, the demand for an error free system raised. And hence not just that but also the deciding factor of any industry seems to be its production. And hence it is equally important to speed up the production process by advancing technology. And hence this paper is an idea developed to increase the counting operations in an industry. It deals with generating a total value of objects moving on a conveyor after manufacturing and before packing.[8]

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