INSPECTION OF MATERIAL QUALITY USING MACHINE VISION SYSTEM

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ABSTRACT

In the modern technological world every process is been operated automatically. The main aim of our project focuses on to use it in industries. Hence, it is necessary to inspect each and every object for its quality during manufacturing progression. Machine Vision system can be implies here for indispensable advantages. Commercial Vision systems available in market are very expensive. Industries principally in third world countries it is not simple for them to employ Typical Machine Vision System in place of unadventurous measuring methods due to economic reasons. Keeping this scenario in mind, an attempt was made to develop a conveyor using Machine Vision System. The aim is to design and develop a quality inspecting conveyor based on machine vision system which is to be used for industrial purpose. Conveyor systems are using in many industrial applications. And it differentiates the object in to three qualities. 1st Quality, 2nd quality and 3rd quality.

For more effectiveness and to work repetitive process we use ATMAL based 89C51 micro controller in conveyor system to improve its accuracy and it provides automatic handling.

Keyword: - *Conveyor, Inspection, Machine Vision System, and ATMAl .*

1. INTRODUCTION

A nut is a type of hardware fastener with a threaded hole. Nuts are almost always used opposite a mating bolt to fasten a stack of parts together. The two partners are kept together by a combination of their threads' friction, a slight stretch of the bolt, and compression of the parts. In applications where vibration or rotation may work a nut loose, various locking mechanisms may be employed: Adhesives, safety pins or lock wire, nylon inserts, or slightly oval-shaped threads. The most common shape is hexagonal, for similar reasons as the bolt head - 6 sides give a good granularity of angles for a tool to approach from (good in tight spots), but more (and smaller) corners would be vulnerable to being rounded off. Other specialized shapes exist for certain needs, such as wing nuts for finger adjustment and captive nuts for inaccessible areas. Nuts are graded with strength ratings compatible with their respective bolts; for example, an ISO property class 10 nut will be able to support the bolt proof strength load of an ISO property class 10.9 bolt without stripping. Likewise, an SAE class 5 nut can support the proof load of an SAE class 5 bolt, and so on. The proof strength of the most common property classes is listed at bolted joint

2. LITERATURE REVIEW

An inspection is, most generally, an organized examination or formal evaluation exercise. It involves the measurements, tests, and gauges applied to certain characteristics in regard to an object or activity. The results are usually compared to specified requirements and standards for determining whether the item or activity is in line with these targets. Inspections are usually non-destructive.

Non-Destructive Examination (NDE) or Non-Destructive Testing (NDT) describe a number of technologies used to analyze materials for either inherent flaws or damage from use. Some common methods are visual, Liquid or dye penetrant inspection, magnetic-particle inspection, radiographic testing, ultrasonic testing, eddy-current testing, acoustic emission testing, and thermographic inspection. In addition, many non-destructive inspections can be performed by a precision scale, or when in motion, a check weigher.

A surprise inspection tends to have different results than an announced inspection. Leaders seeking to discover how well lower echelons in their organization are typically doing sometimes drop in unannounced to see what is going on and what conditions are. When an inspection is scheduled in advance, it gives people a chance to cover up or fix mistakes. A surprise inspection, therefore, gives inspectors a better picture of the typical state of the inspected object than an announced inspection.

3. QUALITY CONVEYOR

This project is designed by following blocks,

a) Microcontroller.
b) Conveyor model.
c) DC motor.
d) IR sensor.

In this project we are using PC for analyze the quality of the Object. Conveyor is used for carrying the objects from one end to another end. We have IR sensor in conveyor for detect the objects when they comes. If the object is detected means it will send a low pulse to Microcontroller. Then the controller sends information to PC through serial port. So the PC can identify the object is came and ON which is interfaced with PC. Then the PC analyzes the picture and sends separate information for each quality. Then the controller separates the objects depends on the information from PC. If the object is 2nd or 3rd quality means it will on the DC motor to rotate the rod in left or right direction, to place in the 3rd quality box or in 2nd quality box. If the object is 1st quality means the controller will not ON the DC motor. So the object can be placed in the 1st quality box, which is in the conveyors another end. . This Process will go repeatedly when sensor sense the another object

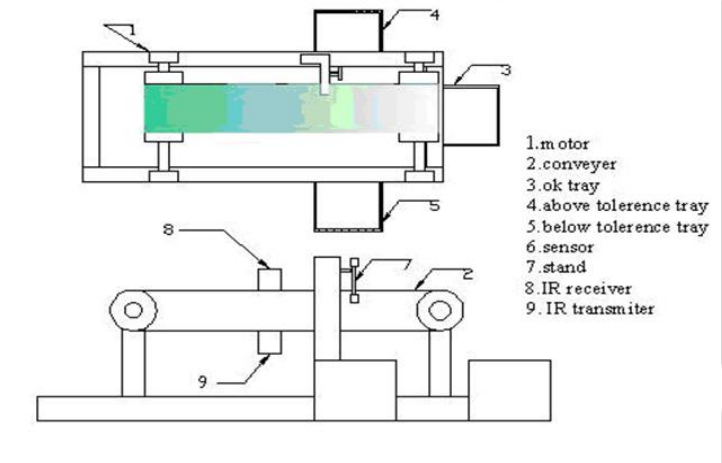


Fig -1: Conveyor system For Quality Checking

3.1 Circuit diagram of quality conveyor systems

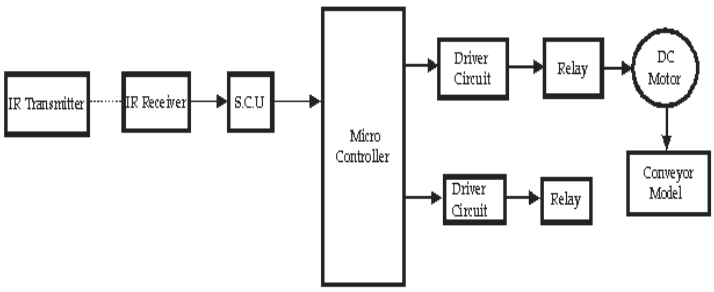


Fig -2: Circuit diagram of quality conveyor systems

4. OVERALL CIRCUIT DIAGRAM

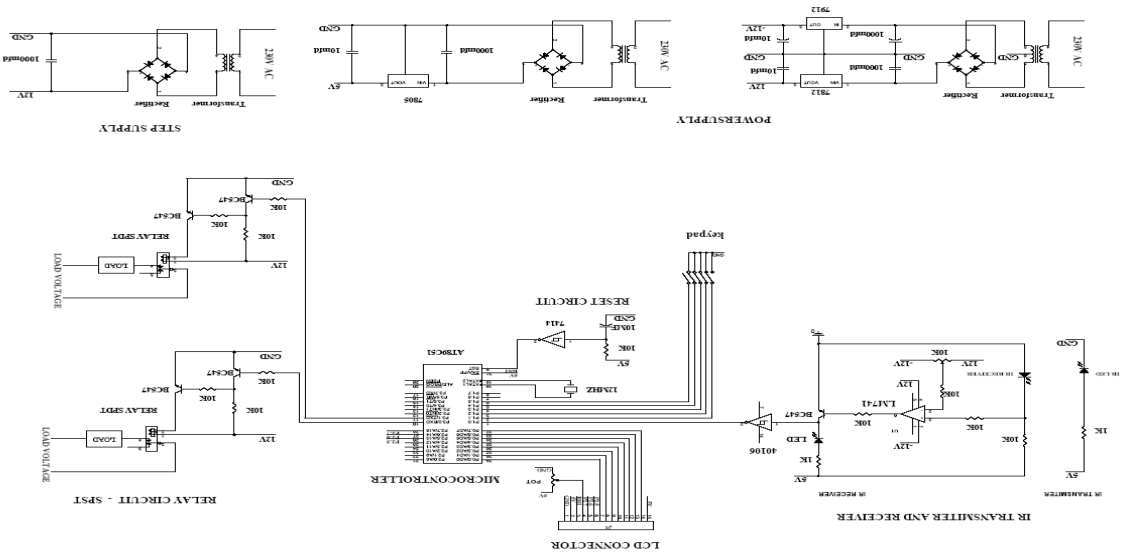
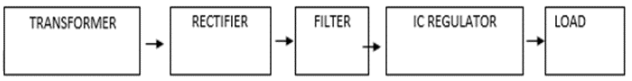


Fig -3: Overall Circuit Diagram

4.1 Power Supply Description

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.



a) Transformer

The transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC; rest of the circuits will give only RMS output.

b) Bridge rectifier

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4. The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow. The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1) and (2) can be observed across D1 and D3.

One-half cycle later the polarity across the secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing

through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit. This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits. In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts.

The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 v0lts, as result of the small voltage drop across the diode. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage, which is 1000 volts. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit.

4.2 **IC voltage regulators**

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watt

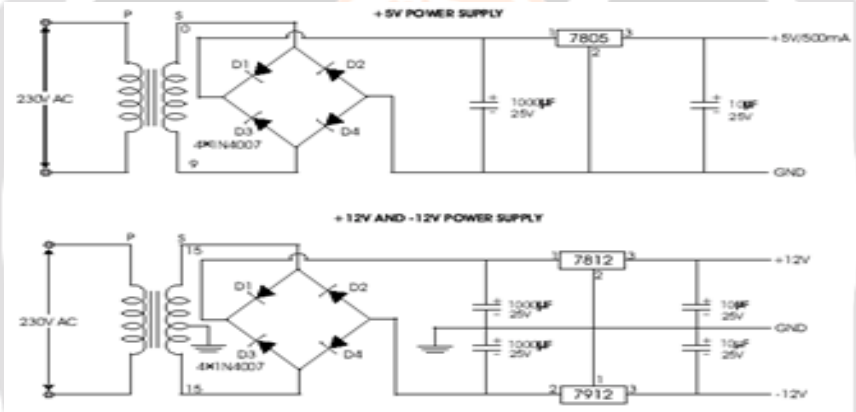


Fig -4: IC voltage regulators

4.3 Microcontroller Circuit

The microcontroller circuit is connected with reset circuit, crystal oscillator circuit, lcd circuit the reset circuit is the one which is an external interrupt which is designed to reset the program. And the crystal oscillator circuit is the one used to generate the pulses to microcontroller and it also called as the heart of the microcontroller here we have used 12mhz crystal which generates pulses upto 12000000 frequency which is converted it machine cycle frequency when divided by 12 which is equal to 1000000hz to find the time we have to invert the frequency so that we get one micro second for each execution of the instruction.

The lcd that is liquid crystal display which is used to display the what we need the lcd has fourteen pins in which three pins for the command and eight pins for the data. If the data is given to lcd it is write command which is configured by the programmer otherwise it is read command in which data read to microcontroller the data pins are given to the to port0 and command pins are given to the port2.

Other than these pin a one pin configured for the contrast of the lcd. Thus the microcontroller circuit works

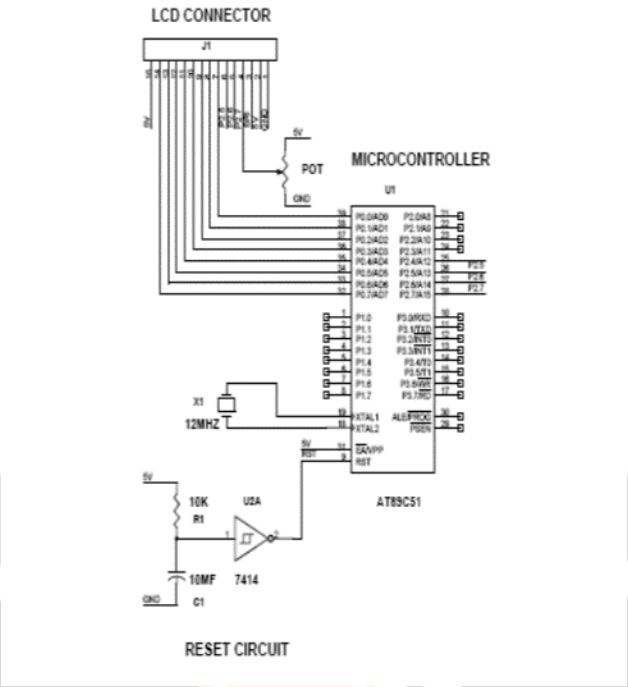


Fig -5: Micro controller circuit

4.4 IR Sensing Circuit

Infrared transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. Similarly IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other.

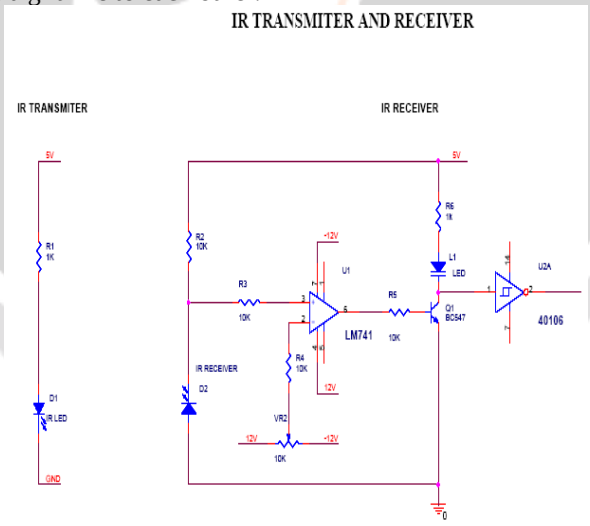


Fig - 6: IR transmitter and receiver

The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. The comparator is constructed with LM 741 operational amplifier. In the comparator circuit the reference voltage is given to inverting input terminal. The noninverting input terminal is connected IR receiver. When interrupt the IR rays between the IR transmitter and receiver, the IR receiver is not conducting. So the comparator non inverting input terminal voltage is higher then inverting input. Now the comparator output is in the range of +12V. This voltage is given to base of the transistor Q1. Hence the transistor is conducting.

Here the transistor is act as switch so the collector and emitter will be closed. The output is taken from collector terminal. Now the output is zero.

When IR transmitter passes the rays to receiver, the IR receiver is conducting due to that non inverting input voltage is lower than inverting input. Now the comparator output is -12V so the transistor is cutoff region. The 5v is given to 40106 IC which is the inverter with buffer. The inverter output is given to microcontroller or PC. This circuit is mainly used to for counting application, intruder detector etc.

4.5 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

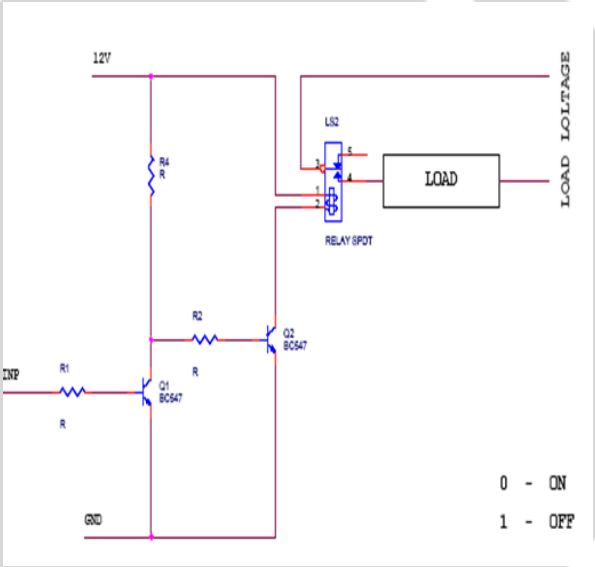


Fig -7: Relay

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay.

The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

The relay's switch connections are usually labeled COM, NC and NO:

- COM = Common, always connect to this, it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.

5. CONCLUSIONS

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on ATMAL microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (ATMAL microcontroller) used this "SEPERATION OF MATERIAL QUALITY USING MISION VISION SYSTEM" is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems. The principle of the development of science is that "nothing is impossible". So we shall look forward to a bright & sophisticated world.

6. REFERENCES

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