DESIGN AND DEVELOPMENT OF METAL PARTS COUNTING MACHINE

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Abstract :As India is a developing country the growth of industries plays vital role in becoming a developed country which can be achieved by developing technologies that paves path towards it. Small scale industries manufacturing nuts, bolts, screws or other metal tools can be difficult to identify because of their small sizes, but it is needed to count each item during manufacturing to make sure that each bunch has the correct measure which is identified as the major problem. Thus, the machine designed here contributes the solution for speedy and effective way of counting small parts without labor. This incomplex device increases the output,easy to use and maintains quality control. This machine finds enormous applications in various fields. In this research paper our prominence is to understand the counting machine's working principle and its cost-effective impact.

Keywords **–Arduino ,IC A4988,Proximity Sensor, Stepper motor, LCD display.**

I. INTRODUCTION

Due to lag of advancement in technology in the good old days machines in big sizes were only used in industries and the common practice of supplying of small parts in high volume manufacturing and packing operations is to estimate the number of parts by their weight.

Unfortunately, varying sizes and material densities often lead to wasteful overfill, estimating the count of metal parts manually or by weight is one of the most expensive and time consuming tasks which may also cause loss to either supplier or to the consumer.

With regard to this concept and the problems faced by small scale and large scale industries the idea of small parts counting machine evolved. The projected small parts counting machine uses the microcontroller Arduino Uno for its efficient working it uses inductive proximity sensor to count the number of parts needed and the corresponding sensed signals is sent to the input side of the IC present in the Arduino. As the Arduino receives the signal it indicates the input pins of display to show the number of parts counted. The programming of the planned project and interfacing of the display were made easier due to the use of Arduino.

II. OBJECTIVE

Despite the fact that there are various types of machines available for counting only materials like paper, no comparable machine were available to neither count metal parts nor non-metallic parts. As there will be lot of time and labor wasted in counting these small parts. To overcome this problem, we came up with the idea of designing a machine that solves this problem and believe that this small parts counting machine makes a difference in growth of industries.

III. OPERATING PRINCIPLE

The proposed machine is fundamentally an example for estimating count of metal parts, it involves both the function of counting and sorting.

Counting:

The number of parts to be counted out from the bunch is given via 4x4 keypad interfaced with Arduino .The required processing is done by Arduino and further displays the input count for separating from the bunch on the LCD. The time for which the motor should rotate is programmed based on the small parts.

The disc connected to the shaft of the motor is loaded with small parts and is rotated for the time required for the given count of parts to be sensed by the proximity sensor. The method of circular geometry axis is used to get the proper spacing between the nuts. The particular count of number is given as an input, as soon as the count reaches the value of the particular count the Arduino executes the interrupt and stops the counting as the motor1 stops rotating.

Sorting:

As the stepper motor has a step angle of 1.8 degrees which is equivalent to 200 steps in one revolution, the designer have to decide the number of steps that a motor should take in one complete revolution. In this design we have taken 90 degrees one step, therefore as the motor1 executes the interrupt for the given count and there after motor2 rotates from the given step angle and collection of parts repeats in the same way.

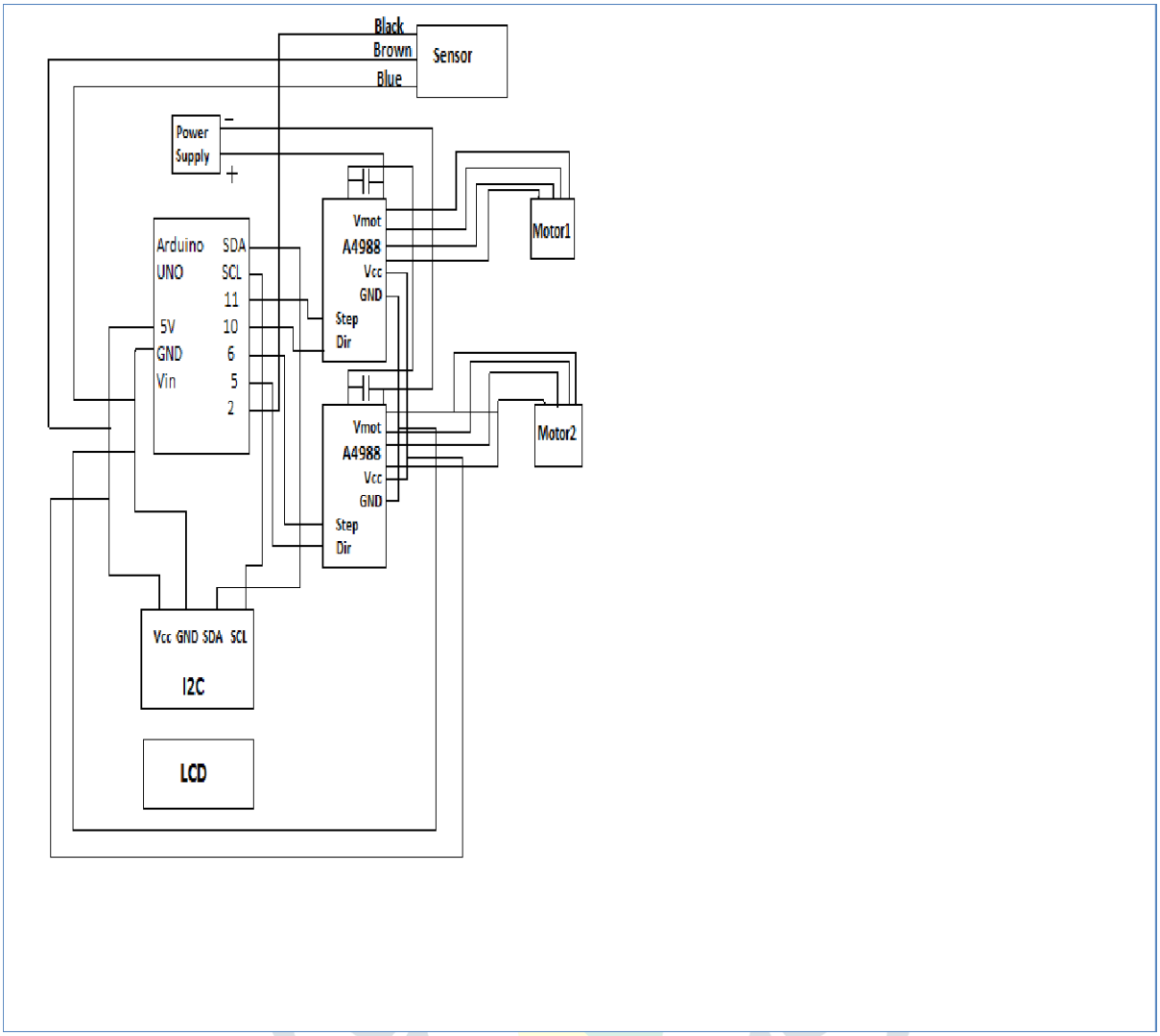

Fig 1:Circuit diagram of the proposed machine

Fig 3: Developed hardware module

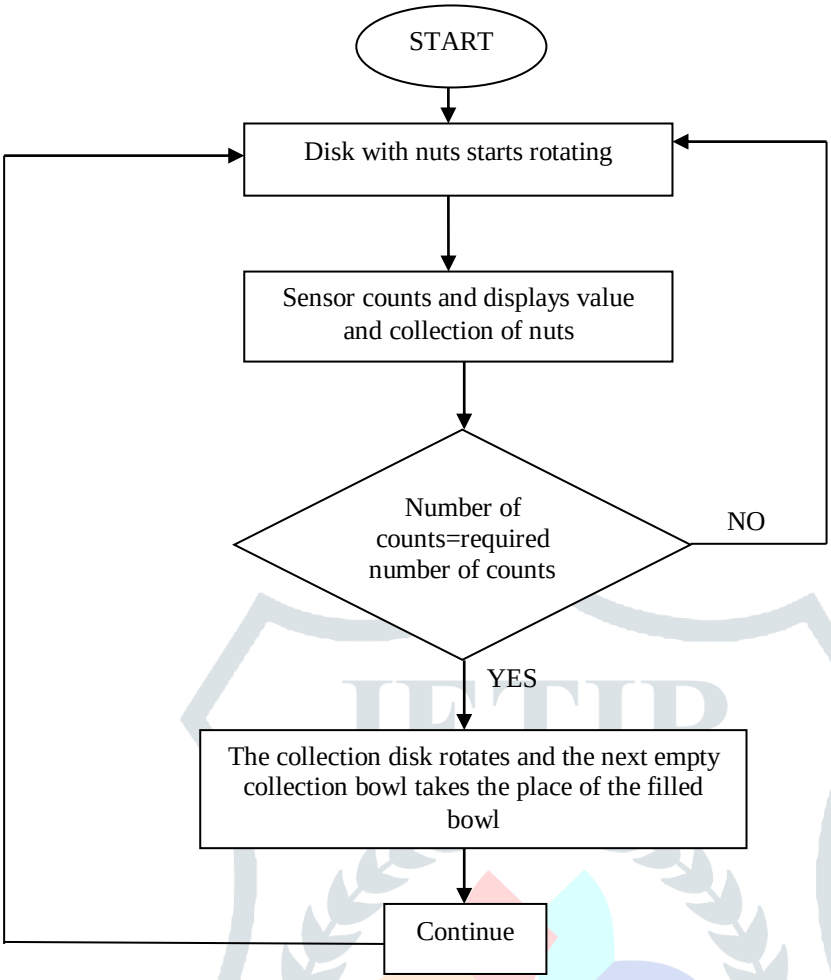

Fig 3: Flow chart of the operational procedure

IV. COMPONENT DESCRIPTION

A. ***Arduino***

Arduino Uno is based on microcontroller ATmega328P.It is a sophisticated board developed by Robospecies technologies, it supports all kind of Robotics project and embedded systems projects with easy made programming and debugging.It has 14 digital input/output pins,6 analog input pins,a USB connection and a reset button, it also has 8-bit PWM output with the analogwrite() function.

Fig 4: Arduino board

B. Proximity Sensor

Inductive proximity sensors identify metal objects nearing them without coming in contact with the object.They detect only metal objects and it also allows an inductive proximity sensor to detect a metal object through opaque plastic which is not done by photoelectric sensors.

C. Stepper motor

A stepper motor is any class of electric machine that divides a full rotation into number equal steps. The motor's position can be then be commanded to move and hold at one of these steps without any position sensor for feedback, as long as motor is carefully sized to the application in respect to torque and speed.

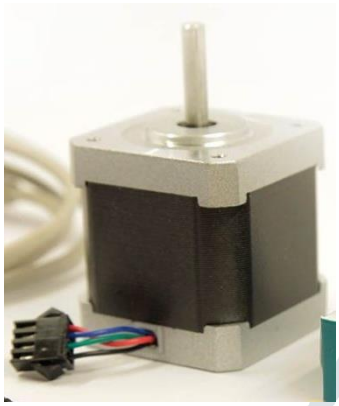

Fig 5: Stepper motor

D. LCD

A liquid crystal display is electronic visual display that uses the light modulating properties of liquid crystals as they do not emit light directly. LCDs are available to display arbitrary images or fixed images with low information content, which can be displayed or hidden ,such as preset words ,digits and 7-segment displays as in digital clock. They use same basic technology, except that arbitrary images are made up of large numbers of small pixels, while other displays have larger elements.

SL. NO	Pin Category	Pin Name
01	Power	Vin, 3.3V, 5V, GND
02	Reset	Reset
03	Analog Pins	A0-A5
04	Input/Output Pins	Digital Pins 0 - 13
05	Serial	0(Tx),1(Rx)
06	Inbuilt LED	13
07	External Interrupts	2,3

Table1:Arduino pin description

SL NO	Name	Function
01	Black	Phase A
02	Green	
03	Blue	Phase B
04	Red	
05	White	12V
06	Yellow	

Table2: Stepper motor pin description

List of components required

1. Stepper Motor –NEMA17
2. ArduinoUNO
3. Inductive Sensor – npnNC contact
4. 16x2 LCDdisplay
5. A4988driver
6. Capacitor – 100 micro Farad
7. Adaptor –12V,2A

V. ADVANTAGES

1. Very accurate
2. Relatively fast
3. High accuracy of the machining function
4. It is very compact
5. It is cost effective

VI. *DISADVANTAGES*

1. Lack of Awareness & Understanding
2. Still developing

VII. *Market share analysis*

According to the survey conducted by various industrial analysts, the parts counting machine has been the major product in the other packaging machines market over the past year. This methodology of counting parts has gained share in major countries of the world like India, United States of America, Canada, etc. Currently the market share of India is 19.28% which can be increased in coming years to make its way to become a developed country.

VIII. *APPLICATIONS*

1. This method of counting can be employed in many industries.
2. Money counter
3. Automated tablet counter
4. Filling machine
5. Production counter box

IX. *RESULTS AND DISCUSSIONS*

Every proposed project has a thought or purposebehind it.The project proposed here may not be considered as the best machine but it makes sure to form the base for further developments.As the implementation of this project is in small size makes it portable and easy to handle irrespective of the places.

Automated metal parts estimating and sorting machine is a technological procedure which is occupied by mechanical and electrical process which can be made more effective depending on the load by higher power rating motors.

REFERENCES

[1] V.V.Athani,Stepper motors: Fundamentals,Applications and Design.
[2] Anju S, Chippy S.R, Haritha H, Nijo V.C and Er.Beema A.O, “Automatic Paper Counting Machine”, International Journal of Science Technology& Engineering (IJSTE) VOL.2, Issue 10, pp.917-921, 2016.
[3] Jangali Satish G, GoroshKarikatti, Anjali Kathani, Sanjay Gunejetti, “Automatic Seed counting system” International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, Vol.4 Issue 05, May 2015