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AUTOMATED WEIGHING AND PACKAGING SYSTEM USING A VIBRATOR

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ABSTRACT

The proposed research is to develop an automated weighing and packaging system using a vibrator. It can be done by using an STM32F103C6 ARM processor which is a 32bit processor. The principle behind this automation is the pulse width modulation technique (PWM).In this technique, the width of the pulse is varied keeping the frequency constant and the speed can be varied by using the duty cycle. The duty cycle is the fraction for which the signal is ON over some time and it can be used to control the speed of the vibrator. Hence when we interface the microcontroller STM32F103C6 with cube IDE by using the pulse width modulation technique. The setup consists of a 25kg container, a vibrator motor, and an STM32F103C6 microprocessor. Initially if we want to load an 8kg of rice into a container starting from 1 to 8kg it will load the rice into the container at a rapid speed once the 8kg limit is attained the speed of the vibrator gradually reduces and this flow is controlled by the variation of the speed in the vibrator. When the vibration is high the rate of flow is high ie, it is directly proportional to when the vibration is stopped and it ensures that the 8kg limit set by the controller is attained and it is cut off from filling and moves to the next stage. In this stage, the quantity of weight displaced from the container is weighed digitally using weighing machine and sent for packaging through the conveyor.

Keywords: Pulse width modulation, Stm32f103c6, Vibrator, Duty cycle, Weighing, Automation, Flow.

1. INTRODUCTION

Since the experiment is an automated weighing and packaging system. We require the components such as the container of 25litres capacity,a vibrator motor ,digital weighing machine,STM32F103c6 microprocessor with Cube IDE interface .It in this project it briefly shows the methodology of automatically weighing of substances and packaging it using a vibrator.It can be done by using the microcontroller STM32F103C8 processor,it is an powerful 32bit microprocessor.In this experiment a certain amount of solid material is fed into the container.The quantity of the solid material must not exceed the capacity of the container.According to the variation in the vibrator motor controlled by the STM32f103c6 microprocessor the rate of flow of the solid material into the container is high initially then with an average rate by flowing in an reduced manner gradually into the container and it flows with a rate of speed corresponding to the quantity of the solid material precisely and at the later or the last stage the flow is cut off and the required amount is filled and the vibration motor gets stopped [1]. The technique that is being used is the PWM In this technique the width of the pulse is varied keeping the frequency constant and the speed can be varied using the duty cycle.

2. LITERATURE REVIEW

1. Design and Experiment of a Variable Spray System for Unmanned Aerial Vehicles Based on PID and PWM Control by Sheng Wen, Quanyong Zhang, Jizhong Deng, Yubin Lan, J ian Shan [6]. This paper shows the variable speed spraying technology of unmanned aerial vehicles (UAV) is rapidly developing in the direction of the development of aviation for future crop protection. In actual agricultural production, the degree of damage to plants by diseases and pests is not the same in different places. To reduce pesticide waste, pesticides should be sprayed according to the level of pests, pests, and weeds. Based on the description of the map of plant diseases and pests in the target area, a spreading system with adjustable pulse width modulation was developed. The STMicroelectronics 32 (STM32) chip is also used as the heart of the control system. The system is combined with sensor technology to obtain prescription values through real-time interpretation of prescription charts. A rectangular pulse is then generated with a variable value of the obtained duty cycle to modulate the flow. A closed-loop proportional-integral-derivative (PID) control algorithm is used to reduce the time it takes for the system to reach a steady state. The results show that the deviation between volume and target traffic is stable and within 2.16%. When the square wave duty cycle is in the range of 40% to 100%, the single nozzle flow range changes from 0.16L/min to 0.54L/min. Different spray patterns are achieved for different spraying requirements. Outdoor testing of the variable spray system has shown that the variable spray system can quickly adjust the flow rate to the setpoint set on the prescription map.
2. Research on STM32 Development Board Based on ARM Cortex-M3 by Zhang Bo, Yuchuan Jia, Zengfa Gao, Zhuoya Liu, Deng [7]. Cortex m3 is a 32-bit processor core using armv7 m architecture, which is among those that have great advantages of low cost and low power consumption. In this article, we will study the arm cortex m3 and

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stm32 microcontrollers. From the stm32f103zet6 development board, the basic module gpio of the processor stm32 experiments and the PWM pulse are generated by the timer along with the modulation output. PWM is an efficient technique for using the digital output of a microprocessor to drive analog circuits and is widely used in many areas from measurement and communication to speed control and conversion. Hence, the study of PWM technology has a major role in practical significance. The time of the timer is the period of the PWM. By calculating the square wave frequency and duty cycle, the timer and IO port are configured, and finally, the PWM output is completed.

3. Power-white LED dimming detection system based on NC PWM by Haiyan Guo; Bingliang Bai; Mengfang Duan; Changyong Lin [8]. It involves the design pattern of the PWM control and navigation system. It uses an STM32 microcontroller output PWM signal to control the constant current drive to achieve digital dimming. BH1750FVI luminance detection module detects white LED luminance and sends it to STM32 after LCD12864 processing and feedback adjustment. The experimental results show that the system can achieve effective PWM dimming, compared with the measured results of the illumination meter SPIC200.
4. Design and implementation of servo motor speed control system based on STM32 by B. L. Liu, Minghai Yuan, Guorong Chen, and Jun Peng [9]. To realize the fast, accurate, smooth speed control of the rotary table a speed control servo system based on STM32 is designed. This system uses the embedded STM32F103 microprocessor as the core and the absolute encoder as the encoder. The system provides motor speed control with PWM(pulse width modulation). Speed and current double-loop control are used, and the expert PID control is used as the control algorithm. The analysis of the experimental results shows that the stability of the system is good, and the static and dynamic indicators correspond to the design accuracy. This design meets the requirements of the servo motor speed control system.
5. Design of DC Motor PID Control System Based on STM32 Single-Chip Microcomputer by Bofeng Zhou, and Jinglu Zhang [10]. The rotational speed of DC motors is an extremely important control quantity in the industrial production control process. With the improvement of industrial standards, the demand for speed control of DC motors in industrial production is also increasing day by day. Therefore, it is necessary to control the speed of DC motors.

3. METHODOLOGY

In this, we are going to construct an automated weighing and packaging system using a vibrator. The brief concept behind this mechanism is PWM. We require the components such as a container of 25 liters capacity, a vibrator motor, STM32f103c6 microcontroller. Initially if we pour a solid material of 8kg into the 25 litre capacity container and the setup is fitted with a vibrator motor and controlled by the PWM technique in the STM32f103c6 microprocessor. When the width of the pulse is low initially with a high speed of 4kg/min is fed into the container the vibrator rotates according to the width that is modulated. Then the speed of the vibrator gradually becomes low with a speed of 3kg/min and the width of the pulse is a little bit high so that an adequate quantity of solid material is fed into the container with a normalized speed. And at the final stage, the remaining 1kg flows into the container at the speed of 1kg/min at which the speed of the vibrator is very low and the width of the pulse is very high and at a certain stage it is filled into the pack and the packaging is completed. And the setup is mounted with a weighing machine and at the final stage, the 8kg of the solid material's weight is checked and sealed. And if we see in the application part it is used in retail shops, supermarkets and especially in the ration shops, etc…The PWM is short for pulse width modulation in this technique using a digital signal we are producing an analog signal. It can be achieved by making a digital output pin high and low at a certain frequency to attain a square wave. The PWM is controlled by the timer. Since there are many output pins and inputs pins that are assigned we can choose from those pins. In the way of making use of the digital controls, we can vary the HIGH time and LOW time of the square wave within the fixed period. Hence it produces an ON state period and OFF state period. By varying the width of the attained ON and the OFF state period of the square wave, and also we can stimulate the voltages obtained between full OFF(0 V) and full ON (5V or 3.3V). The how much the pulse is ON shows the duration of the pulse and it is known as the Width of the Pulse. Thus this technique is known as the pulse width modulation. Because we are changing the pulse or modulating it. And the duty cycle is defined as the ratio of the ON time to the period required by a single pulse. By controlling the duty cycle, we can produce a precise voltage level at the output of the PWM signal, thus this can be used to control the speed of the vibrator ie, when the duty cycle accounts tp 50% then the ON time and OFF time are equal and the output obtained is a perfect square wave with an average voltage.

FLOW CHART

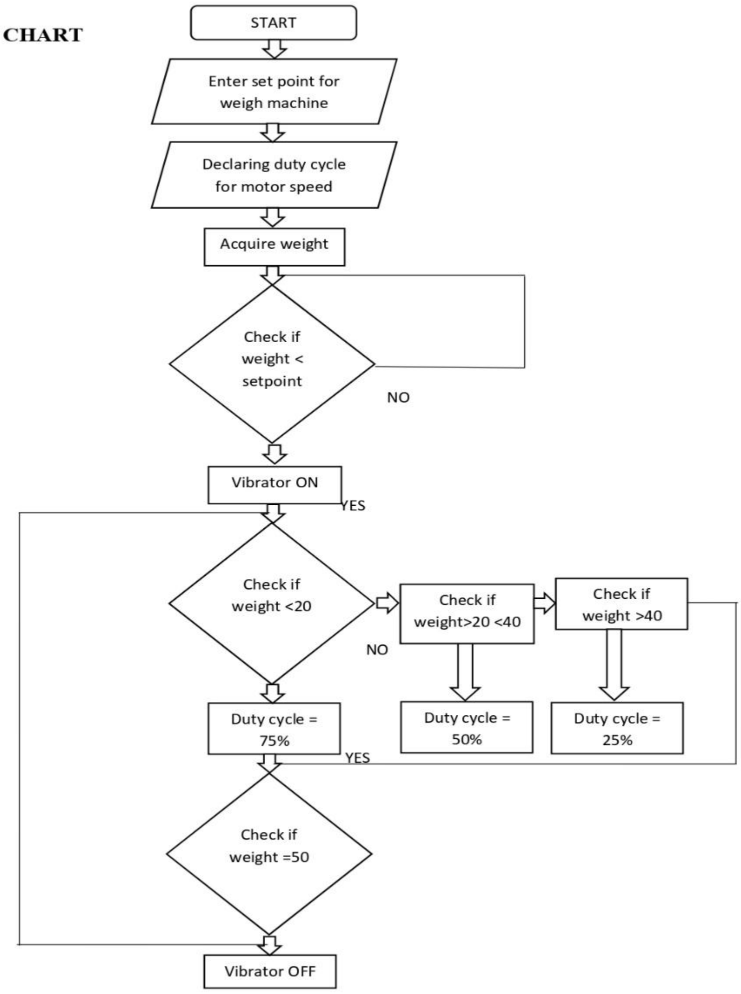

Figure 1: Flow chart.

4. RESULTS AND DISCUSSION

Hence from the above experiment we could obtain the desired result for the different types of weight that is weighed accordingly to the speed of the vibrator.And the duty cyle of the PWM modulation technique when it is high the speed of the vibrator is also high and when it is low the speed of the vibrator is also .Hence from the above conclusion we can say that the duty cycle of the PWM is directly proportional.

The different types of the weights of the solid material according to the varying duty cycle of the PWM is discussed in the above report analysis.And in the field of applications it is employed in the machines with vending mechanism.And here by with the proper maintainance and mechanism it is very much reliable to the sustaining environment.When the weighing stage is completed then it moves on to the packaging stage here it is packed with the automated controller techniques and then sealed.Only at the starting stage there is an manual need then it is fully automated such that I have declared the name as automated weighing system.The similar application of this experiment we can see in the petrol pump,where initially there is an rapid speed of flow into the tube then gradually decreases and finally cut off, the similar mechanism is employed here with an different microprocessor.

5. CONCLUSION

The project has presented the development of an improved design of the automated weighing and packaging system by a vibrator. The system controls the speed of the vibrator. When the quantity of solid material being fed into the container is correspondingly varied according to the weight and the speed of the vibrator using the techniques of the PWM with the powerful microprocessor STM32F03C6.This is mainly employed in the field of supermarkets, and government ration shops for automatically weighing and packaging the goods. Finally, this project is concluded with the improved design of the PWM at the low-cost efficiency and reliability.

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