Automatic Chicken Feeder System Using Microcontroller

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Abstract – **The previous of chicken feeder system is operate as a manual way to feed the chicken. This system has error in amount of grain to feed, wasted grain and consume man power to operate it. After a few years, people move toward design the automatic system that need more energy, money and time to operate it which is need to be improved to satisfy the user requirements. A solution to these problems is to design an embedded system that provides a portable chicken feeder system that running by low power and low cost[1,2]. This paper describe an automatic chicken feeder system that provide the user to select the desired amount of feed measuremnt, to select number of day to feed and the system will automatically feed the chicken. The system uses a microcontroller to read user selection, set the amount of grain and feed the chicken according to what the user select. A plate is used to control the grain from the storage and attached to a motor. The amount of grain to feed the chicken was performed by the software to control the microcontroller and interfacing circuits.**

I. INTRODUCTION

The number of entrepreneur involve in commercialize chicken breeding increase every year. There are two types of business; a commercial and small business. For commercial purposes, usually more than 5000 chickens are allocated in big cages. Small business refer to 2000 chicken in one cage. The method of feeding the chicken are different; it can be done in two way; manually or automatically.

Nowadays, the automatic feeding system is available in the market. Eventhough this method is better than manual, the equipment is design for commercial purpose and the size of the system is large. In addtion , high investment in equipment and devices is required. Precise manual guide and knowledgeable, skilled people are required to operate the machine[3,4,5].

To cater the need for small business, a medium size automatic system chicken feederis proposed to provide the food effectively and also to control chickens feeding time. This controller system provides an efficient solution for exact quantity of the food distribution, fixed feeding time and hassle free automatic feeding in order to help breeders. User can choose the desired days to feed and save it to microcontroller's memory[6]. As the consequences, the feeder will feed the chicken automatically as what has been set.

II. AUTOMATIC CHICKEN FEEDER SYSTEM

The important thing that need to be considered is the age of the chicken. By doing the study about the chicken lifecycle, this system is designed to feed the chicken from the age of 4 weeks to 22 week which the main source of food given is pellet[7,8]. The time to feed the chicken is set twice per day; 9am and 5pm for 2 days or in 32 hours. This system is also designed to feed up to 7 chickens at the one time. The automatic chicken feeder system consists of four main parts; a storage unit,feeder unit and microcontroller unit.

A. Storage Unit

Nowdays, the breeder can use many types of the grain. Therefore the density for each grain is different[9]. Table I shown the type of the grain and the density respectively. The storage unit is designed to store a maximum of 14kg grain.. It is place at the top part of the system to allow the grain fall smoothly. The size of the casing is 250mm x 250mm x 720mm. The storage is built from the box and trapezoid shape. The casing design is shown in Fig.1. The maximum amount of the grain that can be held can be estimated using Equation (1).

$$Ag = Dg \times V \qquad (1)$$

Where Ag is amount of grain (kg), Dg is density (kg/m^3) and V is Volume(m^3)

TABLE I
THE AMOUNT OF GRAIN CAN BE STORE

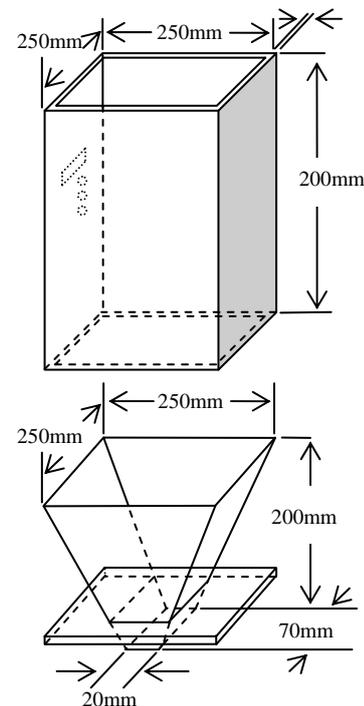| Type of grain	Density (kg/m^3)	Amount (kg)
Maize	760	13.21
Barley	600	10.43
Millet	760	13.21
Wheat	780	13.56

Fig. 1. The storage design

B. Feeder Unit

The feeder unit consists of the plate; the DC gear motor and a driver motor. The plate has a hole to allow the grain to flow. The movement of the plate is controlled by the motor that attached to the plate via the gear system as shown in Fig. 2.
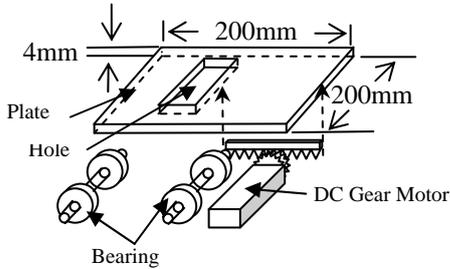

Fig. 2. The feeder plate unit

The plate is used to block and allow the grain flow. The DC motor will rotate the gear to the left or right depend on microcontroller instruction. There is a bearing which is used to support the plate and to allow the plate to move easily. This is important because the plate needs to hold up to 14kg of grain. Fig. 3 shows how the plate hold the grain. The arrow indicate the movement of the plate to prevent the grain from falling to the bottom.
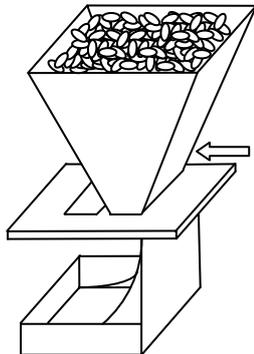

Fig. 3. The plate blocking the hole to hold the grain

During the feeding time, the plate will move to the right to allow the grain to fall to the bottom. The motor will stop for a few in seconds depend on set the amount of grain to feed the chicken. Fig. 4 shows the direction of plate move during feeding time.
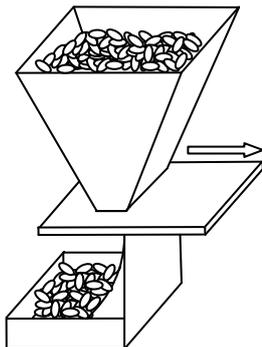

Fig. 4. The feeder plate positoin during feeding time

C. Microcontroller Unit

The microcontroller unit consists of microcontroller, Liquid Crystal Display (LCD) and switch as shown in Fig. 5. A more detailed schematic diagram is shown in Fig 6. In this system , the microcontroller, PIC16F876A and driver motor are connected to the main switch, three menu selection push button and a LCD display. Button 1 is designed for less than 3 chicken, button 2 less than 5 chicken and button 3 for less than 7 chicken. The microcontroller is used to control the time and the feeding chickens process. The function of the driver motor is to make the DC gear motor moves forward and reverse when received signal from the microcontroller. The LCD display is used to display menu and operating time feeding[10].
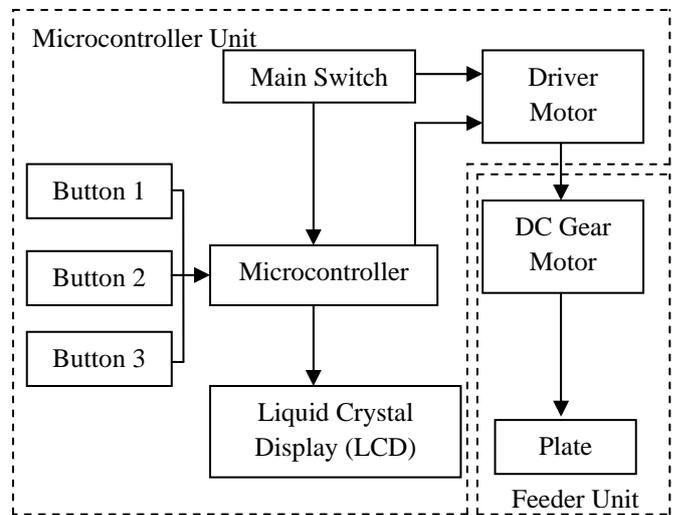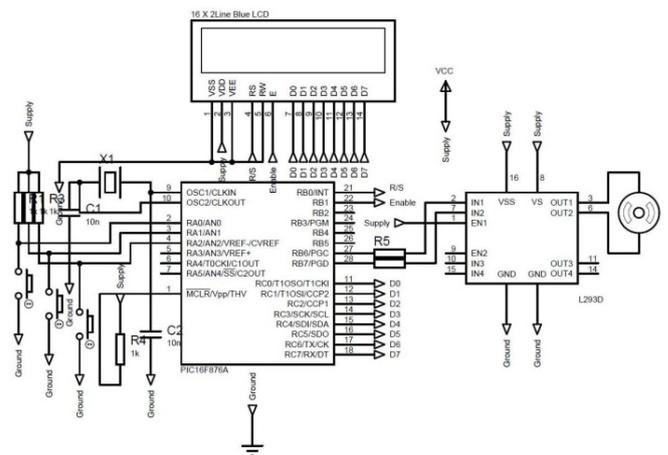

Fig. 5 . Block diagram of the system

Fig. 6. Circuit diagram of the system

D. Controlling Software

By using Proteus software, all the electronic circuit system was tested to make sure it function properly. In order to avoid failure in microcontroller system, the controlling software was run by the Proteus software. The result that produced by this software was examined to investigate any failure operation.

A program PIC assembly language is written to control the process of feeding the chicken. The automatic feeding process is shown in Fig. 7. The process starts with a menu displayed to the user to select the number of feeding day. User need to select the number of chicken that they have. Once the selection is made, user need to press the start button to make the system run operate. The system is design to provide the grain for two days.

The microcontroller save the user setting in the memory and will give different delays to DC motor. The delay is determine from the amount of grain to be given for one feed and a maximum of two days.
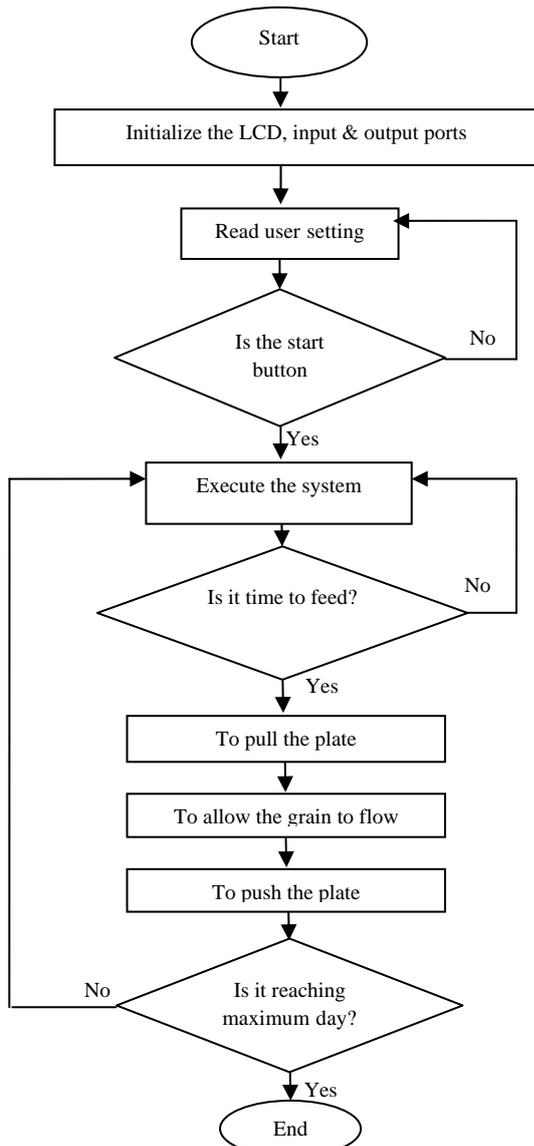

Fig. 7 . The feeding process

E. System Performance Evaluation

The performance of the system was tested dispensing 1kg grain from 1 to 5 kg grain stored in the storage unit. This is to examine the system can dispense the grain succesfully or not. The dispensing operation may be stopped by the grain that stucked in the gap between the storage tip and the plate. How long the battery can be last was also tested by leaving the system to operate for two days[11,12,13].

III. RESULT AND DISCUSSION

A few experiments had been done to ensure that the system is able to read the user selection correctly, give the right time delay to feed the chicken, and measure the amount of grain and dispense the grain without mess. Before the real hardware is developed, the simulation is conducted to check whether or not the motor can move in reverse and forward directions. Fig. 9 show the waveform from the output 1 and output 2 of the pin 3 and 6 respectively. The output 1 is connected to channel 1 and output 2 is connected to channel 2. The output 1 will be activated first to pull the plate forwardly for 1.1 second, then the DC motor will stop to allow the grain fall through the hole The motor will reverse for a few second to close the hole and prevent the grain to fall when output 2 of the driver motor is activated. The gap between both operation is the time to feed the chicken. Fig. 10 and Fig. 11 show dispense 7.8 second delay is used for 1kg of the grain and 39.50 second for 5kg respectively.

The performance of the system to feed the chickens by the amount of 1kg with different amount of the storage is shown in table II. The time consumption of controlling the amount of grain is also important. Time performance of the system is shown in Fig. 8.

The system will feed the chickens 4 times in the duration of 32 hours. The voltage of the battery is measured before being attached to the circuit. The result after 32 hours is shown in Table III. From the experiment , it was found that, the battery can be used for only 2 days.

TABLE II
THE AMOUNT OF GRAIN THAT CAN FEED DURING HOLD THE
DIFFERENT AMOUNT OF STORAGE
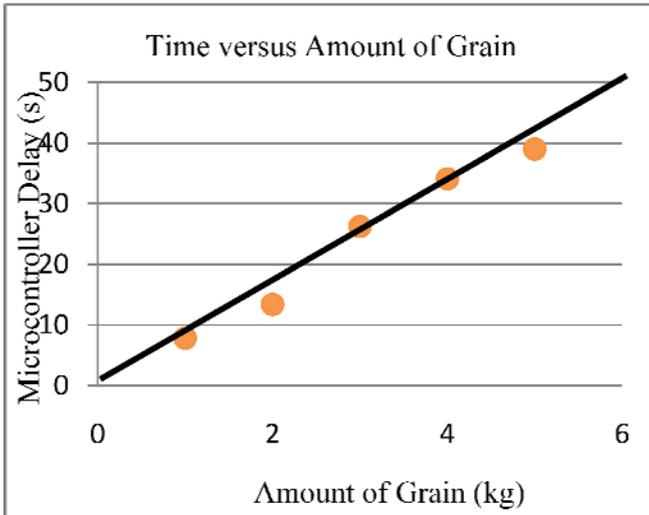
Amount of storage (kg)	Amount of grain fall (kg)
5	1.2
4	1
3	1.1
2	0.9
1	1

Fig. 8: How long 1kg to 5kg takes to dispense

Fig 9: The wave form that microcontroller activated the motor
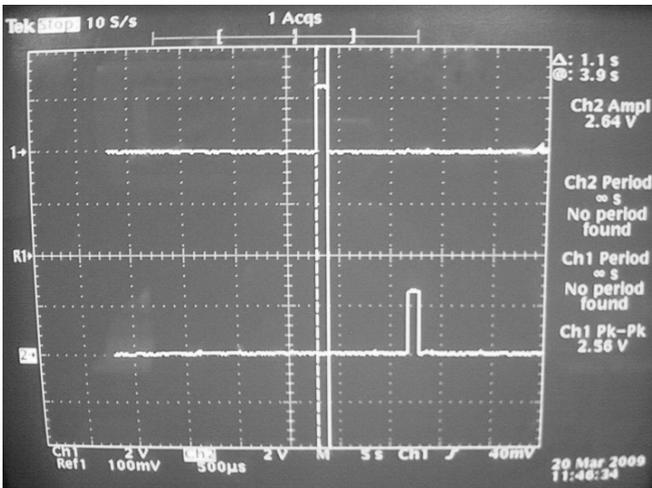

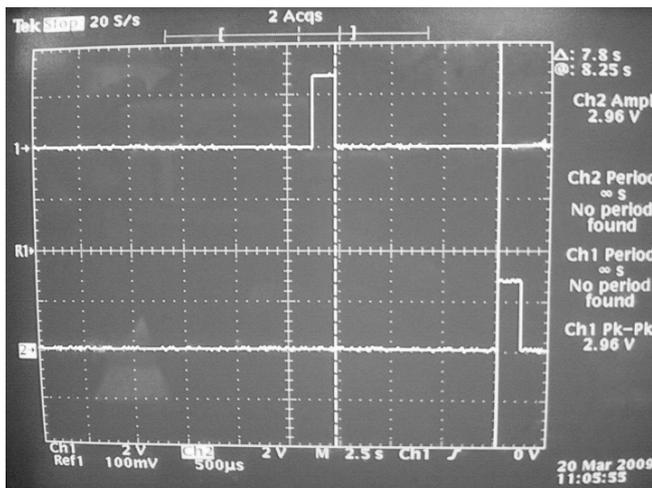Fig 10: The waveform of delay the motor operation to feed by 1kg grain

Fig. 11 . The waveforn of delay the motor operation to feed by 5kg grain

TABLE III
THE VOLTAGE OF THE BATTERY AFTER 32 HOURS OPERATION

Supply to circuit	Battery Brand	Type of Battery	Before (V)	After (V)
Microcontroller unit	Energizer	Alkaline	9	6.8
Motor Driver unit	Energizer	Alkaline	9	7.5

IV. CONCLUSION

The developement of the proposed automatic chicken feeder have been discussed in this paper. The system has the capability to feed the chicken with the exact amount of grain and time without waste. Modification can be made to the system in the future with modification the casing to feed the large amount of grain. The feeder system also can be modify to capability to feed the chicken with the various type of grain. The power supply also can be modify to make the system operate for more days.

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