Arduino-based Food and Water Dispenser for Pets with GSM Technology Control

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Abstract—**This paper presents a project design for which the pet owner can feed his own pet even without his presence by just sending a text message to the system through his cellular phone. The system uses the concept of GSM technology to receive signal from the owner. If the system received the message, the servo motor and solenoid valve will be activated. The servo motor will rotate that will serve as the food transportation and the solenoid valve will be opened for the water to freely flow. Once the feeding is already done, the owner will receive a text message from the system which notifies him of a successful feeding. The concept was intended for people who always have a busy schedule to feed his/her pet.**

Keywords—**Arduino, GSM technology, Microcontroller**

I. Introduction

All these modern technologies just make people try to do everything at once. Nowadays, people tend to be busier; and because of this, people tend to forget also some of their responsibilities which are the main cause of trouble. One of these responsibilities is having a pet at home. Most people want to have his/her own pet for its attractive appearance, loyalty and playful personality. Having a pet is an obligation which doesn't go into waste because having a pet serves entertainment and company at home. One main problem in the present society is the people's busyness. It is one main reason why pet owners commit irresponsible deeds when it comes to taking care of their pets. Their pets seem to be on the bottom list of their priorities. One important factor on pet care is feeding. This is where this research paper comes in action in which is an Arduino-based food and water dispenser will then be activated through GSM technology. It is a machine that responds through the use of SMS. With the use of cellular phone which is economically and readily available as means of transmitting via SMS, a person can be able to look over their pets in terms of feeding. With the use of GSM technology, it is possible to control the system anytime and anywhere. By a single text message, the owner can be able to command the prototype to dispense an amount of food and water for his/her pet. With this, it gives the person less work, more time, and also with less worries. This paper is organized as it follows: Section II briefly presents the methodology and conceptual framework used in this research paper. Section III is devoted to the experimental results, which are carried out in order to verify the effectiveness of proposed method by means of the prototype. Conclusion ends the paper at section IV.

II. Methodology

Figure 1 shows the block diagram of the conceptual procedures followed in order to complete the experimentation. The flow of the diagram is the actual and determined process of this work. The design stage then runs all throughout the concept of the experiment which sums up the preliminary ideas up to the materials considered. The simulation is mainly focused on the working code and schematic itself. Fabrication process is thru building the prototype device and the PCB composition. The testing stage refers to the testing of the device which is mounted on the structure for complete evaluation and analysis of the system. Following these steps will then yield to conclusion.
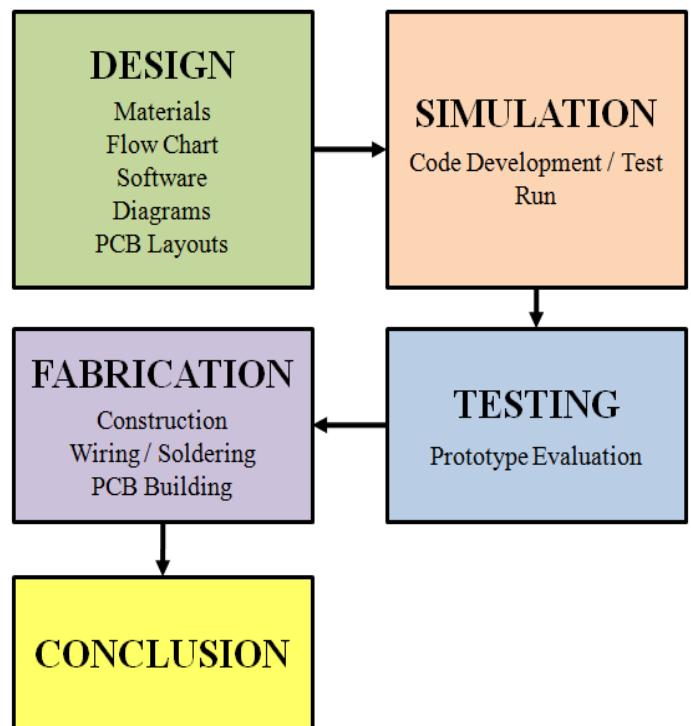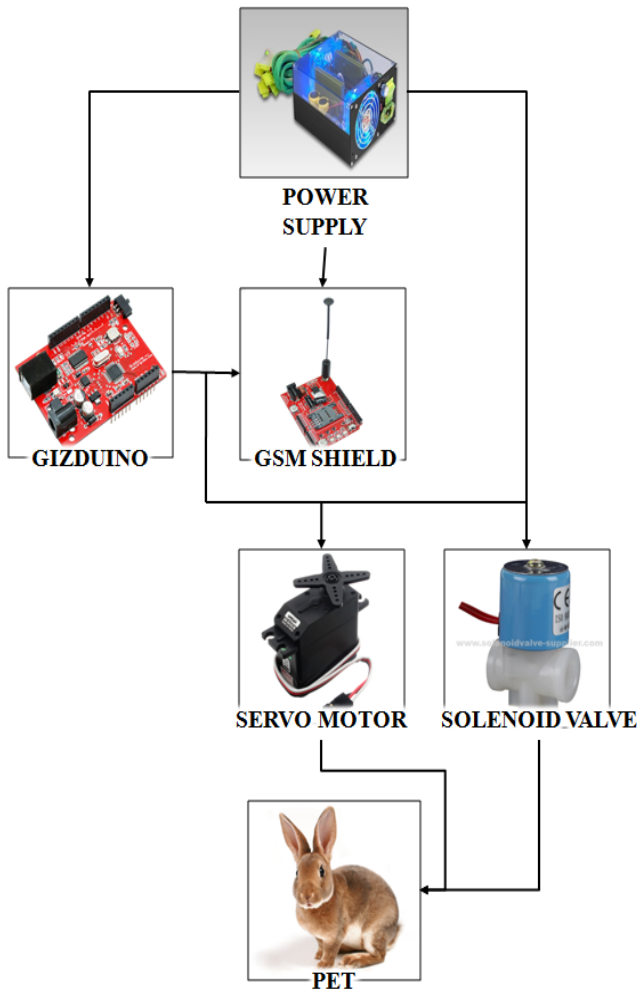

Fig. 1. Methodology of the system.

Fig. 2. General block diagram of the system.

The block diagram showed in figure 2 illustrates the concept of operation of the prototype. The prototype works with the GSM shield. After supplying power to the system, this will send a message to the pet owner prompting him/her that the machine is initialized and ready to work its function. Sending an SMS to the device will trigger the servo motor and the solenoid valve to do its work. After performing the task, the equipment will notify the owner and texting it that the pet feeding was successful. The solenoid is connected to an external power supply with a transistor which serves as a switch while the servo motor uses the +5V supply from the ATmega328. The ATmega328 has 23 pins all-in-all; 14 digital I/O pins, 6 analog I/O pins, 16 MHz crystal oscillator, a USB type-B connection, a power input jack, and a reset button. The additional component which is the GSM shield which functions as module that accepts SMS request from a mobile users. It contains SIM900D, a module buffered UART, fused input power, a manual power switch, and also a SIM card holder. This enables the machine to perform a function of a basic phone, i.e., to be able to send and receive text messages from other mobile phone users. This device is placed just on top of the Atmega 328 that is connected through the TX and RX pins.
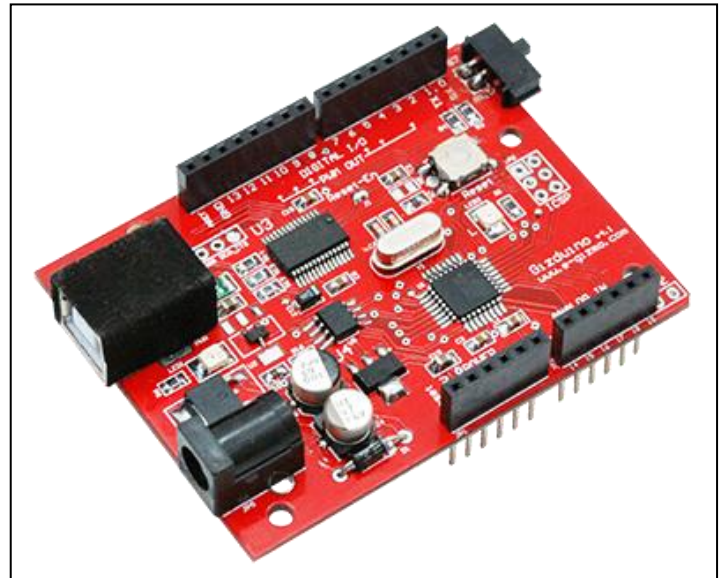

Fig. 3. Gizduino 328 version [1].

Fig. 4. Servo motor.

The servo motor has three wires: power, ground, and signal. The red wire which is the power is connected to the +5V pin on the microcontroller; the brown is the ground which is obviously connected to a ground pin; and the orange is the signal wire which should be connected to the pin on the microcontroller clearly defined by the code to trigger the instrument. The servo motor will rotate the hatch located at the bottom of the feeds container catching the feeds from it. When the servo motor rotates the hatch by 180 degrees, the opening of the hatch will be upside down. Thus, letting the feeds fall into the feeder plate and hence this lets the pet gets the food. The solenoid valve has two wires which then should analyze to perform its function using a microcontroller. Setting the pin high for a certain amount of time will then manipulate the instrument momentarily but using a solenoid will require different voltage.

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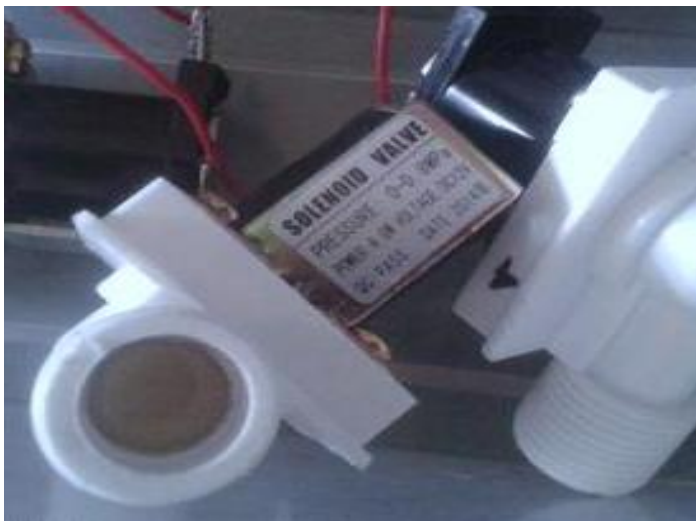
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Fig. 5. Solenoid valve.

In this situation, a transistor is used. The TIP120 is connected to the circuit to perform as bridge. It will allow small voltage from the microcontroller to switch into larger voltage of the solenoid. Meanwhile, the diode connected to circuit allows the current to flow in one direction. The diode will prevent the microcontroller to burn because it feeds the current when the solenoid is turned off back in to it until is dissipates. The solenoid is attached to a bottle filled with clean water. This device will control the flow of the water. When activated, the spring contracts opening the tube allowing the flow of water and after it serves its purpose the tube will be closed which stops the flow.
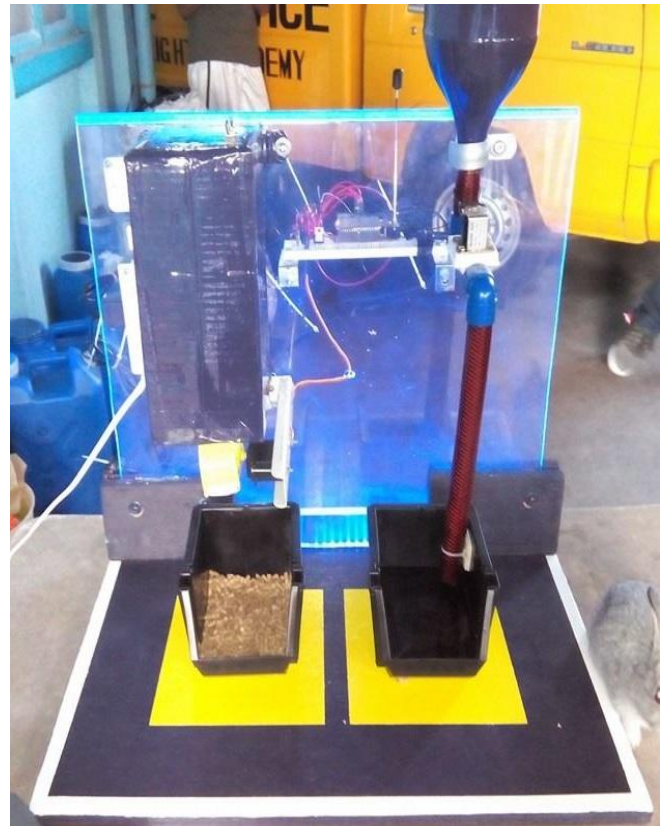
III. Experimental Results
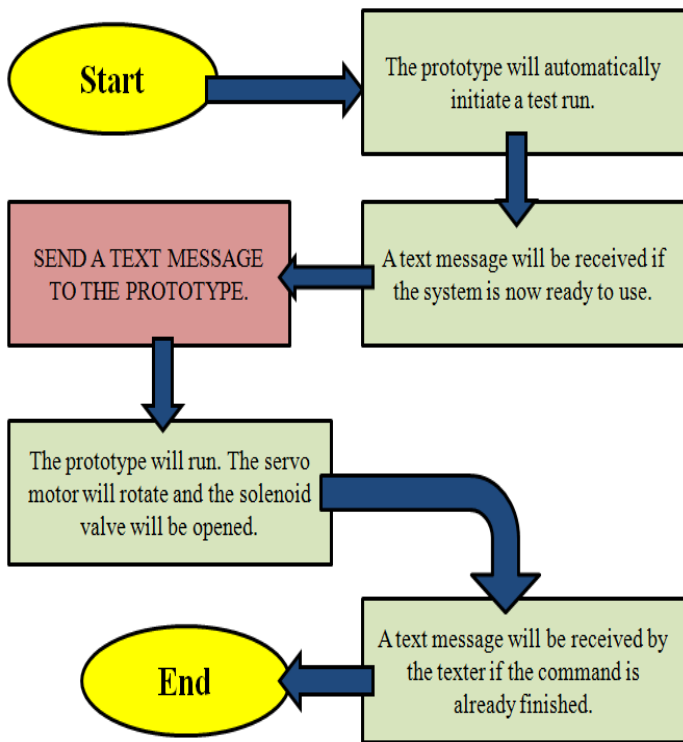

Fig. 7. Prototype design (front view).

Fig. 6. Operation flow of the system.

Fig. 8. Prototype design (side view).

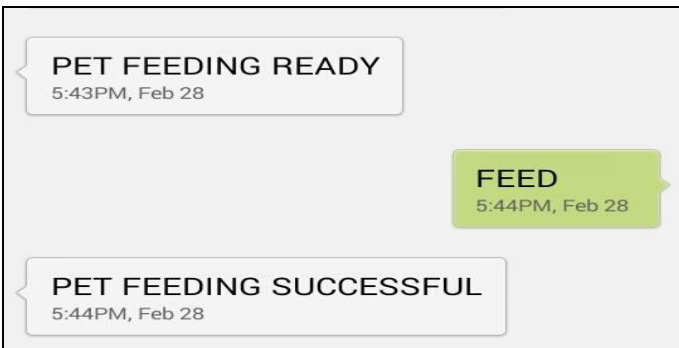Fig. 9. Testing of the prototype with a Rabbit pet.

Fig. 10. SMS notifications.

Table 1. Operational evaluation.

Area of concern	Findings	Comments
Start up	The prototype conducts an initial run and goes in its initial position.	Preliminary testing required before actual use.
Notifications	Gives notification on start-up and after feeding.	Does not notify if it the SIM card has zero load balance or if there is no signal in the area.
Actual feeding	Fixed drop rate of food and water.	It may incur unnecessary feed mess.

The operation was evaluated based on the outcomes exhibited by the prototype in the following areas: start-up, notifications and actual feeding.

IV. Conclusion

This paper has presented the Arduino-based pet food and water dispenser for pets controlled via GSM technology. The system utilizes the principle of sending an SMS through the use of the cellular phones. Creating this project is beneficial to people for their pets to maintain healthy diet. Having a text-based pet food and water dispenser is essential in every home especially to busy people who are too occupied and are often away to work or in school. Sometimes, being dependent to yourself besides your busyness may fail to remind of your other responsibilities, which considers feeding your pet on the desired time. Proper time management and having dependence on this kind of food dispenser may help a person become worry-free from providing proper care for pets and also prevent underfeeding of pets which causes diseases, starvation, or even death. The text-activated pet food and water dispenser gives the owners the power to control the feeding time of their pets on the desired time they want even wherever they are, as long as cellular signal is present. The researchers then recommend an advanced artificial intelligence techniques to dispense the food and water for pets.

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