

Development of an Auto Cupping Machine by Using Arduino Nano Controller

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ABSTRACT

Auto Cupping Machine is a project machine that had been develop from traditional way of therapy to a modern way of cupping therapy. In the traditional way, cupping therapist use cup, bamboo or horn to do the air suction process. The process before are basically use an environment method to do so such as by using heat method, the therapy will light up some fire inside on the cup and put up on the patient skin to process a vacuum suction. After that, the therapist also use a bottle spray or some cloth like towel or cotton to wipe out the anti-septic liquid on the patient skin. Besides, to make some scar on the skin, the therapist mainly use a blood lancet needle pen or diabetes pen to make it happen and count it as much as it must. But somehow, in this modern area, the ways of process before need to be done to suit up along with the years. This project which is known as Auto Cupping Machine is an innovation of a modern cupping machine which using high technology component. This project is controlled by an Arduino Nano controller which conduct the timing of the cupping process. There are three mainly motor which are vacuum pump, water pump and coil tattoo machine used to complete the cupping process. The vacuum pump is used to do air suction of the skin while the water pump use as a spray pump that contain anti-septic liquid inside from the container. On the other hand, the coil tattoo machine that combine with blood lancet needle pen are used to make a scar on the patient skin for letting blood to came out of it. This project is really a good innovation of alternative treatment for cupping process which can really reduce time of work, prevent skin illness and help reducing the manpower energy for a cupping therapy.

Keywords: *Cupping; Antiseptic liquid; Arduino Nano & Coil tattoo machine.*

1. INTRODUCTION

Cupping therapy is an ancient form of alternative medicine in which a therapist puts specialized cups on a patient skin for a few minutes to produce suction. Cupping is a therapy used in traditional Chinese medicine (TCM) to remove stagnation and stimulate the flow of qi (chi). Qi is the free flow of vital energy circulating through the body and the world around us, if the qi is disrupted or disturbed, it can create stagnation (blockages) or imbalances in the body. People practice it for many purposes, including to withstand with pain, inflammation, blood flow, relaxation and well-being, and as a type of deep-tissue massage. The cups used in cupping therapy may be made of natural materials such as bamboo or clay, but are now most commonly made of glass or silicone [4].

There are two types of cupping therapy which are dry cupping therapy and wet cupping therapy. During the both types of cupping therapy, the therapist will place a flammable armamentarium such as alcohol, herbs, or paper in a cup and burn the substances. After the fire were extinguished, the therapists puts the cupping cup upside down on patient's skin. As the air inside the cup cools, a vacuum condition is created inside the cup. As the blood vessels expand, it will causes the patient skin to rise and get reddened. The suction created will facilitates the release of toxins from the body's tissues from up to four inches below the surface. This suction also bringing new blood and lymphatic fluid to the region, allowing for an influx of fresh oxygen and other vital nutrients into the region and an increased capacity to transport waste materials out [2].

The most common treatment areas for cupping process are the back and shoulders, however the options for application are nearly endless. Using proper techniques, cupping can be applied to any major surface of the body, including the abdomen to help support digestive function, and the face to promote the skin's natural luster. In general, the cupping cup is leave in the original place for more than 3 minutes. Cupping sessions often involve massage when lotion is

applied to the skin prior to the cups, they can be moved around above the skin while the suction (and therapeutic benefits) are still maintained. This allows for a larger treatment area and can help prevent marks, which we will go over later. Practitioners can massage the cups along the well-known Chinese Medicine meridian lines of the body, or along patterns of muscular tension and oftentimes these overlap [3].

As the cupping process become popular nowadays, a new version of cupping machine is developed. This machine is known as Auto Cupping Machine. It is developed with the adding of new technology which is Arduino Nano. Arduino Nano is used as the main controller for the machine to make it an auto cupping machine. Arduino Nano is a small complete chip board based on ATmega 328 (v3.0) or Atmega 168 (v2.0). Every Arduino has the same functionality and the same features except the number of pins and size. Figure 1 show the structure of Arduino Nano board.

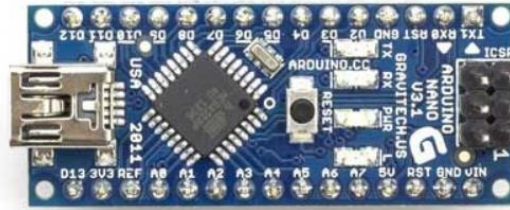


Figure 1: Structure of the Arduino Nano Board

The Arduino Nano had been chosen as the main controller of the Auto Cupping Machine because of the Arduino Nano board which can fits into the small printed circuit board (PCB) of the project. The Arduino Nano is programmed to control all the movements and order to the vacuum pump motor, Flavine Spray motor, Lancet needles and the LED Display System. With the use of the controller makes the machine as a good innovation of alternative treatment for cupping process which can really reduce time of work, prevent skin illness and help reducing the manpower energy for a cupping therapy.

2. PROBLEM STATEMENT

In traditional way of cupping therapy, there are some problem that can be improve to make the process easier and fast as the therapy become demanding nowadays. One the problem is cupping therapy need experience of an individual to operate “manually” and need practice to have a good skills to operate the cupping therapy process.

Else, the needle stabbing technique also become an issue when performing the cupping therapy treatment on a patient body which every stabbing of the needle must be more than 20 or less than 20 stabs to ensure the bleeding level of the patient was not too much. Then, the air pressure in the cup also an issue in performing cupping therapy treatment. Pressure in every patient body was different and may have different air pressure in each parts of the body of the patient. This can be explain by the blood pressure of every patient is different and in every different body parts and organ of blood pressure of a single person is also differ. The controlled variables was the air pressure in the cupping therapy cup so that the patient will experience less ache when the cupping therapy blood sucking process was carry out.

Regarding to all the problem discussed above, an auto cupping machine is proposed to be done as a new revolution of cupping process. With the used of Arduino Nano controller, some of the cupping step can be done automatically by just pressing a button.

3. RESEARCH OBJECTIVE

There are four main objectives in developing this auto cupping machine which are:

- i. To develop an auto cupping machine which suction pressure in each different cupping cup can be measured for different body area of the patient.
- ii. To develop an auto cupping machine which can save the time for every session of cupping.
- iii. To develop an auto cupping machine which can automatically do the vacuum suction on the skin, automatically lancing device and spray the medicine (antiseptic) into the cupping cup.
- iv. To develop an auto cupping machine which is portable for the therapies to use.

4. RESEARCH METHODOLOGY

The process of developing this auto cupping machine is divided into three parts which are designing part, electrical part and mechanical part. In designing part, the process begins with the sketching the training kit. It is designed using inventor software. In the design, it is clearly present all the components with the correct dimension and how the auto cupping machine looks like. Figure 2 show the detail design of Auto Cupping Machine.



Figure 2: Detail Design of Auto Cupping Machine

Then, the electrical part is continued which include the process of designing, printing and etching the Printed Circuit Board (PCB). The PCB is designed using Proteus Design Suite software. In Figure 3 shows the complete circuit design for the machine. The circuit shows the Arduino Nano is used as the main controller of the machine. From the circuit can be clearly seen there are water pump, vacuum pump and needle motor is connected to the Arduino Nano controller as the outputs. Otherwise, there is also LCD display connected to the Arduino Nano as the analog output. Once the PCB completed, all the electronic component such as transistors, diodes, resistors and others are soldered to the PCB.

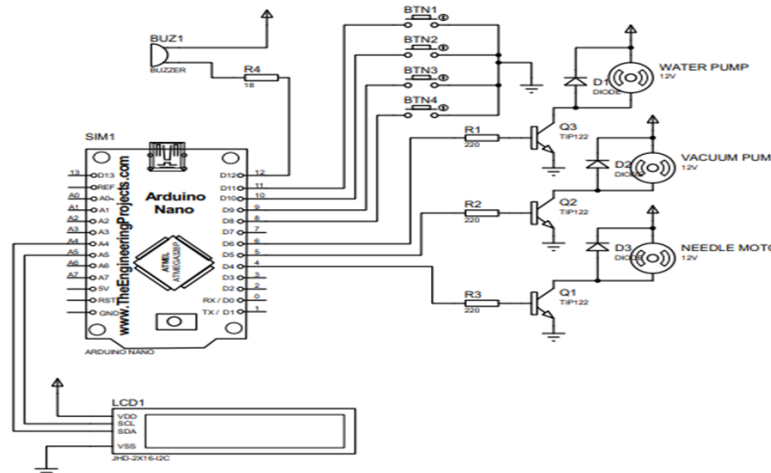


Figure 3: Final Circuit Design

The final part of developing this auto cupping machine is mechanical part. In mechanical part, all the components are assembled together with the body of the machine. The PCB is placed inside the machine to make it seem neat with a good finishing. Figure 4 shows the final product of Auto Cupping Machine.



Figure 4: Auto Cupping Machine

5. RESEARCH FINDINGS

The idea of developing this auto cupping machine is to develop an auto cupping machine which suction pressure in each different cupping cup can be measured for different body area of the patient. Table 1 show the result from different body area of cupping therapy. The table give the reading of the pressure for five different body area which are normally done for cupping therapy. Those body area are neck, shoulder right and left, and abdomen right and left. The pressure is different for different person because of others factor which will influence the result such as the thickness of the skin. The reading of the pressure is shown through LCD display which is programmed into Arduino Nano controller.

Table 1: Table of Pressure suction

NO	AREA	PRESSURE
1	Neck	-0.250kPa
2	Shoulder Right	-0.276kPa
3	Shoulder Left	-0.250kPa
4	Abdomen Right	-0.260kPa
5	Abdomen Left	-0.220kPa

Besides, the development of the machine also is proved can save the time for every session of cupping. From the therapy done using Auto Cupping Machine, a complete cupping therapy can be done just within 20 minutes per session compared to the one hour treatment using traditional way of cupping therapy. It is because this machine is developed with automatic vacuum suction on the skin, automatically lancing device and spray the medicine (antiseptic) into the cupping cup. All the automatic process really help in reducing the time of therapy session.

6. DISCUSSION

Based on the analysis done, this project had conclude that an auto cupping machine is a good innovation in alternative medical treatment. The main component like vacuum motor, water pump and needle gun which is controlled using Arduino Nano controller is a new multilevel of development in design and productivity. An old traditional cupping therapy, basically it use some things such as cupping cup, needle pen, and bottle spray to complete it but with this project machine that combine all the thing in one machine help therapist reduce energy and time management.

Besides, this machine also contain vacuum pump for suction process and vacuum sensor for detecting the pressure in cupping process would help the therapist to manage the air suction. Otherwise, the water pump is used as anti-septic

spray to spray out the anti-septic liquid to avoid skin bruises or to avoid illness that can damage the skin. Then, the needle gun that had been created based on tattoo gun studies, it would stab a needle fast and efficiently to the skin to make a scar for blood come out. This studies for this machine mostly based on the cupping therapy itself that had lot of help. There are many doubt to do this therapy such as this therapy could not be done on triangle area which is nose and mouth area. Furthermore, a pregnant girls also cannot do this therapy process because to avoid any risk that can happen.

From a survey done with cupping practitioners, this machine can be upgrade so that the cupping process can be apply to more than one patient per time. An upgrading for the system and it component would be a good idea for a new generations that would like to do research and more analysis. Besides, some suggestion for the new upcoming project are would like to recommend the new generation to create a new cupping therapy machine that fully automatic and that would help other people more easier to use this machine. This auto cupping machine is a new development that have a very big potential to be commercialized.

7. CONCLUSION

As a conclusion, this development of this auto cupping machine which using Arduino Nano as a controller was a great idea in upgrading a new therapy from traditional therapy. With this auto cupping machine, the time taken in conducting a session of cupping therapy had been reduced and make cupping therapy become easier. Furthermore, with the use of Arduino Nano to control the water pump, vacuum pump and needle motor make this cupping machine is a success auto cupping machine with a good result of cupping therapy. In term of portable machine, this machine is developed using light material which compact every part used for cupping process in one case. It really makes the machine easy to carry to everywhere. As all the objectives is achieved makes this machine is a success machine that can be commercialized in the alternative medical treatment.

8. ACKNOWLEDGMENTS

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