



WiFi Based Massager Device with NodeMCU Through Arduino Interpreter

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Abstract

According to the claim of electrical and shocker makers, creating artificial spasms have a duty of such sport activates for a person and leads to burn calories, weight loss and size. Of course, this function hasn't been proven yet. Slimming belt and massage devices are using 2 mechanism containing vibration and shaking the area and creating heat, which causes temporary relocation and tiny of subcutaneous fat and slimming belt leads to decrease size. Vibration devices can be categorized in to 2 groups: First: topical belts and massagers, and second: vibration plates or whole body vibrator. In this project which has done with the aim of massager devices, one simple with the small dimensions and in order to controlling through wifi, has designed and evaluated, which result of this study, is demonstrating the successful design and making mentioned device has capability to use in therapeutic halls. Moreover, with attention to the similar structure to the slimming belts, it can be used in large dimension for slimming belts.

Keywords: Ip, massager device, Arduino, slimming belt, NODEMCU.

1- Introduction

The first vibrational belt introduced by Dr. Klog in Michigan in 1928. [1, 2] This belt has a simple structure based on the vibration, which is located almost in the middle of the body, around waist and by creating Shake through a vibration motor, it behaves like a mobile phone structure. This pulsation leads to stimulation of spasm in stomach muscles and by using the belt in sitting or walking mode, it is usable while it's working on stomach muscles. According to the researchers, using belt by

creating spasm in stomach muscles can help to the food digestion, moreover, with increasing vibration in this device, we can reach to a state such as work out which leads to the burn calories more than before and where up on weight loss[3,4]. The designer of this slimming belt claim that belt movement plays an effective role to the back muscles stimulation and so it is effective on stomach muscles which helps to decrease weight and stomach contents. From other uses of these belts, can mentioned to the muscles density and strengthening, increasing metabolism,

flexibility and bone density, regulation of blood circulation and refreshment[5].

2- System Component

According to the mentioned subjects, the designed system is containing 2-part, hardware and software which have shown in figure (1).

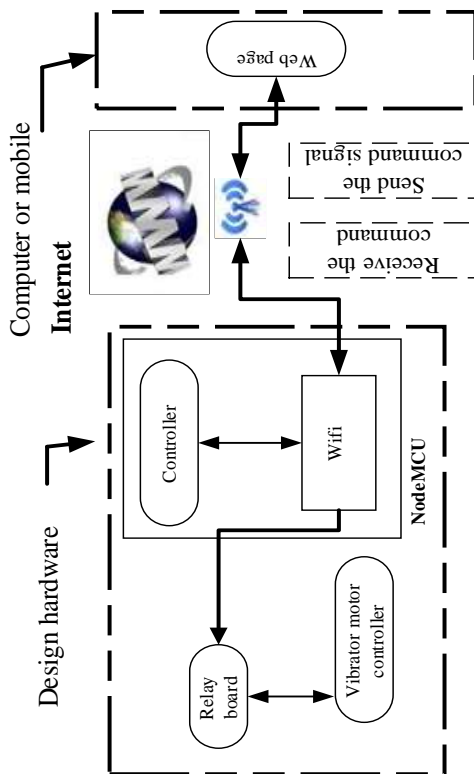


Figure 1: System block diagram system

As figure 1 shows, suggested system is containing 2 parts of send and receive in running software and hardware. The hardware part is containing: 1-NODEMCU madule,2-Relay bord,3-vibration motor.

The software part is containing: HTML part and written program by Arduino language. The purpose of used hardware in the system is using available wifi module on it to create a connection between input and output, and the purpose of using available of software is programming and controlling system, which will be engaged in the following:

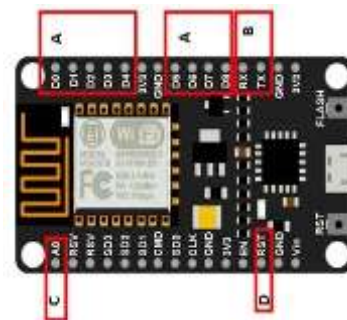
1-2-System Hardware:

1-1-2- NodeMCU01:

This hardware is an open text structure based on internet of things (IOT), using ESP8260-12 chip. [6] which has some parts such as GPIO,PMW,I²C,single wire connection and analogue to digital converter, all collected in one board, moreover, using LUA programming language, this structure Is programmable by Arduino. Mentioned module can be known as one of the best wifi module with capability of connection to router or AP and some information through the net con sent and received by this module esp8266 has shown. The physical structure and basic specifications of this hardware have shown in figure 2.

Table 1:ESP6266 specification

No	Specification	Description
1	Voltage	3.3 V (3.0 – 3.6 V tolerated)
2	Current	10 ua – 500 ma (64 ma average)
3	Processor	Tensilica L106 32 bit
4	Crystal	80-160mhz
5	RAM	32K + 80K (explained below)
6	Memory	Flash memory, 16MB max (512 K – 4 MB often provided)
7	Gpios	17 (multiplexed with other functions)
8	ADC	1 (10 bit)
9	Wi-Fi	802.11 support b/g/n/d/e/i/k/r



As it has shown in figure2, this module has digital pins, serial connection, analogue to digital converter and reset circuit, which has shown in table 3 briefly [7].

Table 2: the pin introduction in NODEMCU01

NO	Label	Pin name	Pin number	Specification
1	A	GPIO	14,12,13,0, 4,5,2,15,16	The input and output module pin which can be assigned to be one or zero beside the two pins of GPIO0 and GPIO15 can be used for the programming mode
2	B	USART	TX/RX	The Serial connection USART with the other hardware Tx for receive the data and Rx for the sending task
3	C	ADC	A0	Used for analog reading
4	D	RESET	RESET	Reset the module in the normal mode this pin should connect with 10K to VCC
5	E	CH_PD	CH_PD	This pin used to active the module and always should be 1

2-1-2-Relay:

To do better command of vibrator motors and also at most 40 Ma existing restriction in NODEMCU01 module, it has used NEC miniature relays with the 5V (figure 4) along [8, 9] with special driver and specifications mentioned in table (4).

Table 3: NEC relay specification

No	Parameter	specification
1	Working voltage	5 volts
2	weight	1.9 gram
3	power	140-200 milli watt



Figure 2: NEC relay

2-1-3-massager motors:

Considering desired dimension to do vibration, usage of vibration motor micro-motor-m1 as a system output has been done and its feature [10-11] has mentioned in table 5 and Figure 4.

Table 4: vibrator motor specification

No	Parameter	specification
1	Motor voltage	3.7 volt
2	Current motor	30-100 ma



Figure 3: vibrator motor

2-2-program software:

The project software is containing 2 parts: First: C++ language for module and second: HTML for webpage to make connection with hardware and webpage. The first part in the software is connection of module to wifi, which for connecting of module wifi, first module recalls, then desired connection to wifi takes place: In the first stage, username and wifi password enter to the program, and webpage server through HTML and required codes are created. In the second stage, input and output pins are determined and initial values are given. In third stage desired program with the specified operation, is created. At the end, through serial connection, the webpage address is received. To run the program, by making a copy in the explorer page, the desired page is accessible creating a webpage through HTML, the controlled program of device is created which makes a connection between hardware and software through wifi. Based on Table 5 command Created webpage is containing HTML codes, consists of 8 keys, with making 8 work states. Table 6 is presenting 8 work states and definition of these work states are related to the motor's location in massagers. (Figure 4).

Table 5: The command stats and function

No	State	Function and action
1	State 1	MOTOR_1 TURN ON/MOTOR_1 TURN OFF
2	State 2	MOTOR_2 TURN ON/MOTOR_2 TURN OFF
3	State 3	MOTOR_3 TURN ON/MOTOR_3 TURN OFF
4	State 4	MOTOR_4 TURN ON/MOTOR_4 TURN OFF
5	State 5	MOTOR_1,2 TURN ON
6	State 6	MOTOR_3,4 TURN ON
7	State 7	MOTOR_1,2,3 TURN ON
8	State 8	MOTOR_1,2,3,4 TURN ON

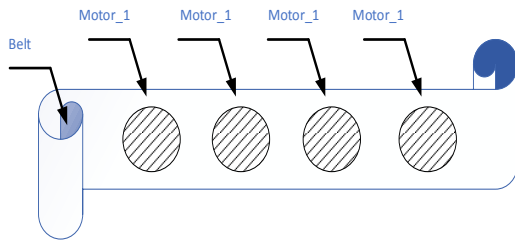


Figure 4: motor position inside the belt

In this structure, the duty of each module pins in the software environment is specified, also in the webpage, the operation of each key is determined, which by program uploading through wifi, it makes a connection between in output and output and its result can be shown in output. The related algorithm of two hardware parts (module) and HTML codes has shown in figure 5 and 8 respectively. As it has shown in figure 5, first module recalling is done, and then desired wifi is defined. With launch of desired web server, used wifi, username and password are determined. Then pins D₁ to D₄ are specified. After receiving Ip, module connection is checked and by making connection to desired webserver, 8 modes are created. For example, by pressing the key 7, at the same time and with a specific time delay, motors number 1 to 3 can be turned off or on. By the program uploading, the webpage ip is received and it is accessible through explorer.

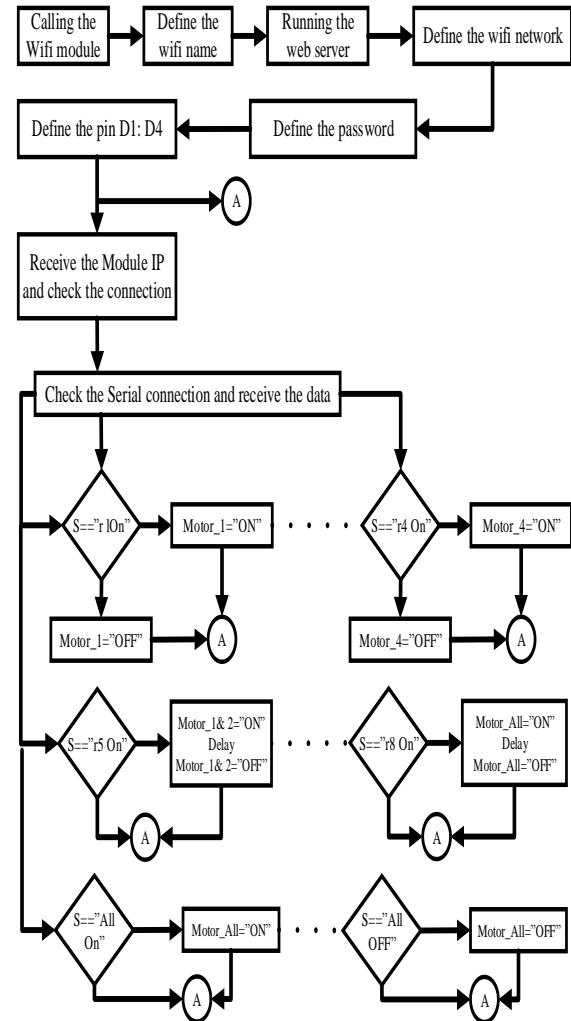


Figure 5: NODEMCU01 flowchart

In figure (5), created webpage flowchart through HTML codes has shown. In this algorithm, first the project name and webpage color are specified by HTML codes, then work states of each keys from r₁ to r₈ (each one is related to turning off and on a special motor) are determined. In this algorithm, r₁ to r₄ keys are related to turn off and on, motor 1 to 4 and keys r₅ to r₈ are related to turn on and off the motor or more, simultaneously with a specific time delay.

3-Design Evaluates:

As it has shown in Table 5, according to the defined algorithm, through HTML code, the webserver structure containing program key is created. Each key makes special mode. For example, key number 1 is related to motor 1 which its function of turning off and on can be

seen by pressing that in the webpage. Key number2 is related to second motor which by pressing of that, the motor can be turned off and on. Key number3 is related to third motor which by pressing that, this motor can be turned off and on. In the same way, key number4 is related to motor4. The other second 4 state keys can turn off and on two or more motor at the same time. The explorer page has shown in figure (6).

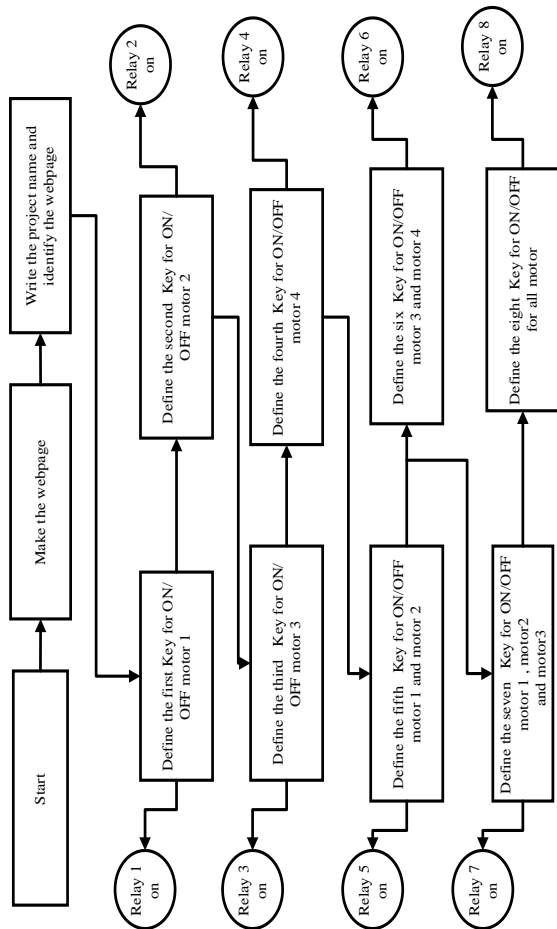


Figure 6: Webpage flow chart

Figure 7 is shown designed webpage for displaying the project. This page has designed through HTML codes, so, each key is located for separate input and by desired motor, and it can be controlled and programmed.

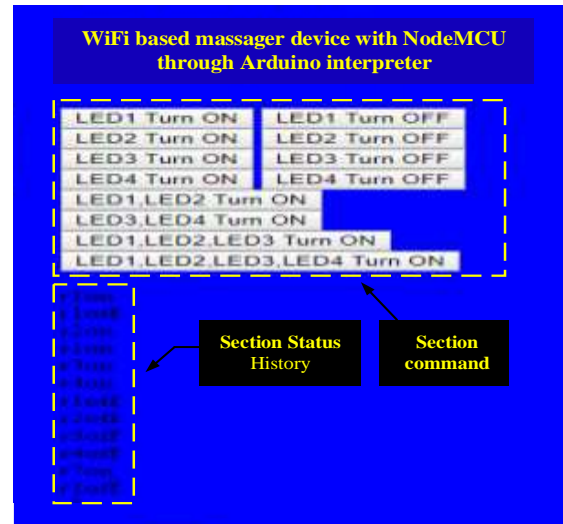


Figure 7: design web page

By pressing each key available in the plate, the functions related to desired motor is done on motor. As it has shown in figure 8, by pressing key (5), the first and second motors are turning on at the same time and after a certain delay, they will turn off. According to the explained hardware the purpose of choosing each part and duty of each components of system design have shown in Table 6.



Figure 8: output control with the web page key

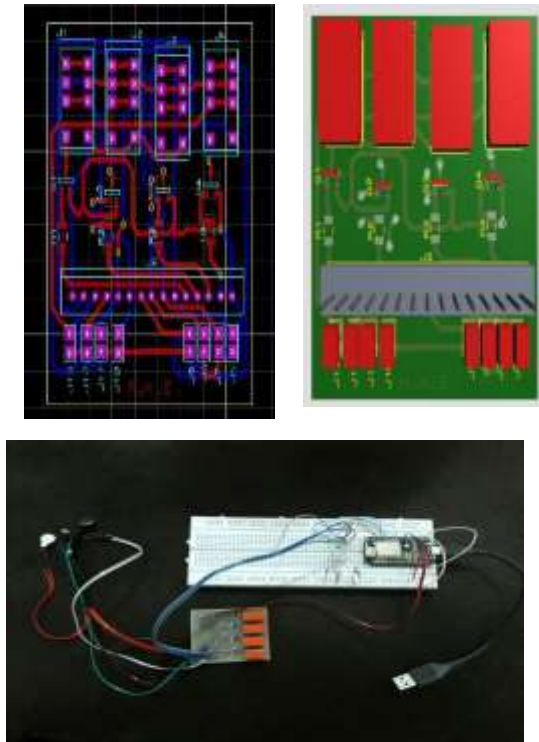


Figure 9: final board with the schematic

Table 6: the part duty and task

No	part	Task	Advantage
1	NODEMCU01	Relation between input and output	The good module with router connection features
2	Relay board	Motor protection	Small size
3	Vibration motor	Output monitoring	Small size
4	Web page	GUI	Independent of any software

4-Result:

The obtained result of mentioned design is shown, this design has the capability of remote control and by using specific sensors [9], it can be used in more particular applications such as massage device and slimming salon through wifi control. This design has used a simple algorithm to make a connection between explorer pages and NODEMCU hardware which causes reducing structure dimension and increasing system capabilities, moreover, using webpage, leads to be accessible in user environment [12-14] and does not need to use any additional software. The reported work

may be applicable in other area like [16-18] as the extended research area in future work.

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