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Removal of cardiac atherosclerosis

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ABSTRACT

Atherosclerosis is a condition in which the plaque, made up of organic and inorganic substances such as fat, cholesterol, and calcium gets deposited in the inner walls of the arteries. This result in the narrowing of the arteries that prohibits the supply of the oxygen-rich blood to the heart and the other parts of the body. The stent is a miniaturized mesh-like tube structure that pushes the plaque depositions against the arterial walls and restores the normal blood flow in the artery. In this paper gives the study of the deformation of a coronary stent that is deployed in the coronary artery of the heart. The catheter inserted into the arteries of blood vessels. Using an ultrasonic sensor to predict the distance by applying an ultrasonic wave. The ability to use a laser that generates an intense beam of coherent monochromatic light will assist to breach the plaque. A Motor being used for a centrifugal fan to grind the broken plaque. GSM is proving for telecommunications. This proposed model can detect the plaque in arteries and remove the plaque by using devices. We have done this process in the prototype model by using a microcontroller.

Keywords— *Catheter, Laser, GSM, Prototype, Microcontroller*

1. INTRODUCTION

According to the statistics information from the World Health Organisation more people die from Cardiovascular Diseases (CVDs) worldwide than from any other cause – an estimated 17.5 million people in 2012 [1]. If current trends continue, the annual number of deaths from cardiovascular disease will rise from 17.5 million in 2012 to 22.2 million by 2030. The risk factors for CVD include behavioural factors, such as an unhealthy diet, tobacco use, harmful use of alcohol, physiological factors and inadequate physical activity, including high blood pressure (hypertension), high blood sugar or glucose high blood cholesterol.

Atherosclerosis can take place in an artery located anywhere in the body such as heart, arms, legs, kidneys etc. This leads to a number of diseases that can even be fatal if not cured. Coronary arteries are responsible for providing oxygen-rich blood to the entire heart muscles. Plaque depositions in the arteries of the heart lead to Coronary Artery Disease (CAD) that can also be referred to as Coronary Heart Disease (CHD). Plaque depositions lead to the narrowing of the coronary arteries thereby reducing the blood flow to the muscles of the heart.

The lack of blood flow in the heart muscles can lead to chest pain and even heart attack [2]. Coronary stent is used which is called as a 3D simulation of a Palmaz Schatz stent [2]. Percutaneous transluminal angioplasty [1] [2] balloon catheter for sensing vessel blockage and generating perturbation motion [1]. The Smart antenna stents integrated with micro pressure sensors leading to the demonstration of continuous wireless tracking [3]. Coronary angioplasty can be used only if one or two arteries are affected. The temporary stent placing in artery causes regenerating the plague depositions in the arteries.

The primary focus of these problems, we proposed a system that helps to remove more than four or five plaques without open heart surgery. We can remove a plaque through laser and motor. Ultrasonic Sensors measure the distance of the plaque. GSM is a mobile communication for transforming information in a well secure manner. The recovery period is less than a day. The catheter is used only once, hence it doesn't cause any infections.

2. BACKGROUND

In the existing system during the process of catheterization. The stent is placed inside the artery itself in order to widen the blood vessels to its original state but it is not removed so we thought to remove the stent completely outside so we are doing this project. The main scope of our project is to remove the stent completely from the blood vessels so that the patient who did catheterization may feel comfortable and in future, he will not get any problem due to the placement of stent inside the blood vessels.

3. METHODOLOGY

Atherosclerosis is a condition in which the plaque, made up of organic and inorganic substances such as fat, cholesterol and calcium, gets deposited in the inner walls of the arteries. Ultrasonic sensors measure distance by using ultrasonic waves.

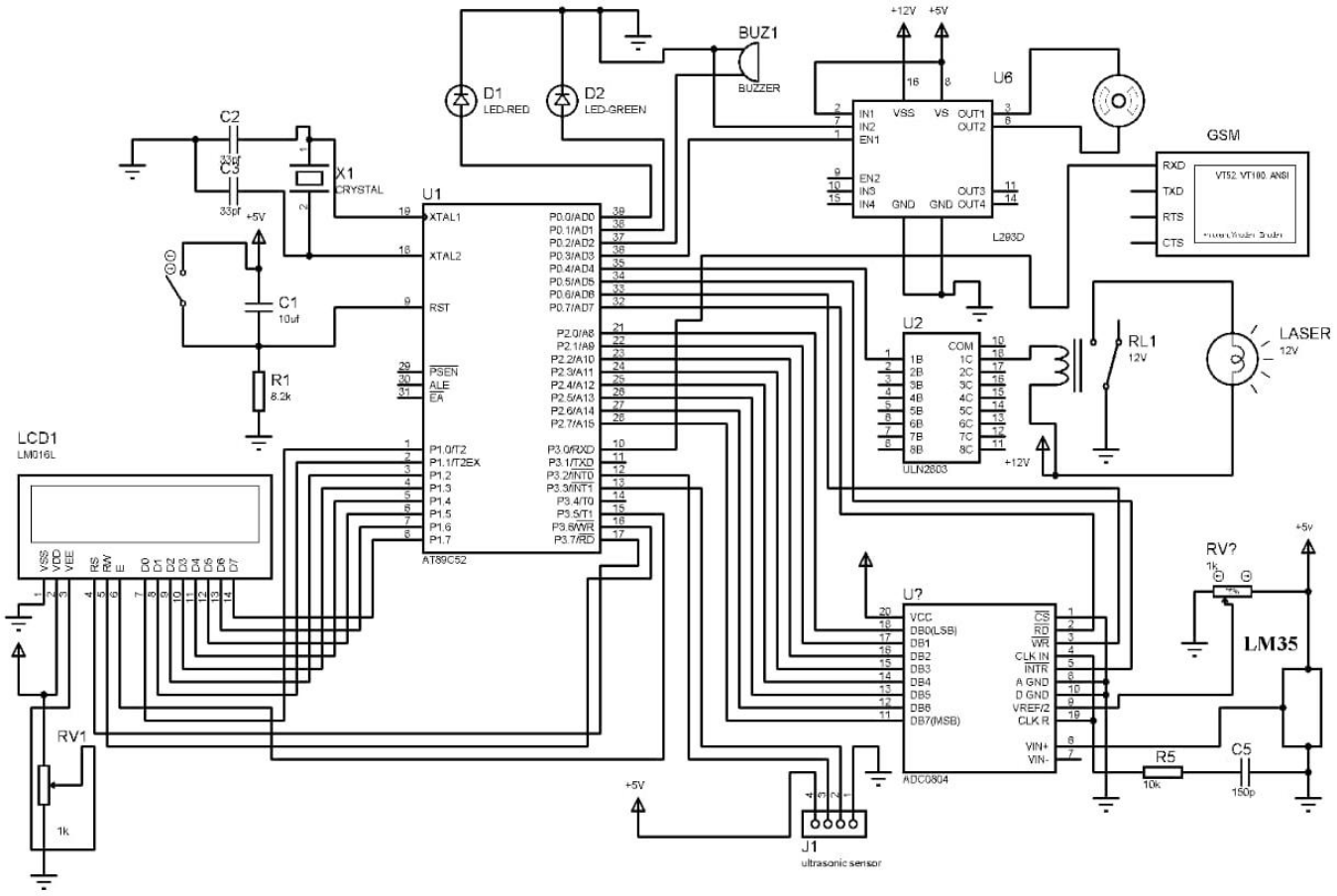

Fig. 1: Schematic diagram

It is used for detection of plaque and also determines the size of the plaque in the artery. The catheter is used for insertion through the artery. The laser is used for breaking the plaque, the laser is given minimally for the purpose of breaking the plaque in a smaller diameter. The broken plaque is then sent to the motor in which it spins and broken into smaller tiny fragments, it will break into a mesh-like particles to which the substance removed outside from the body. Relay driver is an electromagnetic switch that will be used whenever we want to use a low voltage circuit to switch a light bulb ON and OFF which is connected to 220V mains supply. The relay is a process in which block is completely removed until the process is done. It has an indication of the buzzer to which the process started by the buzzer to a second and if it ends and the buzzer is finally sounds and it seems process is completed. Liquid Crystal Display is used for display the output of the artery block in numerical values.

4. HARDWARE DETAILS

4.1 Ultrasonic sensor

Ultrasonic sensor (HC-SR 04) measure distance by using ultrasonic waves. This sensor is a very popular sensor used in many applications where measuring sensing or distance objects are required. The module has two eyes like projects in the front which forms the Ultrasonic Receiver and transmitter. This module has 4 pins- Vcc (5V), Echo, Trig, GND. The sensor head emits an ultrasonic wave and it receives the wave reflected back from the target. The distance can be calculated by L=1/2×T×C.

4.2 Temperature sensor

The LM35 is one kind of commonly used temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature in degree Celsius. It can measure temperature more correctly when compare with a thermistor. This temperature sensor generates a high output voltage than thermocouples. It may not need the output voltage is amplified. The LM35 has an output voltage that is proportional to the Celsius in temperature.

4.3 Laser

Pulsed dye laser treatment is a safe and comfortable way to improve your rejuvenate and complexion. Pulsed Dye Laser treatments have been safely used to treat excess blood vessels for nearly two decades. The Pulsed dye laser uses a concentrated beam of light that targets plaque in blood vessels. The light is converted into heat, destroying the plaque while leaving the surrounding skin undamaged. This is one of the most effective treatments for various skin disorders characterized by red discolouration and also used in the catheterization process.

4.4 DC Motor

The DC motor is an electromagnetic device that converts digital pulses into mechanical shaft rotation. It has some internal mechanism, either electronic or electromechanical to periodically change and the direction of current flow in part of the motor. A DC motor's speed can be controlled over a wide range, using either changing the strength of the current in its field windings or by a variable supply voltage. A DC motor has a stationary set of magnets in an armature and the stator with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have in large motors and multiple turns around the core and there can be several parallel current paths.

4.5 Microcontroller

The 8052 microcontrollers is commonly called as the 8051's "big brother." It is a slightly more powerful microcontroller when compared to 8051. It consists of 256 bytes of Internal RAM compared to 128 in the standard 8051. A third 16-bit timer, capable of a number of new operation modes and the 16-bit reload. Additional to this many components such as ADC and LCD are directly interfaced with it.

5. RESULT AND DISCUSSION

Thus the catheter is inserted through a femoral artery in upper thigh region and then the Ultrasonic sensor will send the pulse through a blood vessel and determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. And then the echo received by the ultrasonic sensor will send back to the microcontroller. The microcontroller is connected with the ultrasonic sensor and LCD. The LCD is connected to the microcontroller to show the distance of the plaque in centimetres. Based on the program code the ATMEL will display the distance of the plaque as output in the LCD screen.

After knowing the distance of the plaque in the artery the catheter is passed through the femoral artery and the plaque is completely removed by the above ideas. As a result, there will be no scar formation because this method is less invasive and there will be no more blood loss during this process. The time consumption of our project will be nearly 30 to 45 minutes.

6. CONCLUSION

Thus our project is used for breaking the plaque formation in the blood vessels even the plaque became harder, the above method is used. Not only for breaking the plaque for in one blood vessel but also used for breaking the plaque in more than one blood vessel with less pain and without affecting the neighbouring blood vessels.

Firstly we using Ultrasonic sensor to detect the plaque. The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels and when it gets objected by plaque it gets reflected back toward the sensor. The distance of the plaque will be shown on the LCD screen.

A dye laser is a laser which uses an organic dye mixed in a solvent as the lasing medium and it helps to break the plaque. It will hit the plaque and plaque will be broken. Then we are grinding with a motor the broken plaque into tiny fragments. Then we remove the tiny fragments of the plaque completely and the buzzer gets indicate. Using GSM we communicate information through telecommunication.

7. REFERENCES

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