

Introduction

1.1 Overview

One of the most common diseases is renal failure; it's a medical condition in which the kidneys fail to adequately filter waste products from the blood. Hemodialysis machine (HD) is used to achieve the extracorporeal removal of waste products such as creatinine and urea and free water from the blood. The machine has problem of stop every time that the sensors find air in the blood.

Patients in sudan have Hemodialysis 3-4 times 3-3.5 hour per time due to patient body. At the start of the session, the blood pressure, skin temperature and pulse will be measured. Two thin needles will be inserted into your AV fistula or graft and taped into place. One needle will slowly remove blood and transfer it to a machine called a dialyzer or dialysis machine. The dialysis machine is made up of a series of membranes that act as filters and a special liquid called dialysate. The membranes filter waste products from blood, which are passed into the dialysate fluid. The 'dirty' dialysate fluid is pumped out of the dialyzer and the 'clean' blood is passed back into your body through the second needle. It would be too dangerous to remove large amounts of blood in one go, so only 40-50ml (two fluid ounces) of blood is removed at any one time. During dialysis sessions, patients can sit or lie on a couch, recliner or bed. They are able to read, listen to music, and use mobile phone or sleep. Children who have hemodialysis often find that playing on a mobile games console is an enjoyable way to pass the time. Hemodialysis is not painful, but some people experience symptoms of nausea, dizziness and muscle cramps during the procedure. This is caused by the rapid changes in blood fluid levels that occur during dialysis. After the dialysis session, the needles are removed and a plaster is applied to prevent bleeding.

1.2 Problem statement

When the air entered to the human blood it can cause serious problems and lead to death, therefore in the hemodialysis machine when air is detected the machine stopped until the air drained manually which consider an inaccurate and time consumed method.

1.3 Proposed Solution

A microcontroller based control system is to be used to sense and drain the air, The system should be able to automatically detect the air and fast response to Drain the air out of the blood .

1.4 Project AIM

Design of an Extracting air control system from blood in hemodialysis machine using Microcontroller, to decrease the time of dialysis operation making patient suffering less.

1.5 Objectives:

The main objective is to design a control system for the hemodialysis machine. The System should be accurate and has fast response.

To achieve this objective:

- A control system proposed to detect and extract the air.
- The performance evaluation for the system will be done.

1.6 Methodology :

The system is developing is several phases firstly ; develop PID algorithm using c programing language, compile the program, secondly; design and simulate atmega16 , sensor and valve, test and troubleshoot for each factor to achieve better

performance. Finally; the system will be able to detect the air bubbles in the blood and drain it through the valve. These will be done as follow;

1. Make the design of the system.
2. Codevision will be used to write and test the code.
3. Protuos simulator will be used to simulate and evaluate the system.

1.7 Scope :

The scope of project is concentrate on automatic control area specially the area of microcontroller. the project focus in biomedical systems (hemodialysis machine).

1.8 Thesis Outlines

Chapter One: introduction gives an overview about the renal failure, hemodialysis and addresses the problem statement and proposed solution.

Chapter Two: Literature Review highlights the hemodialysis structure type, sensors explained in this chapter along with valves.

Chapter Three: system design shows the proposed system and explains the system structure and program flow chart.

Chapter Four: Result and discussion highlight different cases of the Simulation

Chapter Five: Conclusion and recommendation.