3.1 Basic Design and Requirements

Microcontroller (Atmega 16), IR LED and an IR Sensor, Liquid Crystal Display (LCD) ,valve, Motor driver (ULN2003). The IR sensor checks whether there are micro air bubbles in the blood if there is any it gives voltage less than 1.98 at the input ports of the ADC in microcontroller which covert the signal from analogue to digital which help microcontroller to take decision turning the valve of draining blood with air preventing the machine suspension.

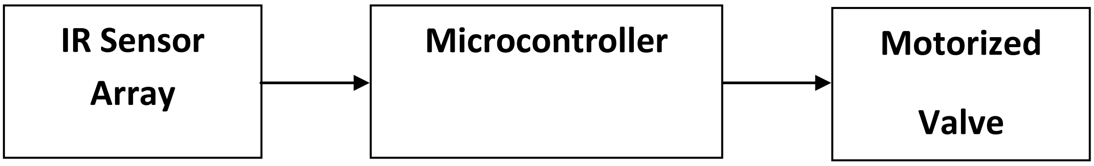

Figure 3-1 block diagram of the system

3.2 Atmega16 Pin Descriptions

The pin connection of atmega16 as listed in data sheet

Table 3-1 pin connections of atmega16

Pin name	Pin description
VCC	Digital supply voltage.
GND	Ground.
Port A (PA7..PA0)	Port A serves as the analog inputs to the A/D Converter. Port A also serves as an 8-bit bi-directional I/O port, if the A/D Converter is not used.
Port B (PB7..PB0)	Port B is an 8-bit bi-directional I/O port with internal pull-up resistors.
Port C (PC7..PC0)	Port C is an 8-bit bi-directional I/O port with internal pull-up resistors. The Port C output buffers have symmetrical drive characteristics with both high sink and source .If the JTAG interface is enabled, the pull-up resistors on pinsPC5(TDI), PC3(TMS) and PC2(TCK) will be activated even if a reset occurs.
Port D (PD7..PD0)	Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit).
RESET	Reset Input. A low level on this pin for longer than the minimum pulse length will generate areset, even if the clock is not running
XTAL1	Input to the inverting Oscillator amplifier and input to the internal clock operating circuit.

XTAL2	Output from the inverting Oscillator amplifier.
AVCC	AVCC is the supply voltage pin for Port A and the A/D Converter. It should be externally connected to VCC, even if the ADC is not used.
AREF	AREF is the analog reference pin for the A/D Converter.

Table 3-2 atmega 16 pins in system functions

pin	**Function**
37	Sensor 1 input
38	Sensor 2 input
39	Sensor 3 input
22	Motor control to pin 1 on uln2003
23	Motor control to pin 2 on uln2003
24	Motor control to pin 3 on uln2003
25	Motor control to pin 4 on uln2003
14	RS of LCD
15	RW of LCD
16	E of LCD
18	D4 of LCD
19	D5 of LCD
20	D6 of LCD
21	D7 of LCD
30	AVCC

3.3 The Driver Chip (ULN2003)

The ULN2003is a high voltage, high current darling on arrays containing seven open collector darling on pairs with common emitters. Each channel rated at 500mA and can withstand peak currents 600mA. Suppression diodes are included for inductive load driving and the inputs are pinned opposite the outputs to simplify board layout.

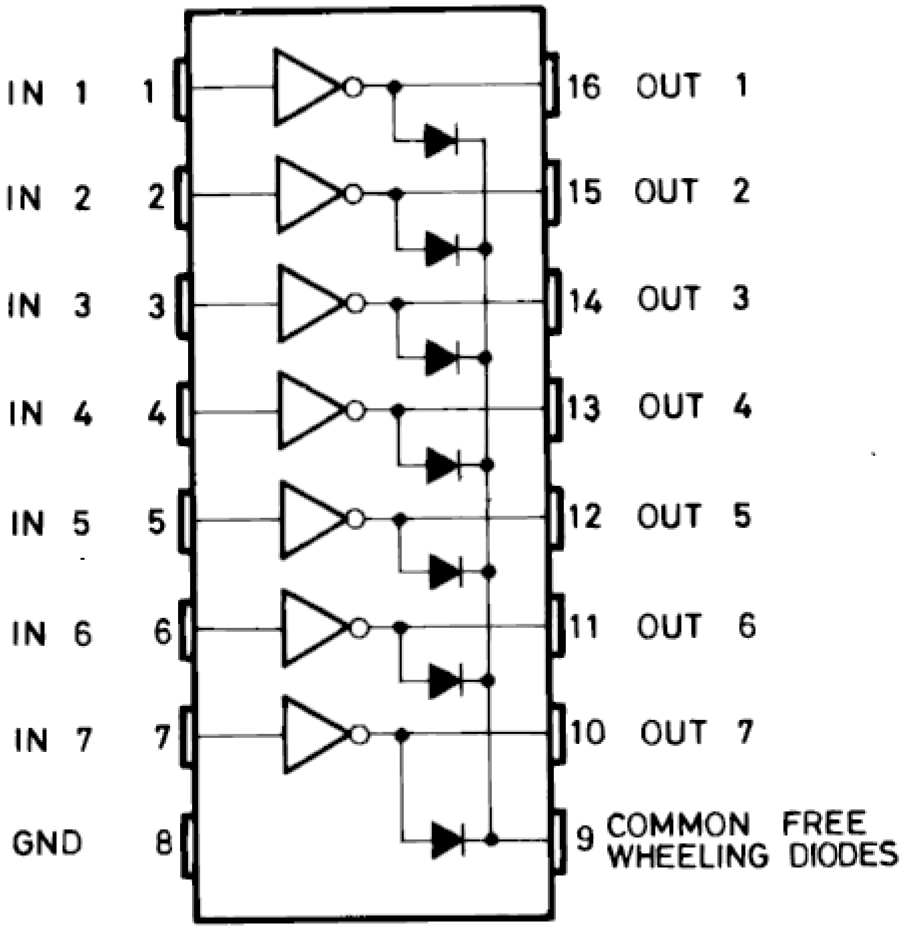

Figure 3-2 pin connections of ULN2003A

This device is useful for driving a wide range of loads including solenoids, relays DC motors, LED displays filament lamps, thermal print heads

and high power buffers. it is supplied in 16 pin plastic DIP packages with a copper lead frame to reduce thermal resistance.

3.4 Proteus

Proteus is a single integrated application with ISIS, ARES and 3D Viewer modules appearing as tabbed modules. The program enables changes on the schematic to be reflected across PCB, BOM and Design Explorer in real time. Proteus stores the design (DSN), layout (LYT) and common database in a single project file (PDSPRJ).ISIS has been used to make and test the circuit of system and obtain the results.

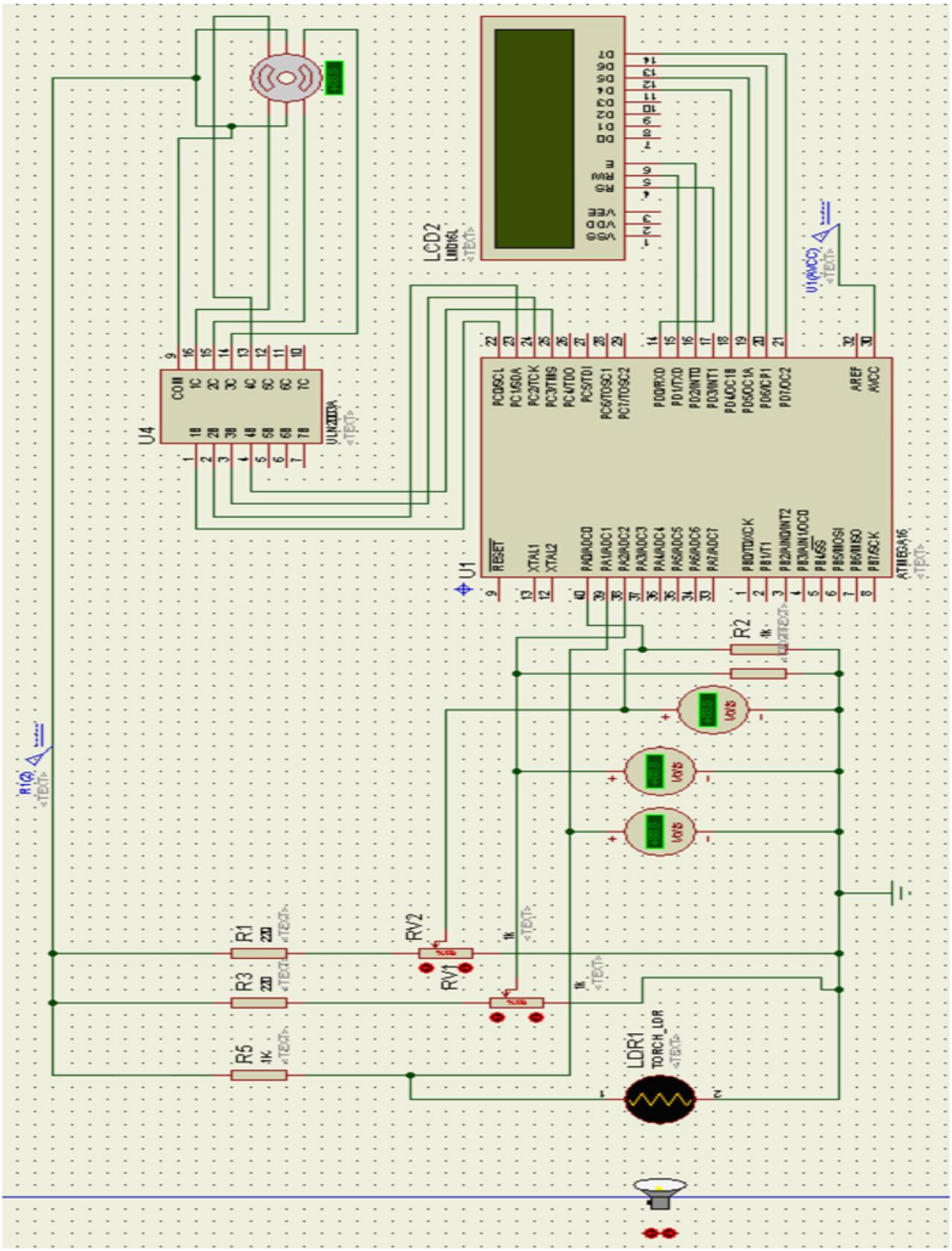

Figure 3- 3 system simulation circuit

3.5 CodeVisionAVR

CodeVisionAVR is a C cross-compiler, Integrated Development Environment and Automatic Program Generator designed for the Atmel AVR family of microcontrollers. It is designed to run under the XP, Vista, Windows 7 and Windows 8 32bit and 64bit operating systems. The C cross-compiler implements all the elements of the ANSI C language, as allowed by the AVR architecture, with some features added to take advantage of specificity of the AVR architecture and the embedded system needs. The compiled COFF object files can be C source level debugged, with variable watching, using the Atmel Studio and AVR Studio debuggers. For the code writing compiling and execution Code vision AVR has been used. Flowing flow chart has been executed in the compiler and result has been obtained.

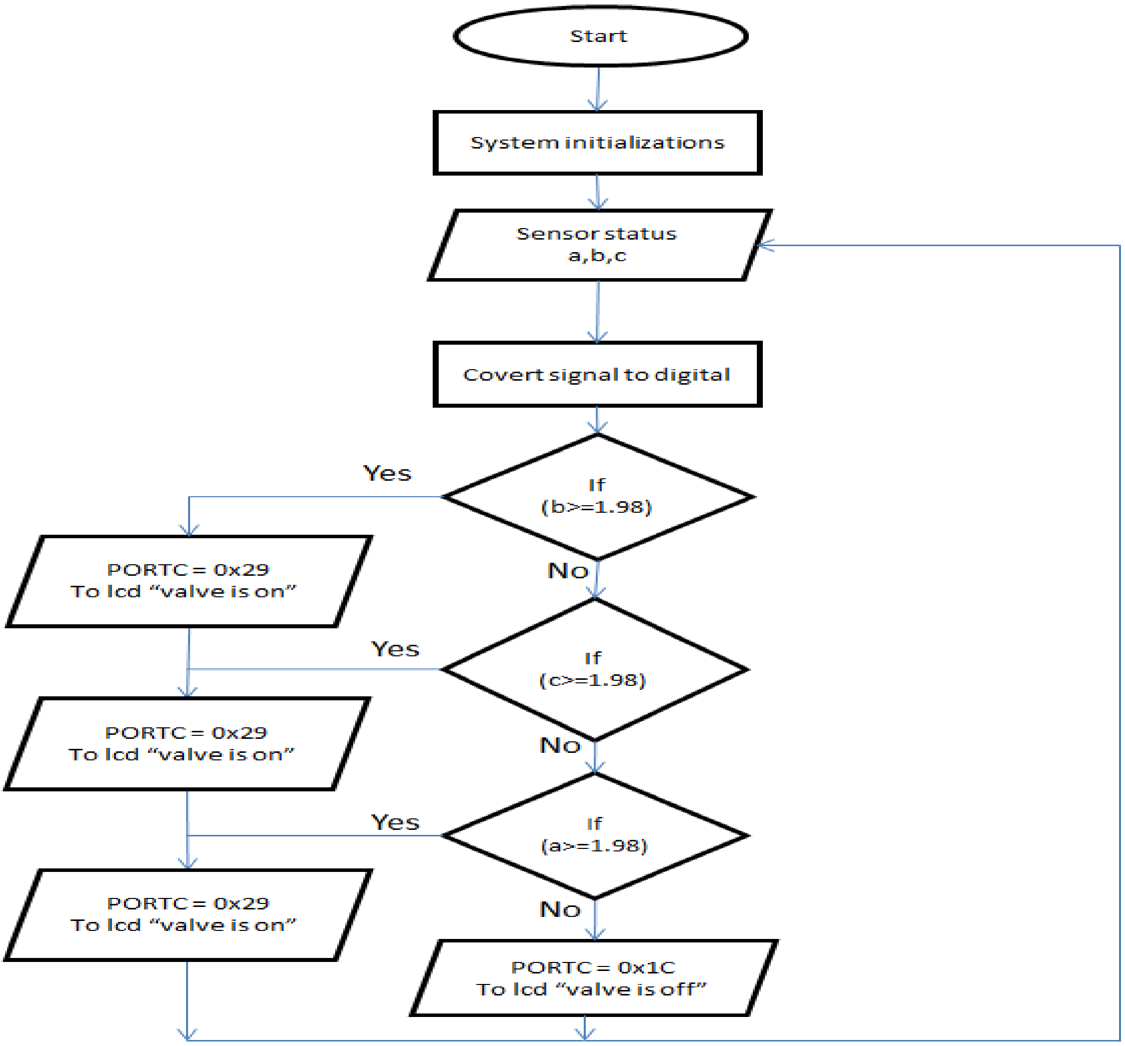

Figure 3-4 system program flow charts