

Psycho-Electro Control of Human Mind State (PECHMS)Mohsinuddin KhajaMoinuddin¹, Prof. Amol Barve², Misbahauddin Khajamoinuddin³¹Department of Electrical & Electronics Engineering, LNCT, Bhopal (MP)-462021, Indiaim1instrumentation@gmail.com²Department of Electrical & Electronics Engineering, LNCT, Bhopal (MP)-462021, Indiaamol.barve22@gmail.com³Department of Production Engineering, COEP, Pune (MH)-411005, Indiakhajamm07@gmail.com**Abstract**

Impact of mental stress is increasing day by day all over the world as referred by world health organization (W.H.O). Hypertension major cardiovascular disease causing deaths compare to other diseases. Various methods are adopted to measure blood pressure like sphygmomanometer, digital B.P methods, ultrasonic and many more. These methods give measurement only, where as no any kind of method to regulate the blood pressure. Here we made a first step towards making an engineering system to regulate the blood pressure using some psychological methods which can be integrated with measurement. Another concept is to provide standardization of skin resistance which changes from person to person. The skin resistance is directly proportional to value of blood pressure. Major concern involves to reduce monthly expenditure to middle economy families and to provide effective method so as to limit the boundaries of hypertension based cardiovascular diseases.

Key Words: Blood pressure, Hypertension, Regulate, Psychological methods, Skin resistance**Introduction**

Blood is carried from the heart to all parts of the body in blood vessels. Each time the heart beats, it pumps blood into the vessels. Blood pressure is created by the force of blood pushing against the walls of blood vessels (arteries) as it is pumped by the heart [1], [5], [11].

Hypertension, also known as high or raised blood pressure [2], [10], is a condition in which the blood vessels have persistently raised pressure. The higher the pressure in blood vessels the harder the heart has to work in order to pump blood [12]. If left uncontrolled, hypertension can lead to a heart attack, an enlargement of the heart and eventually heart failure [4]. Blood vessels may develop bulges (aneurysms) and weak spots due to high pressure, making them more likely to clog and burst [2]. The pressure in the blood vessels can also cause blood to leak out into the brain. This can cause a stroke. Hypertension can also lead to kidney failure,

blindness, rupture of blood vessels and cognitive impairment [12].

1. SURVEY AND COSTING:

A. Survey: - Globally cardiovascular disease including high blood pressure accounts for approximately 17 million deaths a year, nearly one third of the total. Of these, complications of hypertension account for 9.4 million deaths worldwide every year. Hypertension is responsible for at least 45% of deaths due to heart disease, and 51% of deaths due to stroke [12], [5].

In 2008, worldwide, approximately 40% of adults aged 25 and above had been diagnosed with hypertension; the number of people with the condition rose from 600 million in 1980 to 1 billion in 2008. The prevalence of hypertension is highest in the African Region at 46% of adults aged 25 and above, while the lowest prevalence at 35% is found in the Americas. Overall, high-income countries have a lower prevalence of hypertension - 35% - than other groups at 40% [12], [5].

In 2008, 1 billion people were smokers and the global prevalence of obesity has nearly doubled since 1980. The global prevalence of high cholesterol was 39% and prevalence of diabetes was 10% in adults over 25 years. Tobacco use, unhealthy diet, harmful use of alcohol and physical inactivity are also the main behavioral risk factors of all major noncommunicable diseases, that is cardiovascular disease, diabetes, chronic respiratory disease and cancer [12], [5].

If appropriate action is not taken, deaths due to cardiovascular disease are projected to rise further.

B. Costing: - In certain low- and middle-income countries, current health expenditure on cardiovascular diseases alone accounts for 20% of total health expenditure [12], [5].

Over the period 2011-2025, the cumulative lost output in low- and middle-income countries associated with noncommunicable diseases are projected to be US\$ 7.28 trillion. The annual loss of approximately US\$ 500 billion due to major noncommunicable diseases amounts to approximately 4% of gross domestic product for low and middle income countries. Cardiovascular disease including hypertension accounts for nearly half of the cost [12], [5].

Regarding the Indian patients there is approximately Rs 4000/- is required for the medicine and checkup of blood pressure disease. Mostly the use of tobacco and alcohol is considered here to reduce hypertension for which most of people invest money for no use. In-house treatment cost differently where as ayurvedic, unani and many more fields having the same treatment way which cost on monthly basis to maintain or put the blood pressure within safe limit to avoid heart attack issues.

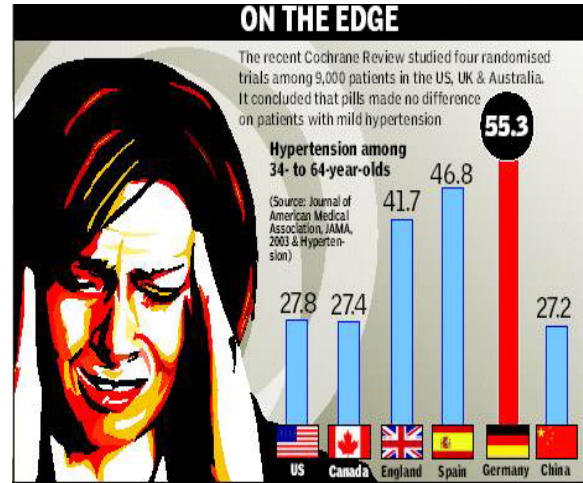


Figure 1: Article from "The Sunday Times", dated September 02, 2012

C. Classification of Blood Pressure for Adults: -

Table I: Classification of blood pressure for adults

Classification of blood pressure for adults		
Category	Systolic, mmHg	Diastolic, mmHg
Hypotension	< 90	< 60
Desirable	90–119	60–79
Prehypertension	120–139	or 80–89
Stage 1 Hypertension	140–159	or 90–99
Stage 2 Hypertension	160–179	or 100–109
Hypertensive Crisis	≥ 180	or ≥ 120

2. SYSTEM BASICS:

A. Relation between Hypertension and Blood Pressure: -

It has been observed as the hypertension is directly affects on blood pressure and blood pressure is affected by the heart pumping action which will increase or decrease blood flow [20].

Mathematically we can say

$$H_t \propto B_p$$

$$B_p \propto F_b$$

H_t = hypertension, B_p = Blood Pressure, and F_b = Rate of Blood Flow due to pumping action of heart.

$$B_p = \frac{1}{R} F_b$$

$\frac{1}{R}$ = Factors affecting Blood flow

The blood flow increases increase the permeability of skin, where as permeability is conductivity of skin to electrical current.

There for

$$F_b \propto P_s$$

P_s = permeability of skin

$$F_b = A \cdot P_s$$

A = Multiplying factor depends upon different locations at skin

$$B_p \propto P_s$$

$$B_p \propto C_s$$

C_s = conductivity of skin to electrical current.

Where as

$$C_s \propto \frac{1}{R_s}$$

R_s = Skin Resistance to electric current

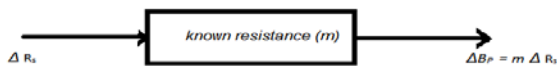
There for in the two cases the B.P and Resistance relationship is as given below

m = Known resistance

Cases

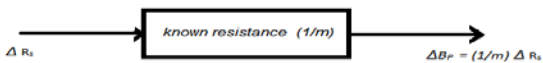
1. The case of high B.P

$$\Delta B_p = m \Delta R_s$$



2. The case of Low B.P

$$\Delta B_p = \frac{1}{m} \Delta R_s$$



B. Mathematical Results: -

Table II: Relation between resistance and conductivity with blood pressure

B.P	Conductivity	Resistance
High	High	Low
Low	Low	High

C. Factors Affecting Skin Resistance: -

Table III: Factors affecting resistance and Value of resistance

Factors affecting resistance	Value of resistance
Thin Skin	Low
Thick Skin	High
Dry Skin	High
Moisturized Skin	Low
Sweating	Low
Temperature	High For High

3. PSYCHOLOGICAL METHODS:

A. Color Therapy: - The effects of color are generated by acculturation and physiological factors, and these two factors strengthen each other. Red, a color with the longest wavelengths, is a stimulating color that captivates eyes faster than any other colors. Colors with a short wavelength calm the mind. Actually, blue colors decrease blood pressure, pulse, and respiratory rate. The physiological characteristics of colors develop cultural associations that strengthen its effect even more [22].

B. Sound Therapy: - The arena that is being addressed involves the use of sound as a healing modality. Sound has been used since the most ancient of times in both individual healing and sacred performance. Within the last three decades of the 20th century the resurgence of various forms of sound healing has produced remarkable results. Sound, both as pure tones and as music, has been found to positively affect an astonishing array of physiological and psychological parameters. Among these are the equalization of brain waves, increasing the depth of breathing, slowing heartbeat and pulse, lowering blood pressure, reducing muscle tension, raising body temperature, increasing circulation and endorphin production, boosting immune function, improving memory and learning, decreasing clerical error, increasing endurance and productivity, strengthening digestion and decreasing depression and, many others ailments and conditions [21].

C. Air Therapy: - Heat stress occurs when one gains heat faster than one can lose it. When this condition persists without relief, there is the danger that workers, such as those in hot industries, can experience heat prostration.

A person's tolerance to high temperature may be limited if he or she cannot sense temperature, lose heat by regulatory sweating, and move heat by blood flow from the body core to the skin surface where cooling can occur[24].

It is the hypothalamus that appears to trigger the heat control mechanisms to either increase or decrease heat loss. This is accomplished by controlling the flow of blood to the skin by constricting or dilating the blood vessels within it. Since blood has high thermal conductivity, this is a very effective means of rapid thermal control of the body. By controlling peripheral blood flow, the body is able to increase skin temperature to speed up elimination of body heat, support sweating, or reduce heat loss in the cold [23].

4. SYSTEM DESIGN AND IMPLEMENTATION:

A. Sensor Placement: -

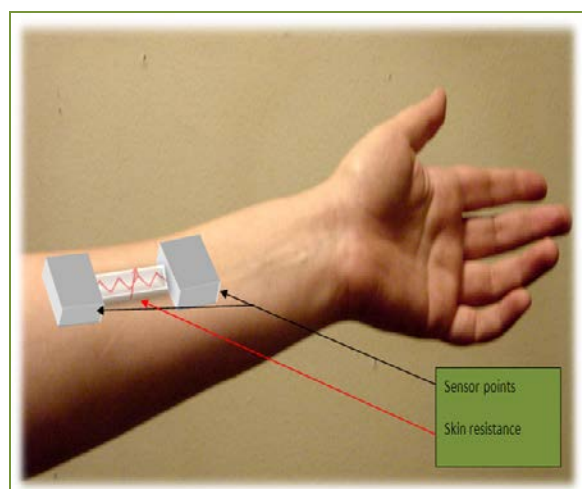


Figure 2: Sensor placement

B. Block Diagram and Hardware Setup: -

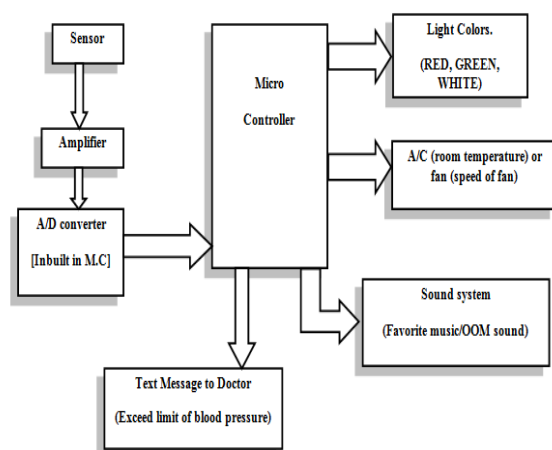


Figure 3: Block diagram of PECHMS

B. Working and Program Flow: -

1. Sensor which is made up of two copper plates with dimensions as 150mm X 150 mm having a gap between them is 150mm built on copper clad PCB. These plates will measure the resistance between them.
2. The sensor is connected in voltage divider network and a pot of 10k is used
3. The amplifier is build to amplify low value of skin resistance implemented in microcontroller program.
4. The skin resistance is converted in to digital form and the reading taken as values from 0 to 1023 as sensor value and 0 to 255 as output value which is a conversion between 0 to 5v in terms of voltage.
5. The ranges has been fixed called threshold for each steps to turn on or off or regulate the speed and programmed to send text message to doctor.
6. In terms it will change the environmental condition which stabilizes the mental condition.



Figure 4: Arduino and sensor plate setup

C. Condition to Check Change in Skin Resistance: -

Here we implemented a trick which shows the finger is cutted by means of razor giving a sudden shock to observer. Figure below shows the final touched finger cut setup.



Figure 5: Final finger cut setup

5. RESULTS:

The 18 cases was studied and among all three cases are shown here giving a sudden value change when finger setup was shown after certain time. This shows the change in skin resistance changes as mental conditions changes.

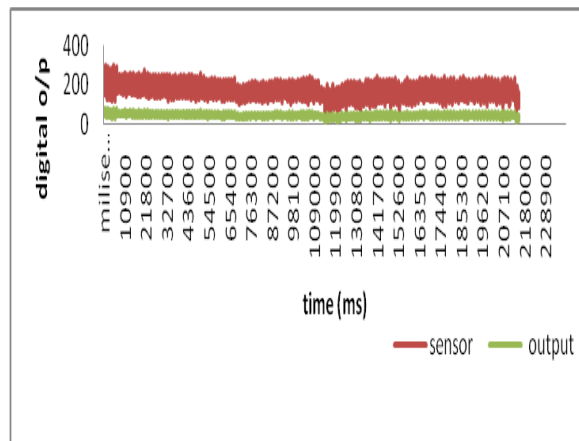


Figure 6: Case I, Name NILESH, Graph plot using sensor and output values with respect to time

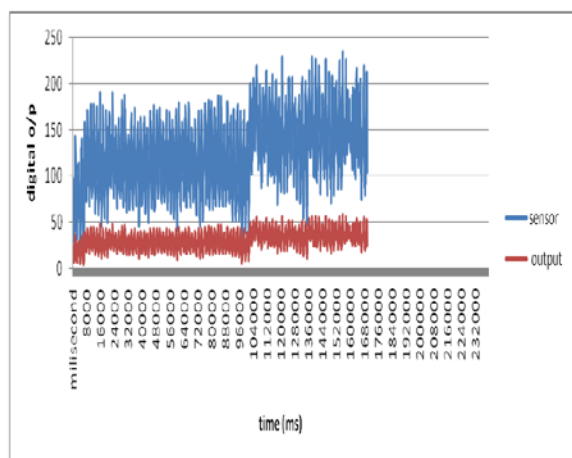


Figure 7: Case II, Name NIKITA, Graph plot using sensor and output values with respect to time

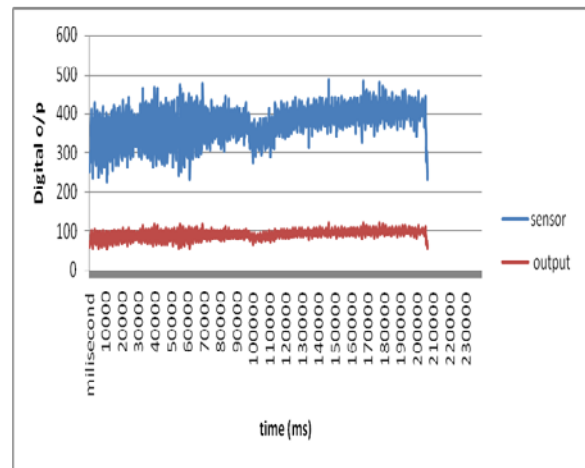


Figure 8: Case III, Name JYOTI, Graph plot using sensor and output values with respect to time

Table IV: Case I Relation between blood pressure and skin resistance

CASE	NILESH BHAGVAT			
SYS	123	107	107	106
DIA	80	79	69	66
PULS	89	91	81	85
R1	34	37	58	59

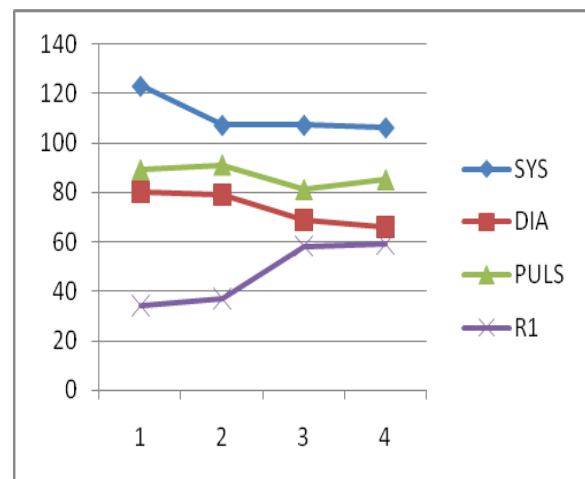


Figure 9: Case I Relation between blood pressure and skin resistance

6. CONCLUSION:

The experiment conducted on subjects, changes skin resistance whenever the blood pressure changes. Here in this experiment after showing tricked finger cut it was disclosed it's a trick then the mind states comes to normal. This parameter can be standardized not to measure but to control the state of mind or mental conditions using some psychological methods

which can be integrated with this system. Changes in environmental conditions changes the human body start to adjust accordingly which makes this system successful to use psychological methods and avoiding material treatment or reducing use of medicine. The name indicates psychological & electrical method combination to control human mind state.

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