same individual and the other graph depict the efficiency. If the peaks are totally overlapping then a value 0 will be generated which means 100 percent efficient. And hence the same algorithm will be used to calculate the efficiency. The numeric value will be multiplied with 100 to calculate the percentage and the same will be displayed on the display.

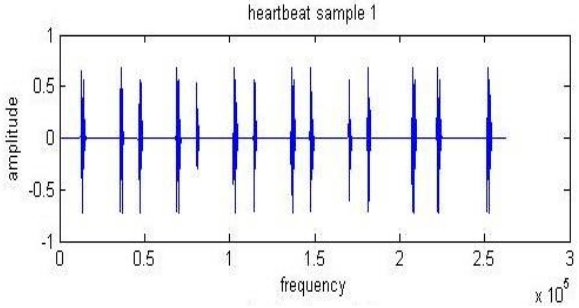

Figure 1: First heart sample of the individual.

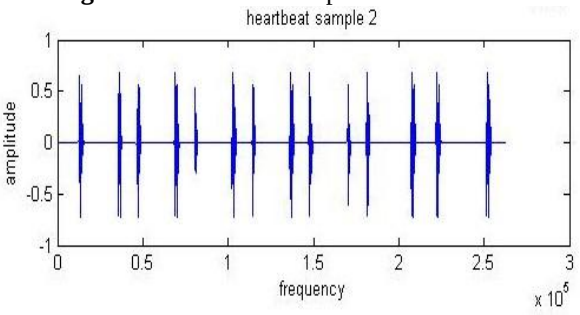

Figure 2: Second heart sample of the individual, same time period as the first one.

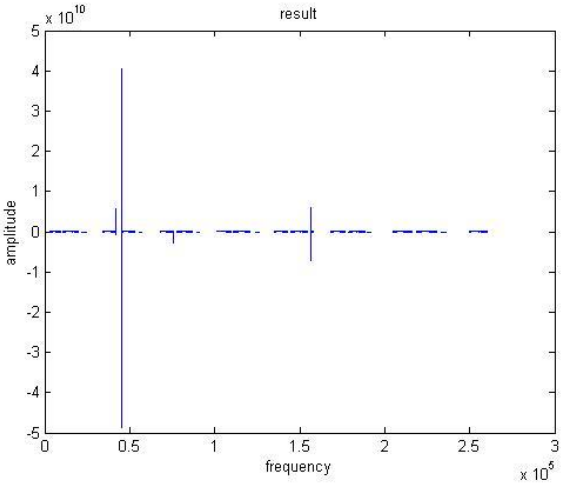

Figure 3: After running the algorithm the results obtained, The same gaps show perfect overlap (100%), Small peaks depict that some part of the peak amplitude was left out, pointing towards the valves of heart.

Markov's model

The Markov's model, uses several states and then actions upon the same states taken, e can take multiple states as an input to predict the data or if sufficient take only 1 state. In our experiment we took 3 states as the basis for calculation: the states taken were the length of the signal, the frequency variation of the signal, and the peak amplitudes of the beats of the heart. Now the transition of one state to another is a probabilistic relation between each state. Suppose the above states are denoted as w1, w2, w3. And let the output state be w0. Now the probability depends upon the transition of states from one level to another. For example if w1 state transit to state w2 then let the probability of such action be a12, similarly from w2 to w3,probability be a23 and so on. Now the probability of one state to transit to the output w0 is 'b'. Now the main idea of the experiment is to predict the future of the given states. A constant is to be used depending upon the values of the states and its attributes. The calculative formulas of Markov's model are shown below:

The task is to compute, given the parameters of the model, the probability of a particular output sequence. This requires summation over all possible state sequences:
The probability of observing a sequence:
Y = y(0), y(1), y (2) …….. y (L-1).
Where L is the length of the signal

$$P(Y) = \sum_{x=0}^{L-1} P(Y|X)P(X)$$

Where the sum runs over all possible hidden-node sequences
X = x (0), x (1), x (2) …….. x (L-1).
Above equation sets are the equations which take into consideration only the state (length), hence taking multiple states and then in order to calculate the probability for next2 years will be calculated as the:

The probability of two the result sample (figure 3), let it be denoted as R:
R = K1 [sample 1/ sample 2][25]= Will give the left out efficiency of the heart and K1 is the constant value which will be multiplied to the sample output to predict the future of the valves.

5. Result

The system designed will work to collect data, calculate efficiency and then predict the values of the valve efficiency left after a stipulated time frame. The experimentation of system's data calculator is done and the results obtained are successful in calculating the efficiency of heart.

6. Conclusion

This paper conclude that the efficiency of any part of human organ can be calculated and the future values can be extruded out using model's with multiple states and parameters to predict what is the future of such organs if they keep on going in the same state. System also conclude to help the user govern its hearts well functionality, any small disorder can be a major reason for death in future time frames.

7. Future scope

Such intelligent system are the future of tomorrows technology. Prediction of future and accurate prediction of future are two main points a healthy system which can predict the future accurately is what is needed in health care. A system which can calculate the functionality of an organ is much required the user is pre planned to know when his or her organs can fail in the coming years. Can help the cases of kidney failure, heart valve failures, heart muscles failure and acute chronic cases of organ degradations. The future scope of such an idea do not allow the patient to go to hospital and

get checkups he or she can sit at home and complete the whole process of prediction within minutes.

References

[1] Pragmatism, mathematical models, and the scientific ideal of prediction and control: J. Moore, Behavioural Processes Available online 14 January 2015.
[2] An improved mathematical model for prediction of air quantity to minimise radiation levels in underground uranium mines: DurgaCharanPanigrahi, PatitapabanSahu, Devi Prasad Mishra: Journal of Environmental Radioactivity Volume 140, February 2015, Pages 95–104.
[3] Prediction methods of skin burn for performance evaluation of thermal protective clothing: Li-Na Zhai, Jun Li: Burn: Available online 24 March 2015.
[4] Linear Regression Models: Mathematical Statistics with Applications in R (Second Edition) 2015, Pages 409–458.
[5] Innovative Mathematical Model for Earthquake Prediction: SuganthKannan: Engineering Failure Analysis Volume 41, June 2014, Pages 89–95, Special issue on ICEFA V- Part II
[6] Mathematical and neural network prediction model of three-phase immiscible recovery process in porous media: MostafaAlizadeha, Mohammad Mahdi Moshirfarahib, Mohammad Reza Rasaieb Journal of Natural Gas Science and Engineering: Volume 20, September 2014, Pages 292–311.
[7] Method and apparatus for third heart sound detection: US 8827919 B2: Siejko, Laura Green, Gerrard M. Carlson, Sep 9, 2014.
[8] Third heart sound activity index for heart failure monitoring: US 8840563 B2, Krysztof Z. Siejko, Laura Green, Gerrard M. Carslon, Sep 23, 2014.
[9] Mathematical Modeling and prediction in infectious disease epidemiology: A. Huppert, G. Katriel, Clinical Microbiology and Infection: Volume 19, Issue 11, November 2013, Pages 999–1005.
[10] Method and apparatus for monitoring heart failure patients with cardiopulmonary comorbidities: US 7480528 B2: Marina Brockway, Donald Hopper, Gerrard M. Carlson, VeerichettyKadhiresan, Kenneth, Jan 20, 2009.
[11] Method and apparatus for third heart sound detection: US 7431699 B2: Siejko, Gerrard M. Carlson, Oct, 2008.
[12] A GIS tool for the evaluation of the precipitation forecasts of a numerical weather prediction model using satellite data, HaralambosFeidas, ThemistoklisKontos, NikolaosSoulakellis, KonstantinosLagouvardos: Volume 33, Issue 8, August 2007, Pages 989–1007.
[13] On Prediction Using Variable Order Markov Models: Ron Begleiter Ran El, Department of Computer Science, Technion - Israel Institute of Technology, Department of Computer Science, Cornell University Ithaca, NY 14853, USA.
[14] PREDICTION OF FINANCIAL TIME SERIES WITH HIDDEN MARKOV MODELS: Yingjian Zhang B.Eng. Shandong University, China, 2001
[15] A verification of numerical weather forecasts for avalanche prediction: Claudia Roeger, David McClunga, Roland Stullb, Joshua Hackerb, HenrykModzelewskib, Volume 33, Issues 2–3, December 2001, Pages 189–205.
[16] Apparatus and methods for analyzing heart sounds: US 5687738 A: Joseph Isaac Shapiro, Howard David Weinberger: Nov 18, 1997.
[17] J. M. Ruijter1,*, C. Ramakers2, W. M. H. Hoogaars1, Y. Karlen3, O.Bakker4, M. J. B. van den Hoff1 and A. F. M. Moorman1: Nucleic Acids Research Volume 37, Issue 6: Pp. e45.
[18] Ventricular efficiency predicted by an analytical model: D. Burkhoff, K. Sagawa, American Journal of Physiology - Regulatory, Integrative and Comparative Physiology Published 1 June 1986 Vol. 250 no. 6, R1021-R1027 DOI:
[19] PAVEMENT PERFORMANCE PREDICTION MODEL USING THE MARKOV PROCESS: Butt, Abbas A Shahin, Mohamed Y, Feighan, Kieran J, Carpenter, Samuel H: pp 12-19: Published on: 1987.
[20] Selective Markov Models for predicting web-pages Accesses: MukundDeshpande and George Karypis: University of Minnesota, Department of Computer Science/Army HPC Research Centre Minneapolis, MN 55455.
[21] Ventilatory Efficiency during Exercise in Healthy SubjectsXing-Guo Sun, James E. Hansen, NuriaGaratachea, Thomas W. Storer, and Karlman Wasserman. Ats journals

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