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Preliminary Design of Estimation Heart disease by using machine learning ANN within one year

Rifki Wijaya[#1], Ary Setijadi Prihatmanto [#2], Kuspriyanto[#3]

[#]*Electrical Enginering, Institut Teknologi Bandung,*
Bandung Indonesia

[1]rifkiwijaya@gmail.com, [2]asetijadi@lskk.ee.itb.ac.id, [3]kuspriyanto@yahoo.com

***Abstract*— In this paper discussed the development of heart disease prediction using machine learning (in this case the Artificial Neural Network or ANN). There are 13 variables that can determine heart disease according to Miss Chaitrali paper.**
Prediction of a person's heart disease one year ahead is performed by studying the model heart rate data. Data is taken by using tool such as smart mirror, smart mouse, smart phones and smart chair. Heart rate data were collected through the Internet and collected in a server.
Learning in this system is performed for a period of one year to get enough data to make predictions. Predictive of future heart disease in one year can increase a person's awareness of heart disease itself. The system is also expected to reduce the number of patients and the number of deaths from heart disease..

***Keywords*— Prediction, Artificial Neural Network, Heart disease**

I. INTRODUCTION

Heart is one of the most important organs in the human body. Heart function is to pump blood around the body. Heart contain two separate pumps, one for each circulation, which simultaneously issued a similar quantity of blood into the circulatory large and small blood circulation. Heart is a muscular organ weighing about 300 grams contracting rhythmically around 70 times per minute in which each pulse removed 75 cc of blood into each circuit [12]. Each vein system consists of three parts, namely the arterial system, the capillary system, and the venous system.

Heart can be attacked by various diseases that lead to the heart can not work optimally. Heart disease is currently the leading cause of death in the world. The World Health Organization (WHO) has estimated 12 million deaths around the world appear each year from heart disease. In 2008, 17.3 million people died from heart disease. More than 80 % of deaths in the world due to heart disease. The World Health Organization (WHO) estimates that by 2030, 23.6 million people worldwide will die from heart disease [8]. According to Suharto (2002), disorders or diseases that often occur in the heart is coronary heart disease, which is obstruction of blood flow in the coronary arteries that supply oxygen and nutrients to the heart move. As an example of a category other clinical cardiovascular disease, can be miokardiak infarction, angina pectoris and coronary insufficiency [15].

According to (John , 2010), statistically someone with heart disease risk factors will have a higher tendency to suffer from coronary disorders when compared with no risk factors . The more risk factors that owned it also compounded the chances of developing heart disease. Risk factors in question are advanced age, male gender, heredity, hypercholesterolemia, high blood pressure, diabetes, and smoking habits.

From the statistics above indicate the need for prediction of heart disease. Prediction of heart disease is expected to reduce the number of patients with heart disease with early detection. Algorithm Artificial Neural Network (ANN) and Support Vector Machine (SVM) has been widely used for recognition of heart disease, some are also used to predict. Prediction is done by inserting a few variables that be a symptom of heart disease. Predictions generally only use the initial medical record alone. It is necessary for prediction of medical record data at regular intervals so that the accuracy can approach 100%.

When the prediction is getting accurate, then the prospective patient can take preventive measures so that heart disease as the number one killer in the world and in Indonesia can be reduced.

II. RESEARCH IN PREDICTION OF HEART DISEASE

Here's a related study on the prediction of cardiovascular disease.

TABLE I
RESEARCH IN PREDICTION OF HEART DISEASE

Research (Year)	Technique	Akuration
Sellappan Palaniappan et al. (IEEE 2008)	Decision Trees, Naïve Bayes and Neural Network	Unknown
Dilip Roy Chowdhury (IJAE 2011)	Multi Layer Perceptron with a BP learning algorithm	75%
Milan Kumari et al (IJCST 2011)	RIPPER classifier, Decision Tree, Artificial neural networks (ANNs), and Support Vector Machine (SVM)	81.08%, 79.05%, 80.06% and 84.12%
Vanisree K et al. (IJCA 2011)	Backpropagation Neural Network	90%
Niti Guru et al. (Delhi Business Review 2007)	Back propagation algorithm	Unknown

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Shantakumar B.Patil et al (EJSR 2009)	K-means clustering algorithm	Unknown

Recognition and prediction can be the same meaning in some paper. Recognition mean that after system check and running on algorithm, we can recognize heart disease on the patient using data we took. Prediction mean after you took data and process them into an algorithm it will result heart disease on the patient at the time or we get result of heart disease judgement on the future time.

III. Data Gathering

Data collection was performed with a variety of tools. This is important because existing tools have to be a ubiquitous and pervasive so that the data can be taken as much as possible.

At this stage, the data is used as a heart rate of data to predict heart disease. The tools used are as follows.

A. Smart Mouse

In the smart mouse and photodiode infrared sensor mounted and Arduino nano as a processor.

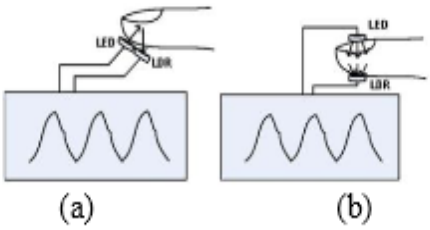

Figure 1 Concept of making smart mouse using photodiode

Figure 2 Smart Mouse

Smart mouse can be used by people who use a computer every day. So that the data obtained when using the mouse can be sent to the server via an Internet connection. Smart mouse can generate a lot of data. The data were collected in a single database server.

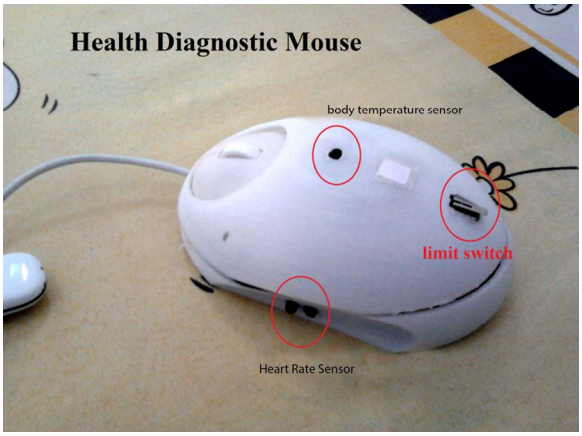

Figure 3 Health diagnostic mouse

This mouse can take 2 variable, heart rate and body temperature. This two variable can be seen on desktop using windows 8 application.

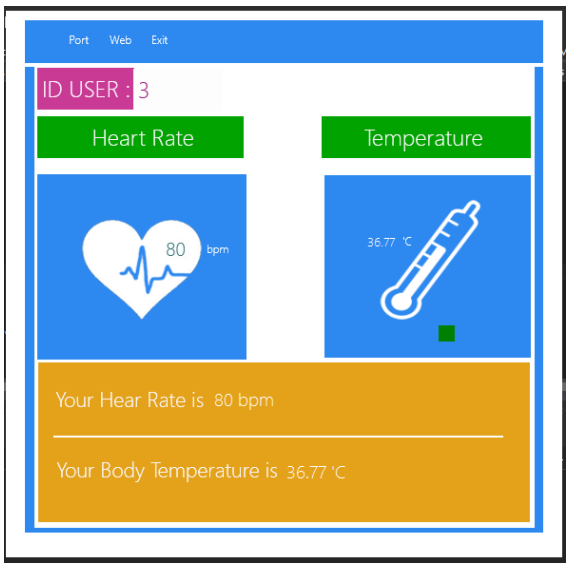

Figure 4 Display of measurement results heartbeat and body temperature.

B. Smart Mirror

Mirror is one tool that many people use it every morning after showering. This tool use MLX90614 sensor and MLX90620 infrared, and as processor temperature using the Arduino UNO. This tool uses OpenCV as facial image processing. This tool uses the color of faces per frame captured by OpenCV enter as input to generate heart rate. Heart rate data on the smart mirror inserted into a server.

Figure 5 Smart Mirror

Figure 6 Smart Mirror can detect heart rate using face

Data result on this tool may inconsistent. Data on this tool is depend on how big the intensity of light into user face and the camera. The environment must be set up before using this tool.

C. *Smart Chair*

Smart Chair sensor hardware is installed Electronic Stethoscope. This tool detects the heartbeat immediately accepted by the stethoscope and put in the Arduino Uno to be processed. Heart rate data is automatically entered into the same server with other tools.

Figure 7 Smart Chair

Most of people work in front of the desk will use chair to sit and work. Data in this tool will be much bigger than other tool.

D. *Application on the smart phone*

Measurement of heart rate on the phone is to put a finger on a smartphone camera. The application will take the images per second of fingers taped so it can be compared and filtered into a heart rate of data.

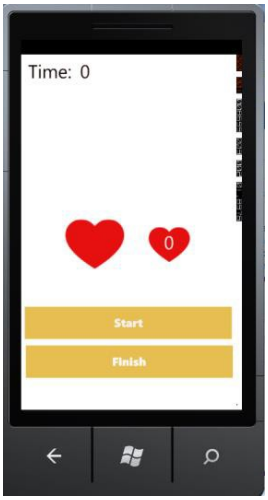

Figure 8 Windows phone app can detect heart rate

IV. Research Method

A. *Data Classification of heart rate*

At this stage, the data already collected the data from the various instruments of heart rate in a server. On the server, do

the classification and verification that the patient had a history of heart disease and is recognized as a data heart rate of people with heart disease. Classification is done to the data of people who have a lot of heart disease. Suppose that the installation is done in a hospital or a health centre so that certain data taken more and more. At the time of admission to hospital, the data retrieved will of course be different from the data taken at the time at home.

B. Determining detection models normal heart and a model detection using prediction system

Having collected the data, modelling and learning of heart rate for people with heart disease and normal people is carried out. The formulation of the data on a historical heart rate so that other incoming data can be recognized as people with heart disease. Historical data in this section is very important.

C. Prediction of someone with heart disease one year ahead using heart rate

This prediction is done with the analysis of historical data that has been collected in a given time period and included in the model which has been formulated.

Neural network prediction algorithm is the best algorithm so far. This algorithm requires quite a lot of historical data so that data result more accurate. The data must be filtered to fix error in learning.

Each data entered will affect the outcome of the process of the algorithm. Data taken from several tools must be normalized. These tools generate the same data type so that the need for fusion algorithm.

V. CONCLUSIONS

No system is completely integrated of the tools available today to retrieve data heart rate. System to analyze existing heart disease is already done, but to predict of one year a head with all tools is not yet done. These tools are tools that are used daily by many people. Most people personally have these tools personally. These tools can be used to detect heart disease in individuals. So that the judgement will be personalized predictions made for one person.

Judgment can help people from making decision of their life, whether it healthy life or not. People will care to their health as bad prediction judgment come to their life.

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