Expert System of Heart Attack Prediction

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Abstract

Nowadays, heart attack become most common deadly disease in modern era. More than 80% of heart attack deaths happening in low-income and middle-income countries. The reason why these two income countries have the highest rates of heart attack deaths that is due to their financial constraints. This led some of them die of heart attack because they did not know their condition in advance. In order to prevent heart attack death rate increasing, the author develop an expert system that allow users to check their heart status with their mobile phone. By using this system, they can early know about their heart status and can early know if they are having a heart attack risk. For develop this proposed system, the author will be using Android technology to develop the proposed system. Next, the author also will be uses decision table to analyze the result. The research methodology will be use in this proposed project is prototyping.

Keywords

Expert system, Diagnosis heart attack, Android technology

Introduction

Heart attack become top cause of deaths in Malaysia. The most common risk factors for heart attack are obesity 77% (Chin, 2016). A heart attack occurs when the death of the heart muscle caused the supply of blood to the heart muscle is interrupted or reduced. If the blood is blocked in the heart for a long time, the risk of damage to the heart is greater. It also called Myocardial Infarction (MI), coronary thrombosis and cardiac infraction (Nordqvist, 2017). The early diagnosis methods use in hospital is blood test, electrocardiogram, coronary angiogram and chest X-ray (Foundation, 2015). The hospital will use those diagnosis methods to determine the best treatment for the patient. Blood test is using to test the level of damaged in your blood. Electrocardiogram is a process of recording the electrical impulses of the heart. Heart abnormalities can be detected through the electrocardiogram signals. Coronary angiogram actual is use for deciding the best treatment to the patient. Next, chest X-ray is using to prove whether there are signs of heart failure. The diagnosis of heart attack is a difficult task in medical field. Thus, to develop an effective heart attack prediction system is needed for early stage detection of heart attack. If the patient can early

know they have heart attack, they can quickly get through treatment for prevent the diseases from continued to deteriorate. Next, it also can be prevented heart attack death rate increase in low-income and middle-income countries.

Methodology

One of the research methodologies to be use on the proposed project is prototyping model. Prototyping methodology also known as incremental development and evolutionary design (Volchko, 2017). The author uses this methodology to research is because the error can be detected earlier, the missing features can be easy identify, the users can involve in the development and they can better understand of the proposed system. The prototyping model having six stages. Stage 1 requirement gathering. The proposed system requirements are defined in as much details as possible in this stage. The author will through questionnaires and interview to gather information about the proposed system. Stage 2 quick design. In this stage, the author will create an initial design that involves only important aspects. The author will just simple design the proposed system in this stage. Stage 3 building prototype. In this stage, the author through the second stage quick design to collect the data, then modify to form a prototype. Stage 4 customer evaluation. The next stage is user evaluates of the first prototype. The user will identify the advantages and disadvantages of the proposed system, what else thing should be added, and what else thing should be removed. Stage 5 refining prototype. In this stage, modify the first prototype based on the user evaluates and develop a second prototype of the new system. Stage 6 engineer product. The final proposed system will be tested and evaluated as a final test event for prevent identification of system problems early in system development. Next, the daily maintenance continuing is important to prevent the large-scale failures and minimize the downtime.

Decision tables are very useful in test design techniques. Decision tables helps testers search for the effects of software state combinations. Besides, decision table also provides a general way of stating complex rules, which is very helpful for testers and developers. Table 1 show the decision table case of the basic prediction.

Table 1. Decision tree of heart attack prediction

	1	2	3	4	5	6	7	8	9	10	11	12
Condition												
What is your gender? (M/F)	M	F	M	F	M	F	M	F	M	F	M	F
Do you smoke? (Y/N)	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
Does anyone in your family have a history of heart attack, a stroke, heart surgery, or any heart disease? (Y/N)	Y	N	N	Y	Y	N	Y	N	Y	N	Y	N
Is your blood pressure 140/90 mmHg or higher? (Y/N)	Y	N	Y	N	N	Y	Y	N	Y	N	Y	N
Is your total cholesterol over 200 mg/dl? (Y/N)	Y	N	N	Y	N	Y	N	N	Y	N	Y	N
Do you have diabetes? (Y/N)	Y	N	Y	N	Y	N	N	Y	N	Y	Y	N
Do you exercise regularly? (Y/N)	Y	N	N	Y	Y	N	Y	Y	Y	N	Y	N
Are you overweight? (Y/N)	Y	N	Y	N	N	Y	Y	N	Y	N	Y	N
Do you drink alcohol regularly? (Y/N)	Y	N	N	Y	N	Y	Y	N	Y	N	Y	N
Is your age more than 45 years old? (Y/N)	Y	N	Y	N	Y	N	N	N	N	Y	Y	N
Do you have a chest tightness like the feeling of pressing heavy object? (Y/N)	Y	N	N	Y	Y	N	N	Y	N	Y	N	Y
Outcomes												
Low Risk		X		X				X		X		X
Moderate Risk			X		X	X	X					
High Risk	X								X		X	

Results and Discussion

1. Did you satisfy the design of the Heart Attack Prediction application user interface?
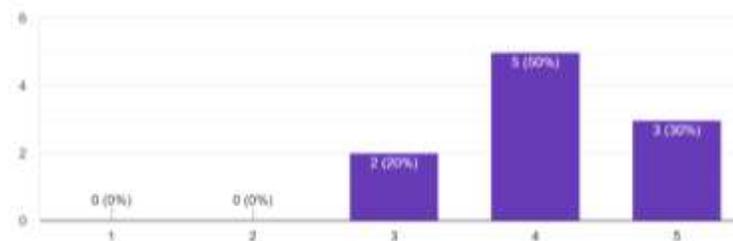
10 responses

Figure 1. Bar chart to evaluate user interface design

This bar chart shows the evaluation of the user interface design. From the chart we can saw that most of the user satisfy with the design of the proposed system UI.

2. Do you think Heart Attack Prediction application is user friendly?
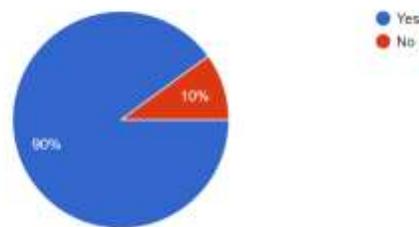10 responses

Figure 2. Pie chart to evaluate the user friendly of the proposed system

This pie chart shows the evaluation the user friendly of the proposed system. From the chart we can saw that 90% of the responses think the proposed system is user friendly, while has 10% of responses think the proposed system is not user friendly.

3. Did you agree that the proposed application help user easier check their heart status?
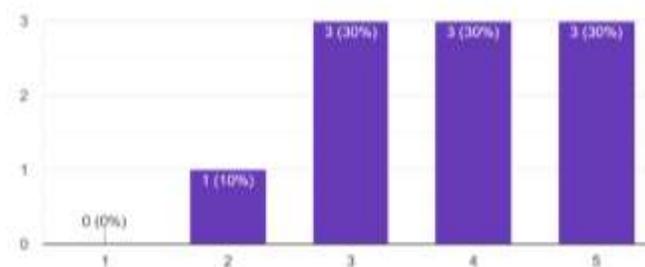10 responses

Figure 3. Bar chart to evaluate the proposed system convenient user check heart status

This bar chart shows the evaluation of the proposed system easier for user check their heart status or not. From the chart we can saw that 60% of responses agree the proposed system is easy for they check their heart status, while 10% of responses did not agree, and 30% of responses select neutral.

After click the start button, the system will directly to the question page, then start answer the question given by system. The system will display question, number of questions, and the selection of answer. After user select the answer, the system will automatic looping to next question. Until the end of the question, the system will display the prediction result. Next, the result will be displaying the percentage risk of having heart attack, risk level, recommended, find doctor button, and try again prediction button. Figure 4 show the start button, example of question will be display on the screen, and the prediction result.
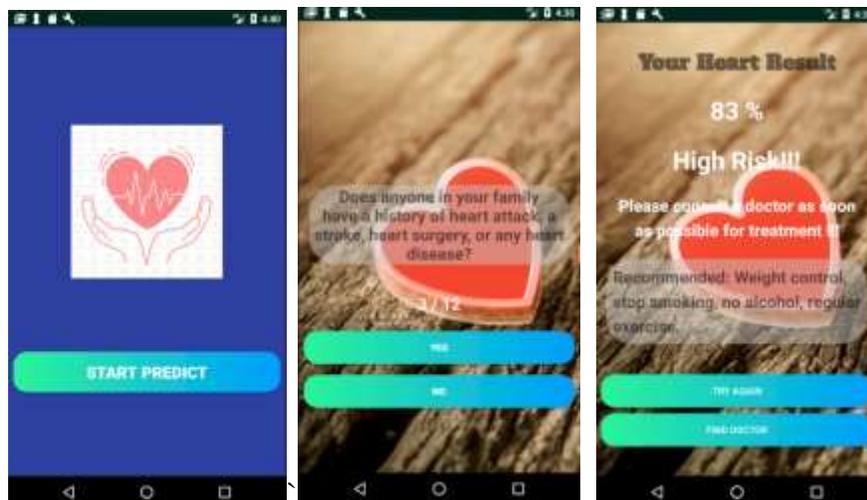
Figure 4. Basic prediction

This prediction will collect the user's data about their gender, age, bmi, total cholesterol value, systolic blood pressure value, and blood sugar value to diagnosis the risk of heart attack. The upper layout is calculation of BMI for someone don't know their BMI, they can enter their height and weight to get the BMI result. The bottom layout is use to collect the user data for diagnosis heart attack risk level. First, select the gender, input the age and bmi. Next, for the cholesterol, blood pressure, and blood sugar value just click the box, it will display a drop-down list for user select the value. After fill up all the details, then click submit button, it will bring to the result interface. The result will display the percentage risk, risk level, weight status, and recommended. Figure 5 show the advanced prediction interface and result.
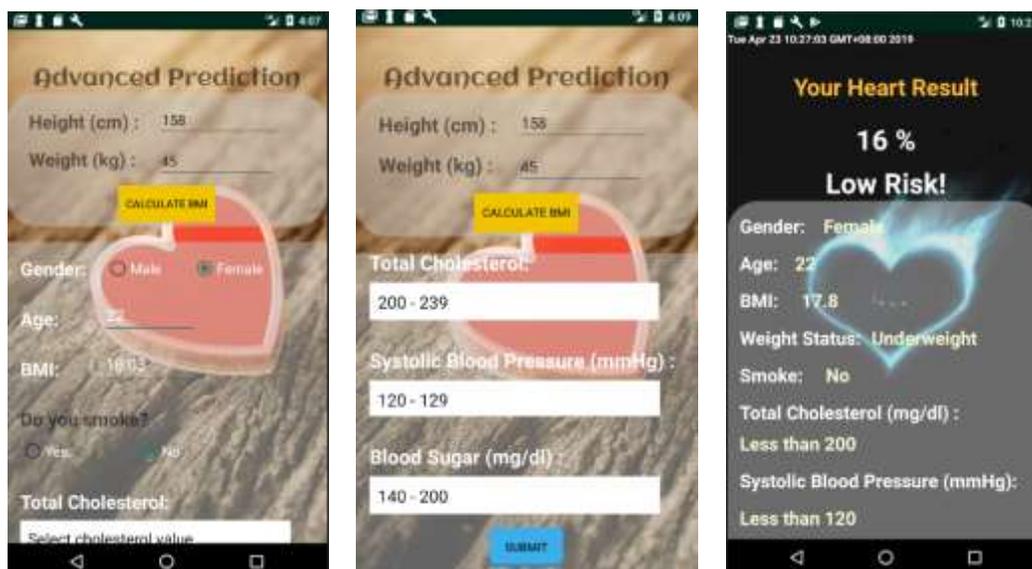

Figure 5. Advanced prediction

Conclusions

The proposed system described in this paper has been successfully designed and tested by author. Next, the three objectives listed in the project have been successfully achieved. Firstly, investigate the current system and how to improve the system by using Android Technology. This objective has been achieved by author, the author already conducts investigate on the current system. Second objective is developing the proposed system to allow patient to check their heart status. This objective has been achieved by author, the author already successful develop the system. The last objective is conducting a suitable testing for the proposed system to ensure the effectiveness of the system. This objective has been successful achieved, the author already conducts a testing on this project. The heart attack prediction system is a great system for us early know the risk of heart attack. Moreover, this proposed system also can prevented heart attack death rate increase in low-income and middle-income countries.

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