

Heart Rate Detection of Stress Levels for Pregnant Women

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Abstract

Background: During pregnancy there are changes because the fetus begins to grow and develop in the stomach of the pregnant woman. During pregnancy these developments also affect the physiology due to hormonal and metabolic changes that affect the psychological prenatal stress of pregnant women.

Purpose: This study aims to determine the initial action to detect heart rate by looking at stress levels in pregnant women.

Methodology: This study uses a hardware programming approach with the stages: Project Planning, Research, Component Testing, Mechanical System Design, Functional Test, Functional Test, Overall System Functional Test, System Optimization.

Results: The results it only detects the stress level of pregnant women using the heart rate and the finding is Detection of stress levels of pregnant women. This is research for Monitoring the heart rate when stressed in real time and continuously as a system that operates and displays history in the telegram application in the form of pregnant women's heart rate data while the pulse sensor is a heart rate detection tool when stressed.

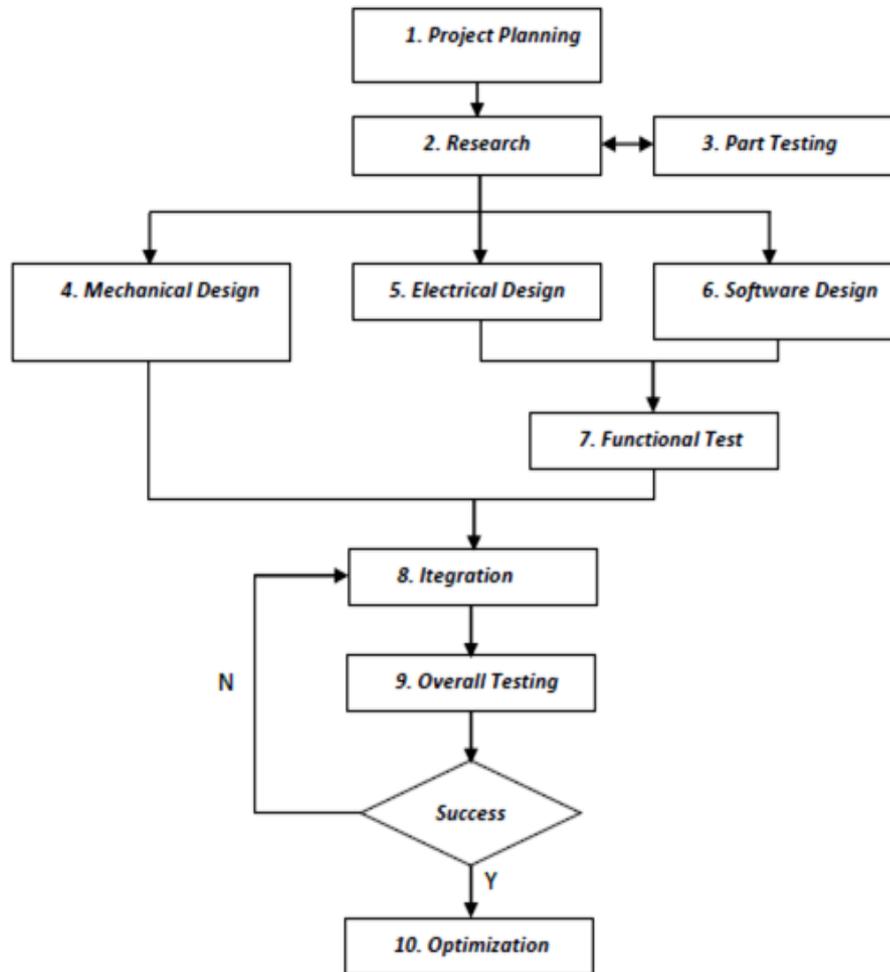
Keywords: Heart Rate, Pregnant Women, Stress, Detection, Sensor Pulse

I. INTRODUCTION

Pregnancy is a period of intrauterine growth and development of the fetus that begins at conception until the beginning of labor. During pregnancy there are many physiological changes in the body of pregnant women as a form of maternal adaptation, namely physical changes, organ function, hormonal system changes, metabolism and psychological conditions related to prenatal stress (Manuaba et al, 2010). Prenatal stress can be caused by physical stress or psychosocial stress. Prenatal stress is almost common in all pregnant women, especially in primigravida. This stress can be caused by external factors (external stressors) or from within (internal stressors) pregnant women. Stress is an uncomfortable condition (dysphoric) which is defined as an imbalance of pregnant women to feel able or resisting various changes in the adaptation process of their pregnancy (Woods et al, 2010; Nurdin, 2014). Psychosocial research on stress during pregnancy conducted on Asian, African and white races stated that 6% of pregnant women experienced mild stress, 78% experienced severe stress and 16% did not experience stress at all. Stress during pregnancy is significantly caused by factors of economic difficulty, household problems, physical violence, medical problems, busy activities, work and a history of pregnancy with complications (Woods et al, 2010). Prenatal stress often occurs only rarely recognized and considered not very important during pregnancy. A Canadian study showed pregnant women experienced low levels of psychosocial stress and 6% of high levels of stress. Pregnant women in Spain 30% have a lower chance of experiencing stress, while in Indonesia there are 64.4% of pregnant women who experience severe stress and have the opportunity to give birth prematurely (Woods et al, 2010; Silviera et al, 2012). Stress during pregnancy is due to the imbalance felt by pregnant women in dealing with the problems and demands of pregnancy. This is considered normal by some during pregnancy, but research from the American College of Obstetricians and Gynecology (ACOG), states the importance of measuring stress in each trimester of pregnancy and postpartum as a prevention of the impact of morbidity caused by stressful conditions during pregnancy. So determining the relationship is considered important (ACOG, 2010; Woods et al, 2010). Increased progesterone in stressful conditions can facilitate negative feedback on the hypothalamic-pituitary-adrenal axis through the metabolism of allopregnone, reducing feelings of anxiety, tension and stimulating sedative effects. Progesterone also enhances the social closeness response which is beneficial during times of stress. Although the mechanism has not yet been ascertained, the interpretation of these findings may be that higher progesterone levels cause cortisol levels to increase in response to stress conditions (Bijlanovic et al, 2015).

II. METHODOLOGY

The methodology used in this study uses a hardware programming methodology where the stages can be seen in the following flowchart



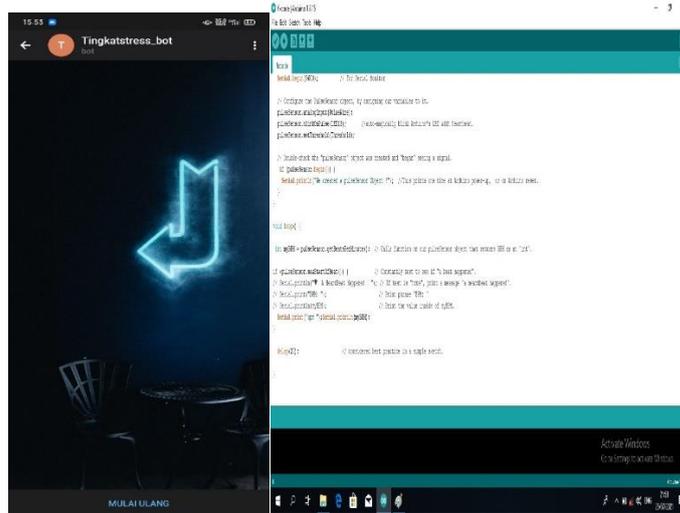
Figur 1 Hardware Programming Methodology

III. RESULTS AND DISCUSSION

The results obtained from this study have been assembled with an Arduino microcontroller and programmed NodeMcu to control an Android-based Stress Level Detection Tool for pregnant women with Heart Rate Using Telegram Notifications. integrated heart.



Figur 2 Tool for detecting stress levels of pregnant women



Figur 3 Configuring Telegram and the NodeMCU Program

1. Discussion

After all the circuits are assembled and become a stress level detection tool, then we will discuss the working mechanism of an android-based stress level detection tool for pregnant women with a heart rate using telegram notifications. Starting from the pulse sensor that is connected to the Arduino Uno to get the value from the sensor then the Arduino Uno itself functions to send data to the NodeMCU via rx and tx communication, then the NodeMCU functions as a data processor and is sent back to the telegram cloud server to send notification in the form of data on the number of BPM and the condition of the user's heart rate. The use of telegram was chosen instead of whatsapp or similar applications because whatsapp does not provide an API that can be accessed by the public and its use is paid, so the author uses the telegram application instead of whatsapp.

2. Structural

Test The configuration and implementation that has been applied goes according to plan and can be used properly even though there are still shortcomings, and from other aspects or stages it can be seen from the description below: a. The tool frame is well structured although there are still shortcomings. b. The configuration in the Blynk application is not a problem at all. c. The program given to NodeMCU to connect to the internet runs well, but when the network is stable.

3. Pulse Sensor Test

Pulse sensor testing is carried out to determine the function of the sensor. The pulse sensor functions as a heart rate detector which will later be processed by the microcontroller and will be sent via a telegram notification in the form of data from the number of BPM and heart rate conditions.

Table 1 Pulse Sensor Test Table

Percobaan	<i>Pulse Sensor</i>	Jumlah BPM
1.	97	97
2.	77	77
3.	105	105
4.	87	87
5.	82	82

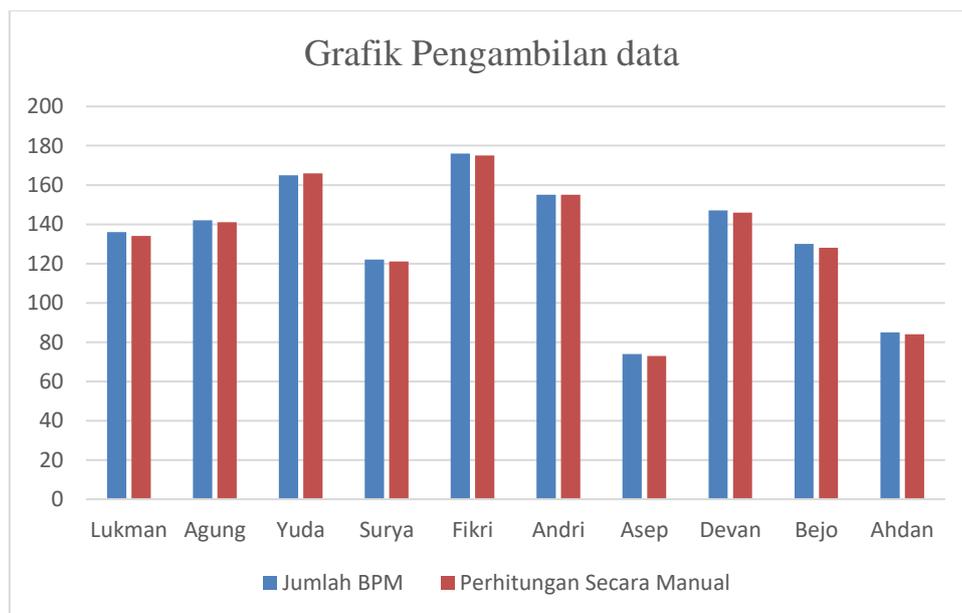
From table 3 above, this is a heart rate test on a pulse sensor on an Android-based stress detection tool for pregnant women with a heart rate using telegram notifications. It can be concluded that the pulse sensor is working properly.

4. Data Retrieval

Data retrieval in the author's intent is to take data from 10 people who are willing to take the results of their heart rate. The 10 people consisted of 10 pregnant women with different age variations. For testing here the author uses the fingers of pregnant women who are willing, the fingers used can use any fingers because all fingers have a heart rate but at a minimum use the index finger. The purpose of collecting this data is only to find out that the tools made by the author can function properly.

Table 2 Results of Data Collection

No.	Nama	Umur	Jumlah BPM	Perhitungan Secara Manual	Kondisi Jantung
1.	Dina	22	136	134	Kondisi Tidak Normal
2.	Lina	21	142	141	Kondisi Tidak Normal
3.	Mery	20	165	166	Kondisi Tidak Normal
4.	Wina	19	122	121	Kondisi Tidak Normal
5.	Vida	21	176	175	Kondisi Tidak Normal
6.	Lilis	21	155	155	Kondisi Tidak Normal
7.	Ani	22	74	73	Kondisi Normal
8.	Nina	19	147	146	Kondisi Tidak Normal
9.	Syarifah	18	130	128	Kondisi Tidak Normal
10.	Leni	18	85	84	Kondisi Normal



Figur 4 Data Collection Graph

From Figure 4 it can be seen that the heart rate measurement tool for pregnant women that has been made functions well as a stress detector.



Figure 5 Telegram Notification Display

Figure 5 pictures of telegram notifications that will be received by the user using an android-based stress level detection tool for pregnant women with a heart rate using a telegram notification that displays data on the results of the number of BPM and heart rate conditions.

Table 3 Distance Testing Table

Percobaan	Jarak	Hasil Percobaan
1.	10 Meter	Berhasil
2.	15 Meter	Berhasil
3.	20 Meter	Berhasil
4.	25 Meter	Berhasil
5.	30 Meter	Berhasil
6.	35 Meter	Berhasil
7.	40 Meter	Berhasil
8.	45 Meter	Berhasil

In table 3, the distance test of the stress detection tool for pregnant women is carried out to send notifications to telegram. The purpose of distance testing is because the tool made uses the internet to send notifications to users with a note that the tool used is connected to wifi so that it can function and can send notifications in the form of data on the results of the number of BPM to users via telegram.

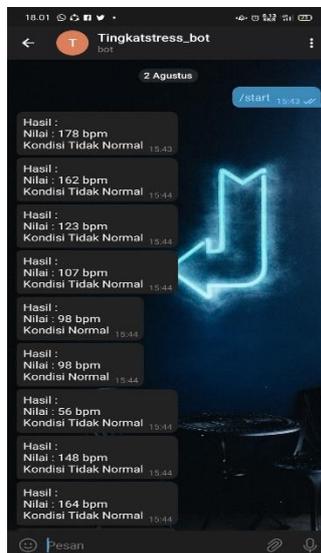


Figure 6 Image of Distance Test Notification Display

Figure 6 above is the result of the notification that appears on the telegram application and the distance test has been functioning properly.

IV. CONCLUSIONS AND NEWNESS

Based on the results, process, design, manufacture and testing of an Android-Based Stress Level Detection Tool for Pregnant Women With Heart Rate Using Telegram Notifications, it can be concluded that this tool uses a pulse sensor as a heart rate input whose value will be displayed in the form of a telegram notification in the form of total data. BPM, but because it is only a notification, there is no storage space (databae) so it can be used indefinitely. There are two conditions in this telegram notification, when the heart rate is less than 60 but more than 100 then the notification that gets is data that says abnormal condition, while if the heart rate is more than 60 but less than 100 then the notification will display data that says normal condition

In this study, it is better to develop a sensor that is more capable than the pulse sensor used by the author and also this tool has not been able to detect heart rate in pregnant women who have a history of heart disease.

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