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# WEBSITE DESIGN



[Feature 05: Stress Monitoring](System%20Feature%20formulae-ver%200.1.2.docx)

On the Track My Health home page, the user can select the

**Stress Monitoring feature icon**. This will

>>> direct them to the Stress Monitoring page.

On the **Stress Monitoring page**, the system will display a

**Graph button** and a

**Table button**,

below the **Stress Monitoring sub-header**.

# GRAPHIC REPORT

If the user selects the Graph button, then they will be able to see a Stress Monitoring graph with an x-axis and a y-axis.

**KIỂU XEM BÌNH THƯỜNG (DEFAULT)**

**Trục X**

The x-axis will reflect

**the date/time parameters of the data recordings**,

Under the graph, the user can select the Date/Time section to display a **pop-up calendar**.

This will allow the user to select a desired start and end date/time.

**Trục Y**

while the y-axis will show

**the stress percentage (% Stress).**

*Please refer to the formula document for further details on any parameters, or measures, listed in this section.*

**PHẦN NỘI DUNG BÊN TRONG**

Within the graph, the system will **display bars (Bar graph)** that

represent the user's stress percentage over time.

However, if there is no data to display, then there will be a notification that states

***"You have no data to graph."***

**BÊN PHẢI CỦA GRAPHIC**

To the right of the Bar graph, the user will see a **Raw data button**.

If the user selects this, then they can

**view the graph information in raw data format.**

**KIỂU XEM RAW DATA**

With the raw data format,

the system will display several parameters

**TRỤC Y KHI CHỌN RAW DATA**

on the y-axis; such as

**HR, >>> light red line**

**HR voltage, >>>> yellow line**

**GSR, and >>>>> black line**

**g-values (i.e.**

**X, >>>** green line

**Y, and >>>** red line

**Z variables). >>>** blue line

**NộI DUNG BÊN TRONG**

Each of these parameters will be represented a light **red line, yellow line, black line, green line, red line, and a blue line**, respectively. These lines will represent each parameter's data over time.

# TABLE REPORT

Aside from a graph, the user can select the Table format.

With the table format, the system will display

several **columns** to represent

**Date/Time,**

**Stress level, and**

**Diagnostics.**

Under each table header (i.e. Date/Time, Stress level, etc.), there will be several entry fields to reflect the data collected over time for each category.

**KHI CHỌN NÚT RAW DATA**

As with the graph, the user can also view the table in Raw data format.

By selecting the Raw data button, the user will see a raw data table that has

**columns** to represent

**Date/Time,**

**HR,**

**HR voltage,**

**GSR,**

**g-values (i.e.**

**X,**

**Y, and**

**Z), and**

**Diagnosis (Diagn).**

Under each table header (i.e. Date/Time, HR, etc.), there will be several entry fields to reflect the data collected over time for each category.

CHỌN DATE/TIME

For the Date/Time field, the user can select Date/Time and a pop-up calendar will display for the user to select the desired start and end date/time.

**PHẦN DIAGNOSIS**

Below the graph/table section, the system will display a Diagnosis and Recommendations field.

Initially, the Diagnosis and Recommendations section will have a

**notification** that reads

***"This page displays your current medical issues and the date that they were noted in your medical record. Click on the issue name for more in-depth information on that particular issue."***

By following the notification directions, the user will be able to retrieve details about their current diagnosis and previous diagnoses.

It will also detail recommendations based on the diagnoses provided.

**BUTTONS PHÍA DƯỚI**

Beneath Diagnosis and Recommendations, there will be a **Settings button** and a **Back to Track My Health button**.

If the user selects the **Settings button**, they will be

directed to the **Stress Monitoring Settings page**.

However, if the user selects the **Back to Track My Health** button, then they will

be transferred to the **Track My Health home page**.

# Stress Monitoring – Settings

On the Stress Monitoring Settings page, the system will display a

**notification**,

under the Stress Monitoring Settings sub-header, that

states

***"This page displays the current settings of this feature."***

Below the notification, the user will see **settings categories** that the user can change; such as

**Measurement duration,**

**Heart rate sample rate,**

**GSR sample rate, and**

**Accelerometer sample rate.**

Please refer to the formula document for further details on any parameters, or measures, listed in this section.

For each category, the user can choose the desired settings.

For example, the user can select a

**Measurement duration,**

**e.g.** two minute interval

**Heart rate sample rate,**

select appropriate Heart rate sample rate

**GSR sample rate, and**

select appropriate GSR sample rate

**Accelerometer sample rate.**

select appropriate Accelerometer sample rate

Each category will have different settings that the user can select from to effectively track their Stress Monitoring data.

**BUTTONS**

Below the Stress Monitoring settings, the user will see

**Edit,**

If the user chooses to **edit** their settings, they will need to

select the Edit button and make the desired changes

**Cancel,**

However, if the user wants to cancel any changes, then they will

select the **Cancel button** and no changes will be saved.

**Save, and**

Once the changes are made

, the user will select the **Save button** so that the desired settings are saved.

**Back button**s.

The user can also select the Back button

This will take them back to the Stress Monitoring page.

# Stress fomula

### Stress introduction

Stress is a physiological response to the

**mental,**

**emotional, or**

**physical challenges**

that we encounter.

Our application uses activity-aware, multi-modal system that

**combines**

**accelerometer,**

**heart rate variability (HRV),**

**and Galvanic Skin Response (GSR) information**

to differentiate (so sánh sự khác biệt) between physical activity and mental stress.

#### HRV

HRV is commonly used as a quantitative marker (đánh dấu số lần) describing the activity of the autonomic nervous system during stress.

HRVparameters are time domain features which are extracted from Photoplethysmography (PPG) as in Heart rate feature. These parameters are:

* Mean HR
* Std HR
* Mean RR
* Std RR (SDNN)
* RMSSD
* pNN50

and they are **calculated over a window duration is 60 seconds**.

#### GSR

There are **two major components for GSR analysis**.

**Skin conductance level (SCL)** is a slowly changing part of the GSR signal, and it can be computed as the mean value of skin conductance over a window of data.

A fast changing part of the GSR signal is called **skin conductance response (SCR),**which occurs in relation to a single stimulus.

Widely used parameters for GSR include the amplitude and latency of SCR and average SCL value.

GSR signal should be pre-processed to reduce noise. The analysis algorithm and feature extraction for GSR is described as below:

1. Filter raw signal with 256-point Low Pass Filter, 3Hz cutoff frequency to reduce noise
2. Get 3 features of SCR from pre-processed data:
   1. Total number of startle response in the segment/window
   2. Sum of response magnitude
   3. Sum of response duration
3. Get 2 features of SCL from pre-processed data:
   1. Mean of SCL
   2. Standard deviation of SCL

#### Activity

While developing mental stress monitoring algorithms in real-life ambulatory situations, it is crucial to take physical activity(e.g.,walking, sitting or standing) into account.

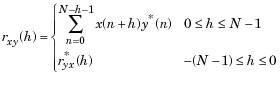
We compensate for the effects of physical activities by **extracting a set of accelerometer features** that characterize different physical activities along with HRV and GSR features.

**For each of 3 axis of accelerometer**, we get **12 following features**:

* Mean: X, Y, Z
* Standard deviation: X, Y, Z
* Energy: X, Y, Z
* Correlation (kết hợp): XY, XZ, YZ

Where energy of discrete signal is calculated as

And cross-correlation of two discrete signals is calculated as



Where *h* is the lag and *\** denotes the complex conjugate

### Model

Build model from

6 features of HRV,

5 features of GSR and

12 features of accelerometer

**to get stress level**

TBD

### Diagnosis

Based on stress level

TBD

### Help/Info

Information about Stress features: refers above.

Information about HRV: refers above.

Information about GSR: refers above.

Information about Accelerometer: refers above.