TREADMILL DASHBOARD

GP106 – GROUP PROJECT

Group number: G 108

Introduction

The project is to program a dashboard to view useful insight into a treadmill user based on the conditions at which the treadmill is operated.

So, we are requested to get

- The rate at with the motor is rotating (RPM)
- The radius of the motor shaft
- Weight and height of the person
- Time duration the person was walking/running as the inputs.

As well as we should do the required calculations in order to find below things.

- Speed
- Distance walked/ran
- Calories burnt
- Number of steps taken

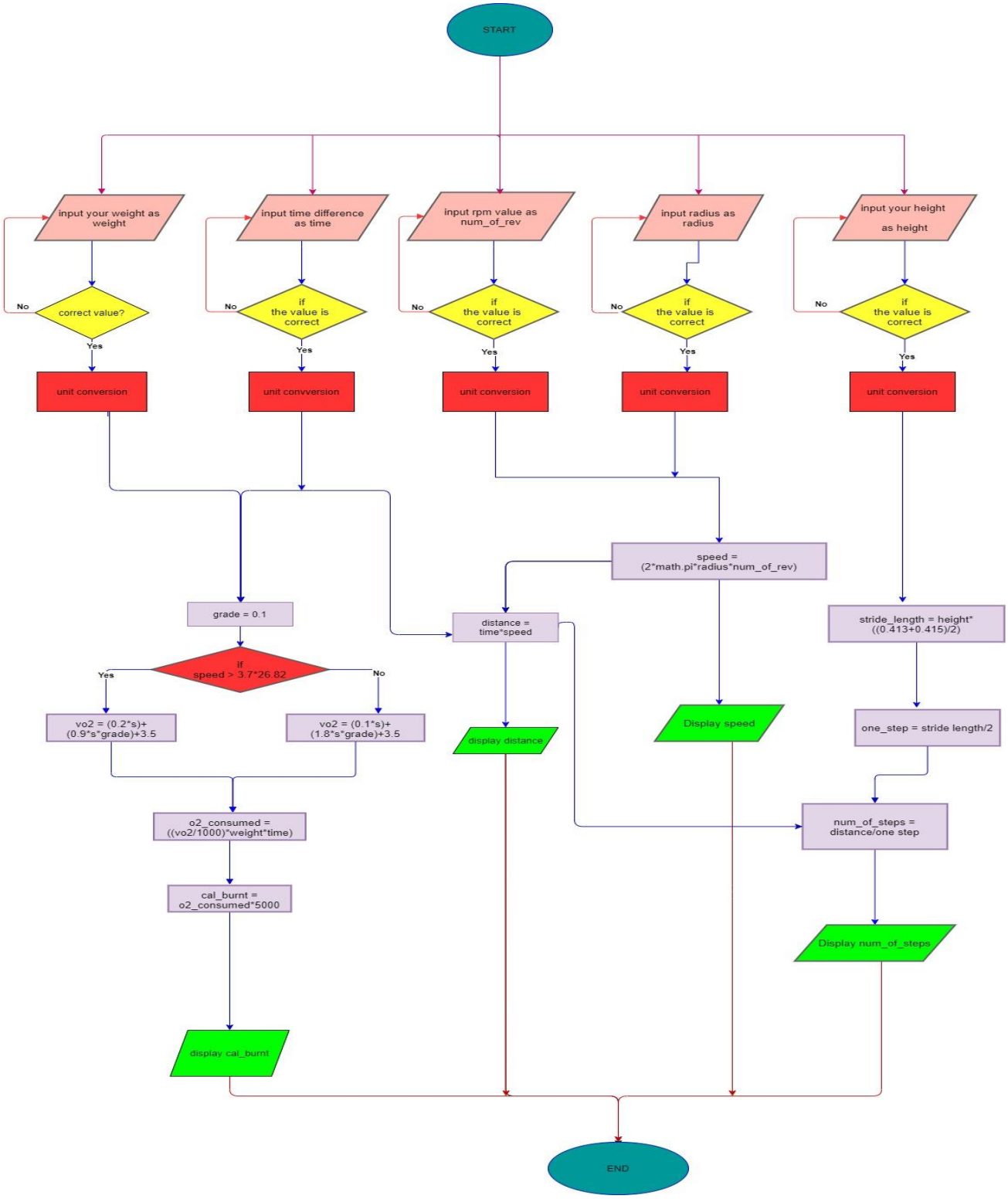
We are supposed to do those things under milestones.

- **MS1** – design the system and write program to calculate above mentioned values
- **MS2** – this involves real-time visualization. Once we call the function by giving treadmill parameters it should start a timer and output the calculated insights in real-time until the program is aborted.
- **BONUS** – improve the work by adding something creative/innovative things. (can be additional features/GUI implementation)

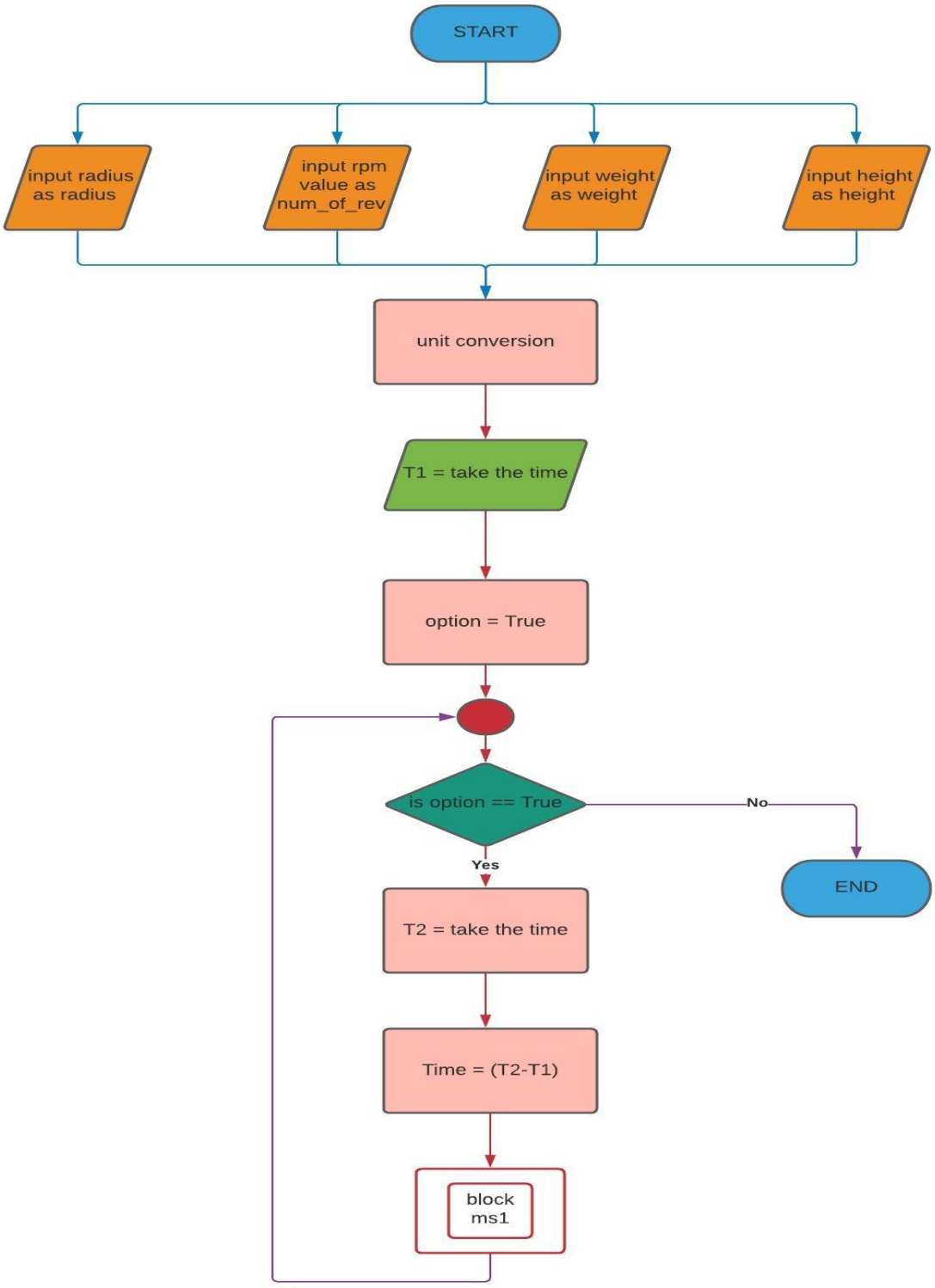
In order to do this project first, we analyzed the task. Then, designed the program by using flow charts (to give an idea about how the program will flow). After that, we started to do the implementation (codes for MS1 and MS2). Finally, added some features to enhance the system.

Flow charts

- Milestone1 (ms1)



- Milestone2 (ms2)



Explanation

Calculating speed

When motor shaft rotates one round, it travels $(2 \times \pi \times \text{radius})$ distance.

Therefore, $\text{speed} = (2 \times \pi \times \text{radius}) \times \text{number of revolutions (RPM)}$

This gives speed in m/min

Calculating distance

The equation we used is,

$\text{Distance} = \text{speed (m/min)} \times \text{time (min)}$ This gives distance in meters. In here speed is taken by calling the function which we created to get the speed.

Calculating calories burnt

First, evaluate the MET value

Walking- $VO_2 = (0.1 \times \text{speed}) + (1.8 \times \text{speed} \times \text{grade}) + 3.5 \quad \text{ml/kg/min}$

Running - $VO_2 = (0.2 \times \text{speed}) + (0.9 \times \text{speed} \times \text{grade}) + 3.5 \quad \text{ml/kg/min}$

Then, evaluate the volume of O_2 consumed

$O_2 = (VO_2 / 1000)\ \text{l/kg/min} \times \text{weight (kg)} \times \text{time (min)}$

$1\ \text{L of}\ O_2\ \text{consumed} = \text{burning}\ 5\ \text{kcal}$

$\text{Calories burnt} = O_2 \times 5\ \text{kcal}$

In here speed is taken by calling the above mentioned function.

Furthermore we have made some assumptions in order to do the calculations.

1) We are not allowed to take the **grade** as an input it the task. So we assumed that grade is equal to 10% for our calculations. Though the grade is expressed as a percentage, the decimal form of grade is used for the calculation.

2) Considering MET value, it is most accurate for

   - Walking $=$ speed of $1.9 - 3.7$ MPH
   - Running $=$ speed > 5 MPH

$$(1 \text{ MPH} = 26.82 \text{ m/min})$$

So for our case we assumed that if speed > 3.7MPH, it is in running condition.

Reference- https://youtu.be/PsYLC7qN6fQ

Calculating steps taken

- Stride length of male $=$ height $\times 0.413$
- Stride length of female $=$ height $\times 0.415$

Since we are not allowed to take the gender as an input, we used common stride length for our case.

✓ Common stride length $=$ height $\times \frac{(0.413+0.415)}{2} =$ height $\times 0.414$

Since 1 step = stride length/2

✓ 1 step $=$ height $\times 0.207$
✓ Number of steps $=$ distance/1 step $=$ distance/ (height $\times 0.207$)

In here distance is taken by calling the function which created to get the distance.

Reference –

https://sites.google.com/site/naspestandard62010/home/assignments/where-did-you-go/stride-length

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