TREADMILL DASHBOARD

GROUP 61

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Contents

Discussion

How a treadmill works is demonstrated by using the python program. The output is generated by the user's input during the first milestone, while the second milestone is programmed to generate time automatically.

In the program we have created for first milestone, the following outputs are displayed on the dashboard by the input provided by the user at the startup.

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

Here the user has to provide the following inputs for the first milestone.

- 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

But in the second milestone these same outputs are calculated but time is not given as an input.

The inputs can be get with help of a dropdown menu to minimize the errors in the inputs. Further, the input values are converted to standard units to give the final outputs in SI units.

Equations

Speed:

Inputs:

The rate at which the motor is rotating - RPM

The radius of the motor shaft – r (m)

Calculations:

$$\text{Speed} = 2 \times r \times \Pi \times \text{RPM} \times 0.00621 \text{ mph}$$

Distance walked/run

Inputs:

Speed - v (mph)

Time the person was walking/running – t (min)

Calculations:

$$\text{Distance walked/ran (d)} = (v \times t)\ 1.60934/60$$

Calories burnt

Inputs:

The weight (kg)

Speed (m/min)

$$(\text{Speed in m/min}) = (\text{Speed in MPH}) \times 26.8$$

Grade (%)

$$\text{Fractional grade} = (\%\ \text{Grade}) / 100$$

Time duration the person was walking/run

Calculations:

Running Equation (>3.7 MPH)

Oxygen consumption V02 = (0.2×speed) + (0.9×speed×fractional grade) + 3.5

(mL / kg × min)

Walking Equation

Oxygen consumption Vo2 = (0.1×speed) + (1.8×speed×fractional grade) +3.5
(mL / kg × min)

Oxygen consumption per minute (mL/min) = Vo2×weight of the person

Oxygen consumption per minute (L/min) = Vo2×weight of the person/1000

Calories burnt per minute (cal/min) = (Vo2 × weight of person /1000)×5
(1L of oxygen = 5 calories)

Calories burnt = Calories burnt per minute × time

Number of steps taken

Inputs:

Height of the person (cm)

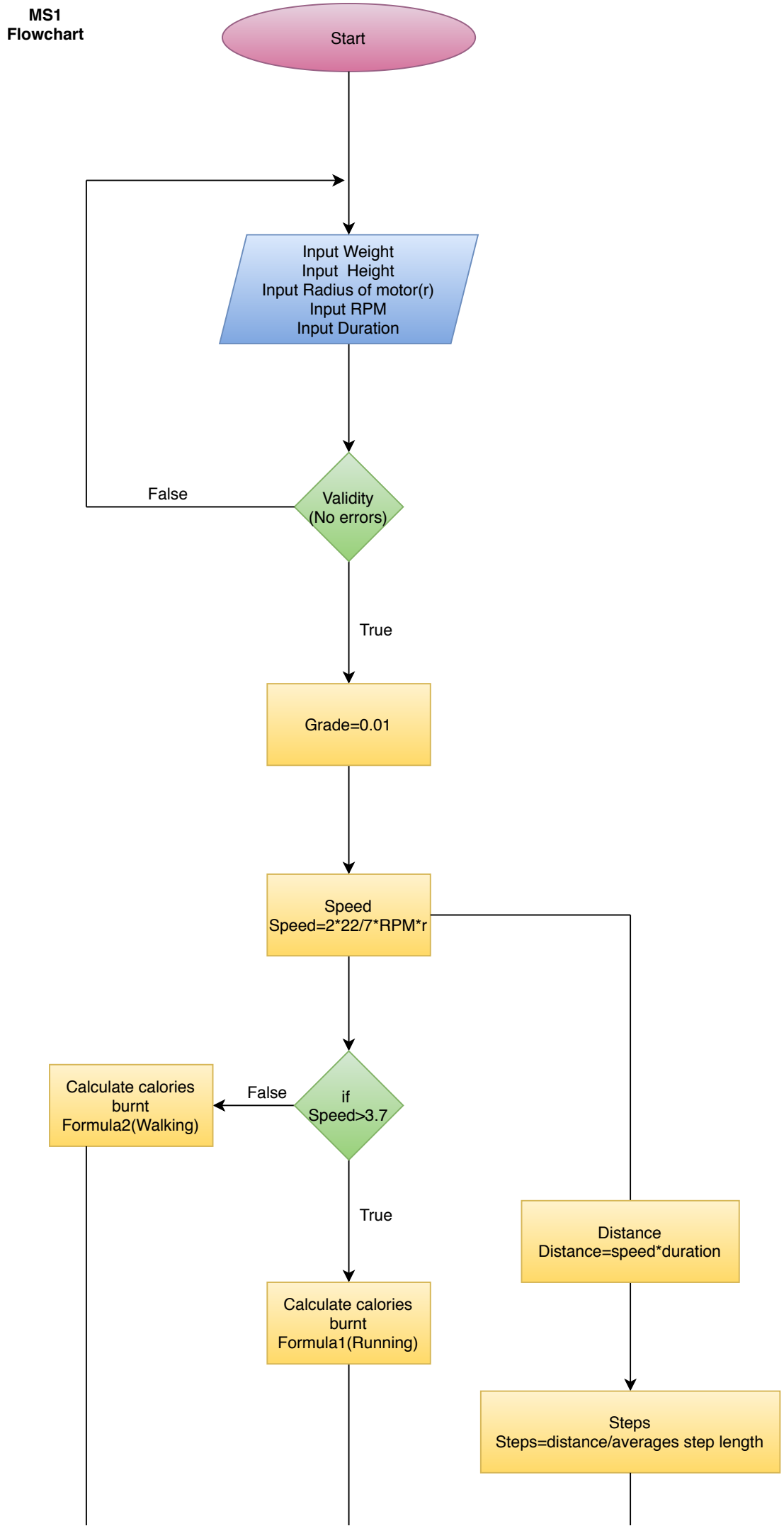
Distance (m)

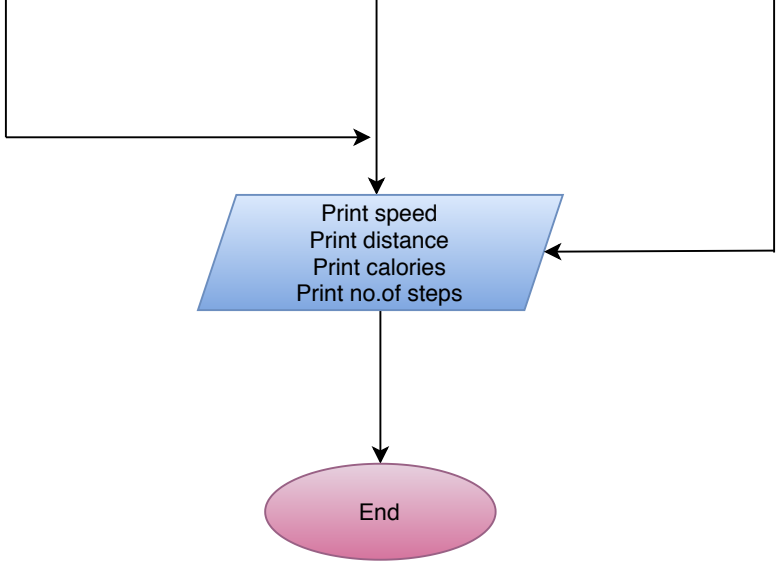
Calculations:

Height in inches	=	Height × 0.393701
Average stride length	=	(Height in inches × 0.413)/12
Average step length	=	Average stride length / 2
Steps per meter	=	5280/ (Average step length × 1609.344)
No. of steps	=	Steps per meter × distance

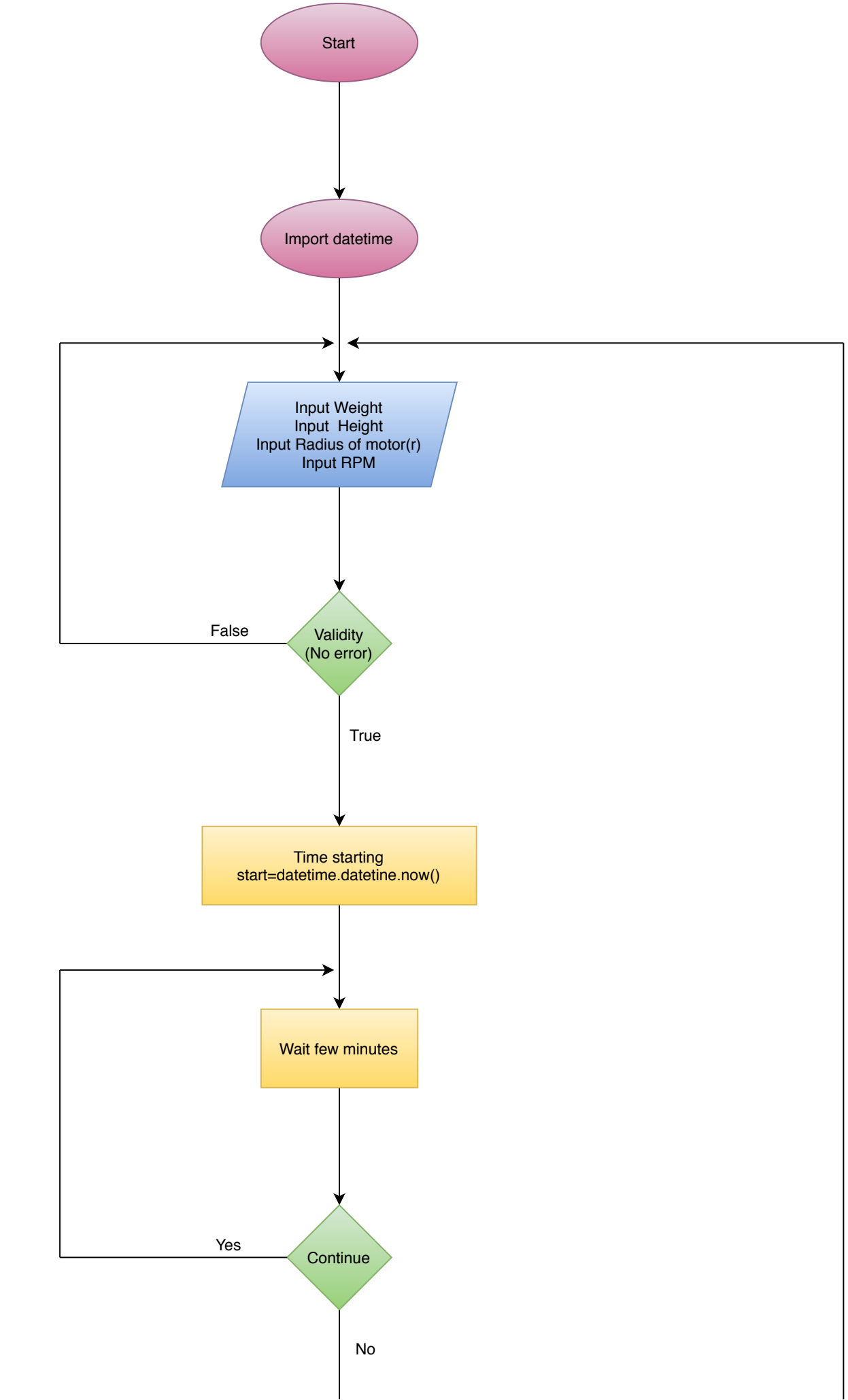
Height vs Approximate Steps Per Mile

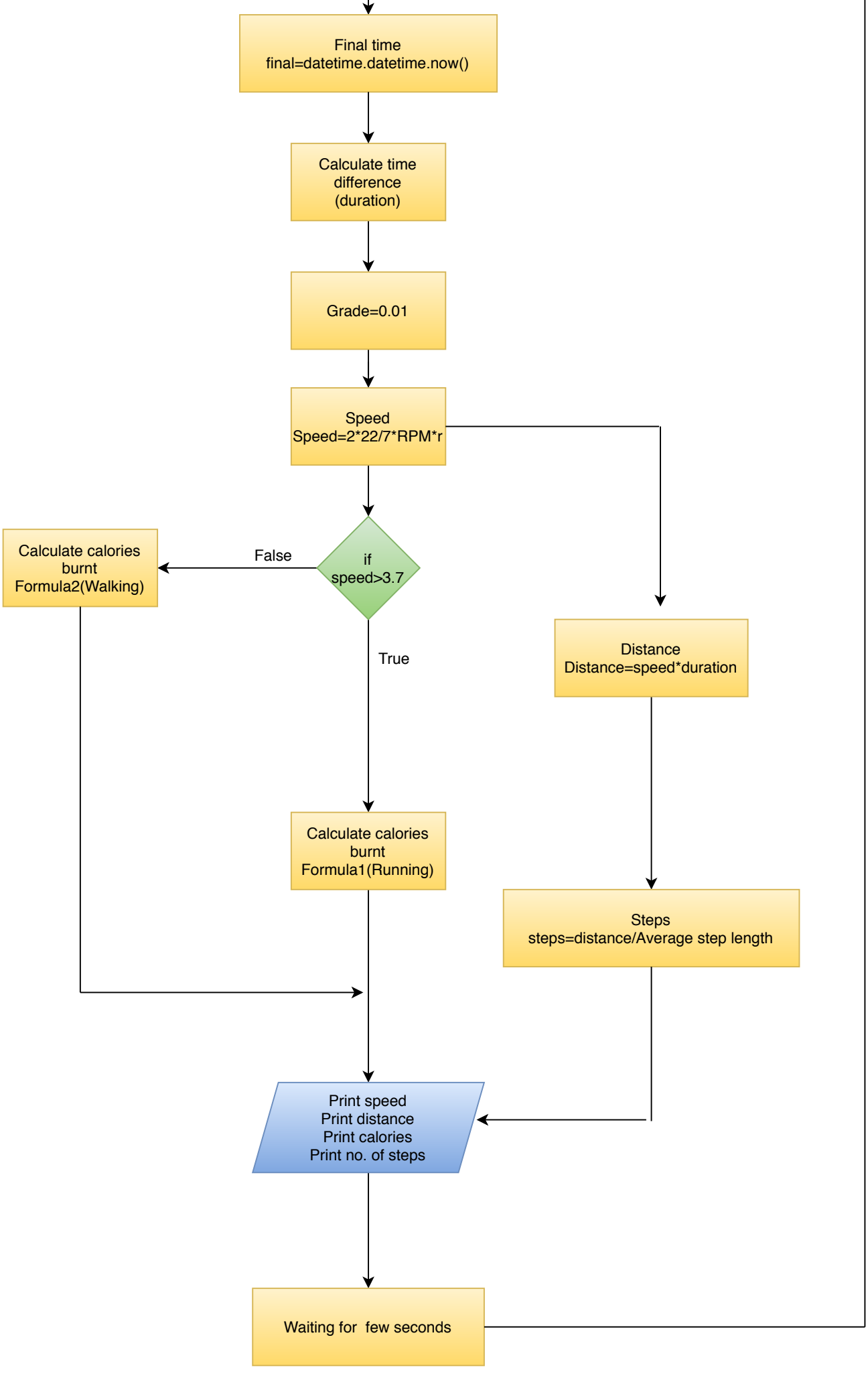
Height	Approximate Steps Per Mile
4'10"	2,645
4'11"	2,600
5'0"	2,556
5'1"	2,514
5'2"	2,474
5'3"	2,435
5'4"	2,397
5'5"	2,360
5'6"	2,324
5'7"	2,289
5'8"	2,256
5'9"	2,223
5'10"	2,191
5'11"	2,160
6'0"	2,130
6'1"	2,101
6'2"	2,073
6'3"	2,045
6'4"	2,018
6’5”	1,992


MS1
Flowchart
Start
Input Weight
Input Height
Input Radius of motor(r)
Input RPM
Input Duration
Validity
(No errors)
False
True
Grade=0.01
Speed
Speed=2*22/7*RPM*r
if
Speed>3.7
False
Calculate calories
burnt
Formula2(Walking)
True
Calculate calories
burnt
Formula1(Running)
Distance
Distance=speed*duration
Steps
Steps=distance/averages step length


Print speed
Print distance
Print calories
Print no.of steps
End

MS2
Flowchart




Final time
final=datetime.datetime.now()
Calculate time difference (duration)
Grade=0.01
Speed
Speed=2*22/7*RPM*r
if speed>3.7
False
Calculate calories burnt Formula2(Walking)
True
Distance
Distance=speed*duration
Calculate calories burnt Formula1(Running)
Steps
steps=distance/Average step length
Print speed
Print distance
Print calories
Print no. of steps
Waiting for few seconds

Design

In his project, it used to think how to create a treadmill machine program step by step. In the first milestone, program was created to get constant RPM, radius, time parameters and also weight and height of the person and calculate the speed, duration, calories burnt, steps taken. In the second milestone the time varies and other parameters were constant. Therefore, the computer time was used the calculate time difference. In both milestone error handling was used to check whether that parameters are in correct form. Overall It's good practice to make a treadmill program.

References

1. https://www.physionic.org/accurate-measure-of-exercise-calorie-exp

2. https://lowellrunning.com/stepspermile/

3. https://www.healthline.com/health/walking-vs-running#weight-loss