**To:**        Professor Gove Allen
**From:**     Richard Kalanaka Rowley
**Date:**     February 05, 2012
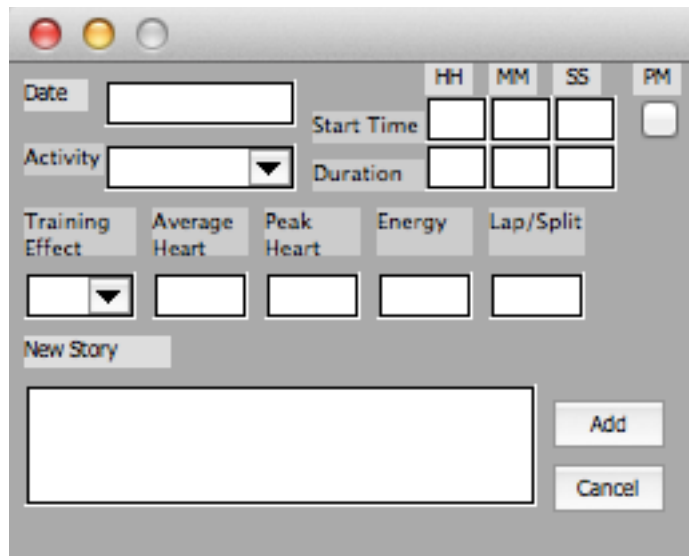**Subject:**  **FINAL PROJECT**

ROWLEY SUUNTO LOG

## EXECUTIVE SUMMARY (2.2)

Suunto is a company that sells watches that may be used to monitor heart rate data, typically used for exercise and training. The data is collected and stored within the watch for a limited time. Although Suunto recommends customers use a supplementary site, MovesCount.org [a related but external website that may be used for logging data and limited analysis as well as social networking and media (think Facebook for health enthusiasts)] the typical Suunto watch user is not a casual athlete and will use the data for advanced analysis. The ROWLEY Suunto Log file allows users to conveniently record activity logs and customize Suunto watch data analysis for accurate and comprehensive reports.

## PROBLEM

After using MovesCount.org for a number of months, I discovered that I do not use the social networking and media sections; they feed local but random videos and images from external websites, are bulky, and unrelated to the social needs of the user.

Although MovesCount.org has expanded their data analysis, the results are limited to the reports generated on the site. The site does offer a feature allowing the user to export some of the workout data to an excel spreadsheet.

My primarily use of the website is to maintain an activity log, however I have been uploading the information to MovesCount.org just to export it into an MS Excel spreadsheet.

### Problem Statement

**Users of the Suunto watch t4D need a way to effectively record workout activities and data, allowing flexible analysis, without the inconvenience of social networking and media bulk of MovesCount.org.**

# SOLUTION(S)

Via visual basic for application (VBA) code, the workbook titled **ROWLEY Suunto Log** provides the user with fluid input and logging of Suunto t4D watch (model) workout data that allows users to generate customized analysis.

## WHY USE THE ROWLEY SUUNTO LOG

The ROWLEY Suunto Log provides users with two features above those found with MovesCount.org: **Customization** and **Convenience**.

### Customization (2.2)

The Suunto t4D watch owners is not a casual athlete. The data the watch provides is catered to the performance athlete. The general reports generated through MovesCount.org are not sufficient. Many users will export the data to an excel file to extract precise data. The ROWLEY Suunto Log allows users to customize reports. Currently the procedures generate a bubble chart packed with detailed performance information.  Future features will implement the benefits of customized pivot tables converted to visual charts and reports. The potential analyses from these reports add the "fit" to athletes "fit"ness (and as long as I am being "pun"ny, potentially the "anal" to the Analyst.)

### Convenience (2.2)

The design of the ROWLEY Suunto Log VBA code allows the user a much more fluid data entry process and avoids the extra steps of importing and exporting data to an external website. It removes the frustrating inconvenience of navigating through irrelevant videos and media as found on the MovesCount.org website. The data is easily accessible from a standard and regularly used Microsoft Office program (Excel).

Chart 1.1 is an example of the results of fifteen (15) workouts that were input into the workbook log. The x-axis depicts the workout, y-axis the heart rate scale; because the Training Effect is related to the Peak Heart rate, the size of the red
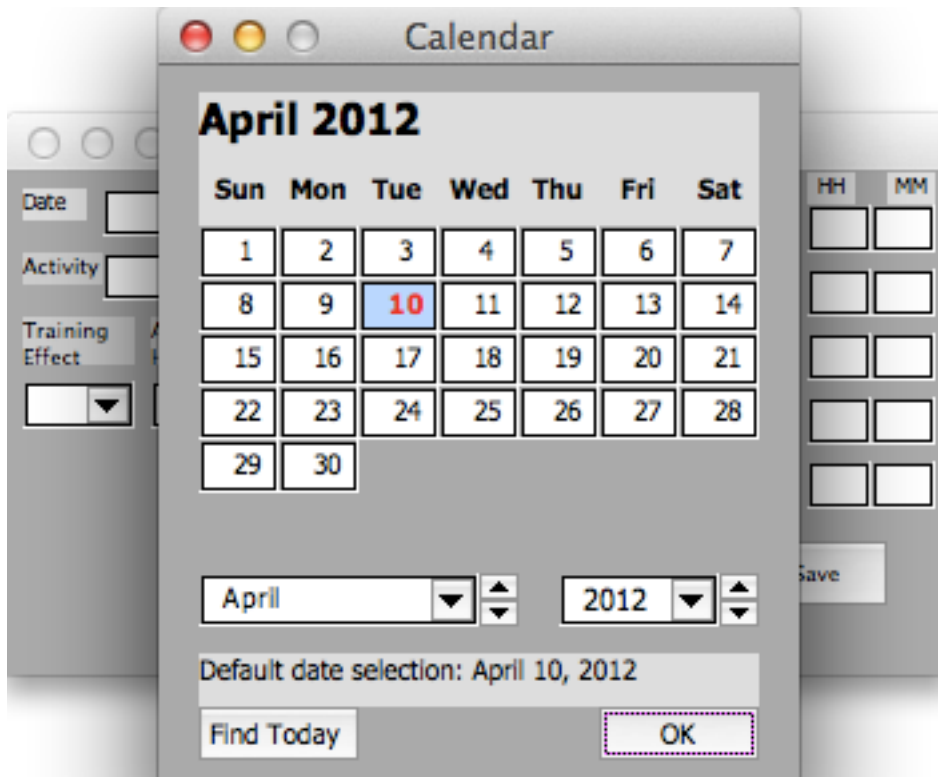
bubbles depicts the Training Effect achieved, similarly the size of the blue bubble shows the ratio of calories burned which is related to the to the average heart rate (and duration of the workout).
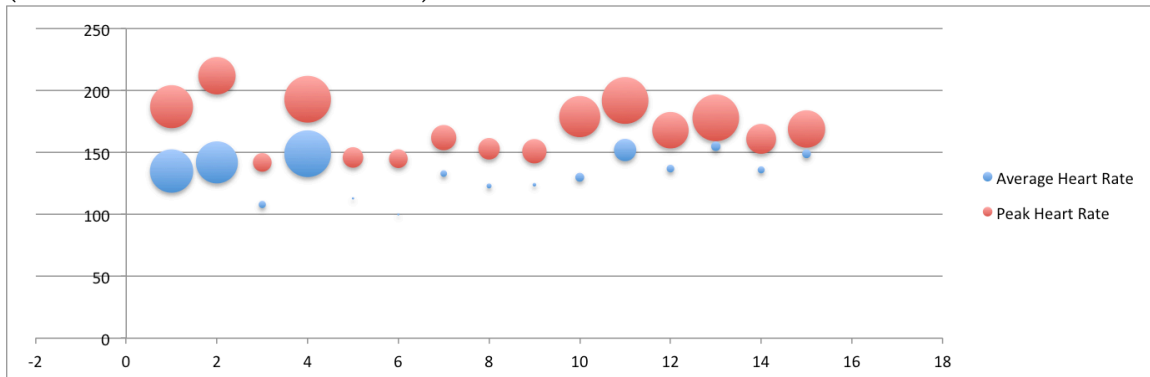


# QUICK GUIDE TO USING THE ROWLEY SUUNTO LOG

The workbook includes the following:

| Three Worksheets | Two Userforms | Two Modules |
|---|---|---|
| 1. "watchInput", | 1. "DatePick" & | 1. "CalandarModule" & |
| 2. "activities", & | 2. "Userform1" | 2. "Module 2" |
| 3. "bodyMetrics" | | |

## IMPLEMENATION LOG (2.3)

- **WORKSHEETS**
  - o "watchInput" contains the location of the buttons to execute the procedures and where the activity log data is stored
  - o "activities" contains the list of activities from which the user may select in the userform combo box.
  - o "bodyMetrics" contains placemarkers for additional data to be added for the analysis reports.
    - ▪ For example user age and maximum heart rate will be used to determine heart rate zones.
- **USERFORMS**
  - o "DatePick" contains code that circumvents the typically required Active X and allows Excel 2011 for Mac to create a calendar popup from which the user may pick a date. (Credits to BlueCactus are found in the Help Credit section below.)
  - o "Userform1" contains the code for the activity data input form. This form implements labels, textboxes, combo boxes, listboxes, check boxes, and buttons. It also follows the Suunto t4D watch data flow to convenience the user.
- **MODULES**
  - o "CalendarModule" contains the code for various aspects of the "DatePick" userform. (Credits to BlueCactus are found in the Help Credit section below.)

o "Module 2" contains the code for the Bubble Chart Report and various other procedures to call the Userform.

## STEP 1: AQUIRE DATA
Use the Suunto t4D watch to record activity data. Save results to the watch.

## STEP 2: ACCESS ROWLEY SUUNTO LOG
Open the ROWLEY Suunto Log file (Excel). Select the "Enable Macros" option. Click the "Add Workout" button to access the data input Userform.

- NOTE: the VBA code was written using Excel 2011 for MAC. This version of Excel limits the ability to customize the Ribbon feature, and therefore does not include a tab on the Ribbon to access these procedures.
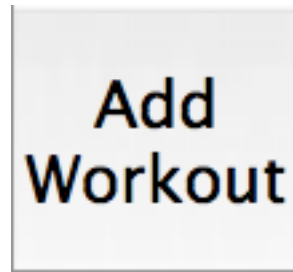
## STEP 3: INPUT DATA
Access the activity data stored on the Suunto t4D. The ROWLEY Suunto Log entry fields conveniently follows the order of the input the data from the Suunto t4D. Input data and save. (See Appendix 1 for descriptions of data.)

## STEP 4: DATA RESULTS
Click the "Chart" button to see a bubble chart including the average and peak heart rates, Training Effect, and calories burned.

**Congratulations! You have successfully used the ROWLEY Suunto Log.**

## PROJECT EXPERIENCE AND INSIGHTS (2.4)

I am a coding rookie. VBA is my first ambitious endeavor to convenience my professional and personal life through code. Although there is a steep learning curve, I enjoyed the class and this application of the materials.

Perception of my own incompetence is one of the largest hurdles for me. I know that there are likely more convenient and efficient ways to accomplish my goals, however I have found that even the simple procedures are difficult to execute. I had big ambitions for this project, and scope creep made them even larger. Ultimately, this project will be a "work in progress." I have completed some of the basic functions, however there are plenty more features that I intend to implement to improve the product and my own experience with VBA. See the appendix for a list of descriptive statistics for the included elements and a list of excluded items.

One of the aspects that I gathered from class is that Professor Allen doesn't know every thing about VBA. There were time when he said, "I don't know the answer to that, should we try it out?" This has been very helpful for my learning and implementation of this project. I wanted a calendar for the userform but knew that it was out of my league. Fortunately, there are other resources out there. I found a great example and, although it took me a while to get it to work, implemented it in my project.

I have definitely learned patience too. I thought I had a good grip on the concept of the project. But when I started inputting data I discovered that textbox fields for AM/PM data would not work as well as check boxes. Also, I'm sure there is a way to have time be input into a textbox in a consistent and efficient format…but I could not find a way to get that one to work. I learned that I'll probably go back to the drawing board regularly, so plan buffer time.

Overall this has been a rewarding experience for me. I was worried about my competence and ability to produce the minimum through the semester. Now I feel much more proficient in VBA and coding and have been recommending the class to other students. Thanks!

## HELP CREDITS (1.4 & 2.5)

### Userform formatting

I used some of my professor's (Gove Allen) code from a Userform assignment to show/hide some portions of the form. The form allows users to add a story, however a story for the activity is not always relevant. So the code conveniently hides the freeform textbox for the story input.

### Calendar procedures

Online resources lead me to vbaexpress.com where I found help for the calendar. An individual with the username BlueCactus provides code that circumvents Active X and allows Excel 2011 for Mac VBA to code a calendar.

The calendar procedure allows the user to select the date of the activity. My current knowledge of VBA would not allow me to write this intricate code. In fact, this code was difficult to even implement in this project.

BlueCactus. *Win/Mac Scalable Calendar Control*. Location: http://www.vbaexpress.com/kb/getarticle.php?kb_id=791 Publisher: .VBA Express. Web April 1, 2012.

# APPENDIX

While there was a variety of information available for inclusion (see the appendix for all potential input fields) I identified the following information to be included in this form.

## BODY METRICS

Weight
Height
Activity Class
Maximum Heart Rate
Sex
Birthday
BMI Optimal Range
Resting Heart Rate (BPM)
Heart Rate Zones (BPM)

# DESCRIPTIVE STATISTICAL DATA

## BODY METRICS

### Weight
Used to determine other statistics.
Variable/measurement: LBS
VBA form use: fluctuating; pending on how often a person weighs in, or inputs weight.

### Height
This field is initially an input but will adjust with increased or decreased workouts
Variable/measurement: ft/in
VBA form use: for most adults this will be a one time only.

### Activity Class
This field is initially an input but will adjust with increased or decreased workouts (pending on training history).  Usually the Coach will adjust this according to the workout schedule, although I have not found the formula. This is probably also used to figure out the METS

Variable/measurement:
Activity Class is initially set on the following scale:
- **Easy going – no recreational sports or heavy physical activity:**
  - Light exercise/walking = 1
- **Recreational - If you participate regularly in recreational sports or do physical work, and your weekly exercise is:**

- less than 1 hour = 2
- more than 1 hour = 3
- **Fitness - If you participate regularly in sports or other physical activity, and you exercise heavily:**
    - under 30 min per week = 4
    - 30-60 min per week = 5
    - 1-3 hours per week = 6
    - over 3 hours per week = 7
- **Endurance or professional - If you train on a regular basis or participate in competitive sports, and your weekly exercise is:**
    - 5-7 hours=7.5
    - 7-9 hours = 8
    - 9-11 hours = 8.5
    - 11-13 hours =9
    - 13-15 hours =9.5 and
    - over 15 hours =10

VBA form use: fluctuating, pending on how often and the duration of a workout, and how often a workout is recorded in the program.

- What is the formula and cap for this?

## Maximum Heart Rate
Used to determine the Heart Rate Zones
Variable/measurement:
- The formula to calculate maximum heart rate is: MHR = 210 – (0.65 x AGE)
- However, the actual maximum heart rate may vary, the max is not completely capped by this age formula.
- Ideally the program would update the max heart rate whenever the Peak Heart Rate exceeds the current heart rate, although it should be on a shifting interval to update the max heart rate.)

VBA form use: automatically calculated by the program; output

## Sex
Used to identify maximum Heart Rate Zones
Variable/measurement: Male/Female
VBA form use: for most adults this will be a one time only.

## Birthday
Used for automatic updating of maximum heart rate
Variable/measurement: MM/DD/YYYY
VBA form use: one time only.

## Body Mass Index (BMI) Optimal Range[1]
Output of the weight and height also used to measure weighting categories. BMI is typically used to screen for weight factors that may lead to health problems.

---

[1] http://www.whathealth.com/bmi/formula.html
[2] http://en.wikipedia.org/wiki/Heart_rate

Variable/measurement:
- The formula to calculate body mass indicator is: BMI = (weight in pounds * 703)/height in inches[2]
- There are different ranges for men and women
    - See a BMI scale

VBA form use:
- Input: N/A
- Output: Status on an obesity scale

### Resting Heart Rate (RHR)

Resting heart rate will be used to indicate change in athletic condition. The resting heart rate is a person's heart rate when they are at rest, that is lying down but awake, and not having recently exerted themselves. The typical resting heart rate in adults is 60-80-bpm. Athletes often have resting heart rates below 60 BPM.[2]

Variable/measurement: beats per minute (BPM)
VBA form use:
- Input: fluctuating, pending on how often a person measures, or inputs RHR.
- Output: N/A

### Heart Rate Zones

The *Target Heart Rate* or *Training Heart Rate* (THR) is a desired range of heart rate reached during aerobic exercise which enables one's heart and lungs to receive the most benefit from a workout. This theoretical range varies based mostly on age; however, a person's physical condition, gender, and previous training also are used in the calculation. Some methods have an element called "intensity" which is expressed as a percentage. The THR can be calculated as a range of 65%–85% intensity. However, it is crucial to derive an accurate $HR_{max}$ to ensure these calculations are meaningful.[3]

Variable/measurement: beats per minute (BPM)
VBA form use: This will vary person to person and may change if the maximum heart rate changes.

**Zoladz method of measurement**
An alternative to the Karvonen method is the *Zoladz method*, which derives exercise zones by subtracting values from $HR_{max}$:
THR = $HR_{max}$ – Adjuster ± 5 bpm
Zone 1 Adjuster = 50 bpm
Zone 2 Adjuster = 40 bpm
Zone 3 Adjuster = 30 bpm
Zone 4 Adjuster = 20 bpm
Zone 5 Adjuster = 10 bpm
*Example for someone with a $HR_{max}$ of 180:*
Zone 1(easy exercise): 180 − 50 ± 5 → 125 – 135 bpm

---

[2] http://en.wikipedia.org/wiki/Heart_rate
[3] http://en.wikipedia.org/wiki/Heart_rate

Zone 4(tough exercise): $180 - 20 \pm 5 \rightarrow 155 - 165$ bpm

## TRAINING EFFECT

### Coach
The watch Coach generates a training routine with a specified Training Effect and recommended workout duration for the next five days.

It would be awesome to figure out how the watch calculates the training program for the target training effect levels for the next 5 days.

How many days in advance does it use to calculate the next workout?

Look a the American College of Sports Medicine for exercise prescriptions

I would use this to identify great workouts, and ideally it would tell me which kind of activity would work well for that workout. EX: a workout prescription of 30 min @ TE 4.5 would recommend a similar activity with the same specs.

### Training Effect
This feature measures the real effect of a workout on physical fitness for improved intended results. This is a significant different between the heart rate zone (temporary training intensity) and Training Effect (total load of a workout). With Zone Training, one is trying to keep the heart rate at a certain level, but in Training Effect a desired heart rate is achieved just once during training.

| | | | |
|---|---|---|---|
| TRAINING EFFECT | RESULT | DESCRIPTION | |
| 1.0-1.9 | Minor | Improves recovery ability; in longer sessions (over one hour) also improves basic endurance. Does not significantly improve aerobic performance | |
| 2.0-2.9 | Maintaining | Maintains aerobic fitness. Builds base for harder training in the future. | |
| 3.0-3.9 | Improving | Improves aerobic performance if repeated 2-4 times a week. No special recovery requirements. | |
| 4.0-4.9 | Highly improving | Rapidly improves aerobic performance if repeated 1-2 times a week. Requires 2-3 recovery sessions (TE 1-2) per week | |
| 5.0 | Over-reaching | Extremely high effect on aerobic performance if adequate recovery allowed; should not be done often | |

# TRAINING LOGS/LOGBOOK (5.4)

Currently the Suunto heart rate monitor stores each training session in a logbook. The available summary information per logged session is:

Achieved Training Effect (TE)
Average and peak heart rate
Calories burned
Lap times
Time inside, above and below heart rate limits

If a speed and distance POD is used, the following information is also logged:

Total distance
Average cadence (Cadence POD only)
Average and maximum speed
Distance per lap
Average speed per lap

# USER MANUAL/FEATURES

## FEATURES
MovesCount.org has poor user input design. The prompts from the t4D version of the Suunto watch has different ordering than the website for the input of data. I dislike moving backward and forward through the watch data outputs to find the right data, or forward/back tabbing through the website for the right field.

## INPUT ORDER
The VBA Suunto project form places the input fields by order of this specific model of watch. The order of input is as follows
1. Date
2. Start Time
3. Duration
4. Training Effect (on a 0.0 – 5.0 scale by tenths)
5. Average Heart Rate (numerical three digit number)
6. Peak Heart Rate (numerical three digit number)
7. Energy (kcal)
8. Inside Zone 1 "Moderate" (time)
9. Inside Zone 2 "Hard" (time)
10. Inside Zone 3 "Very Hard"  (time)
11. Above Zone 3 "Maximal" (time)
12. Below Zone 1 "Easy" (time)
13. Lap/Split
    a. Lap/Split number

b. Total Time
c. Average Heart Rate
d. Lap/Split Duration
Fields not included
14. Activity
a. Default activities
15. Story behind the move

## IN-PROJECT ISSUES

### PROJECT SCOPE

MovesCount.org has a number of entry fields on the website. The watch has features where users may purchase additional Peripheral Observation Devices or "PODS," or data, which will increase the data for results. There was a lot of discarded information; the appendix contains the entirety of the data input fields.

Although I am interested in purchasing these "pods," the work for this project would be expanded beyond the original scope.

### EXCLUDED METRICS

**Maximum Performance Capacity** (as calculated by metabolic equivalent units[4] or METS) - This one is being removed because of the complexity and required accuracy of activity comparison and the varying types of measurement

- MET stands for the amount of oxygen you consume and the number of calories you burn at rest. Usually this means that if you have a MET number of 4, you are working 4 times as hard as you would be at rest.[5]
- The formula to calculate METS is: Calories Burned Per Hour = (weight in pounds/2.2) * METS
  - Another site discussed calculating the calories burned per minute during an activity by multiplying the METS by body weight in KG and dividing by 60.
- One resource for an accurate MET chart is rockwellfitness.com
- Source – website

---

[4] http://www.my-calorie-counter.com/mets_calculation.asp
[5] http://www.fitnessforweightloss.com/what-does-mets-stand-for-on-an-exercise-machine/