



KINESTHETIC ACTIVITIES FOR THE CLASSROOM, LABORATORY, AND OUTREACH EVENTS

ELLIOT MYLOTT EMYLOTT@PDX.EDU

LESTER LAMPERT

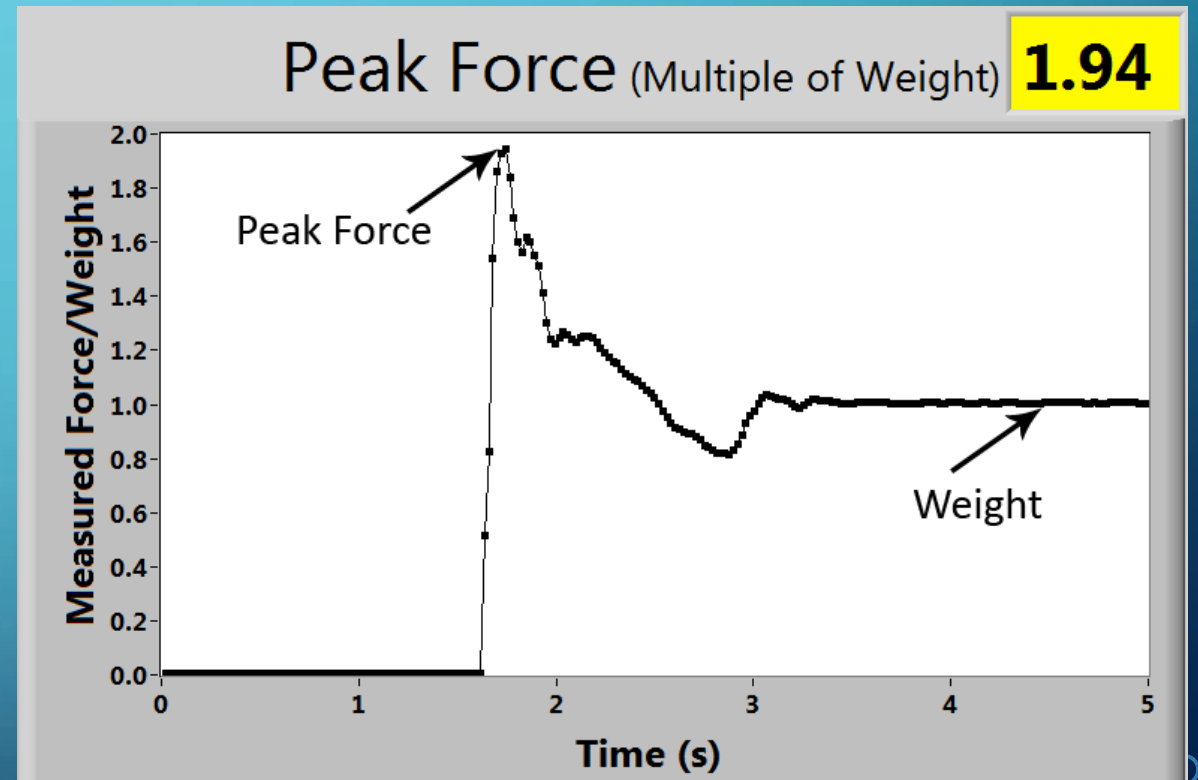
JUSTIN DUNLAP

RALF WIDENHORN RALFW@PDX.EDU

- Topics Explored:
 - Impulse Momentum
 - Center of Mass
 - Kinematics
- Supplies Required:
 - LabQuest and Force Plates
(Can be adapted for Pasco)
 - Webcam
 - LabVIEW not Required*

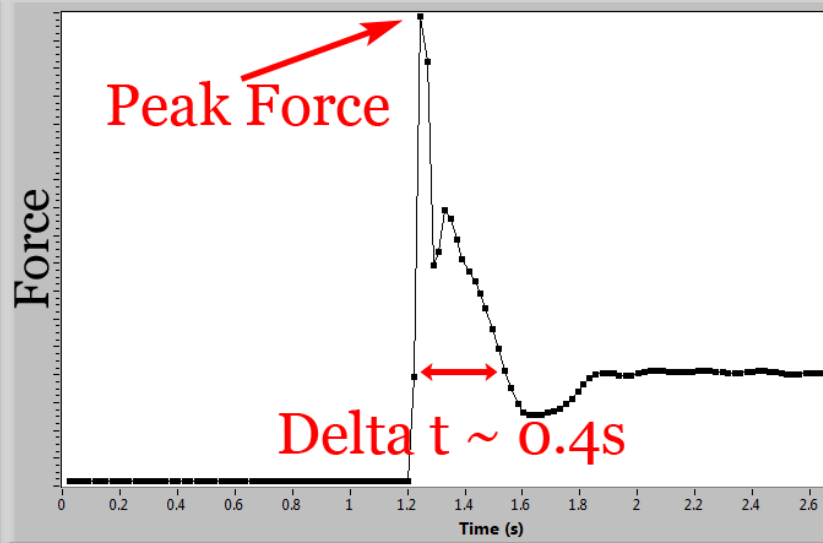
IMPULSE MOMENTUM

$$F \Delta t = m \Delta v$$



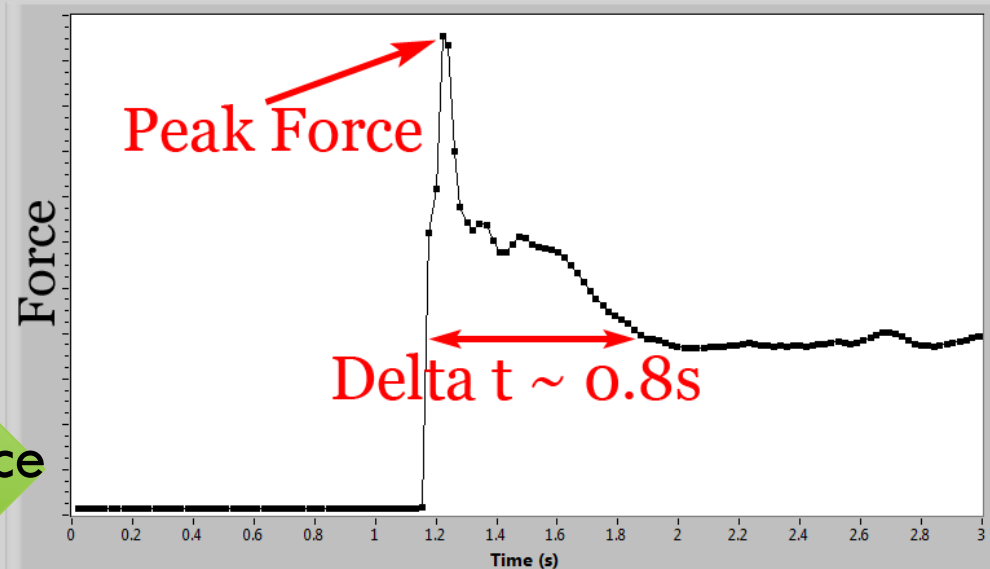
IMPULSE-MOMENTUM CHALLENGE

Peak Force (Multiple of Weight) **4.03**



“Bad” landing- large peak force

Peak Force (Multiple of Weight) **2.41**

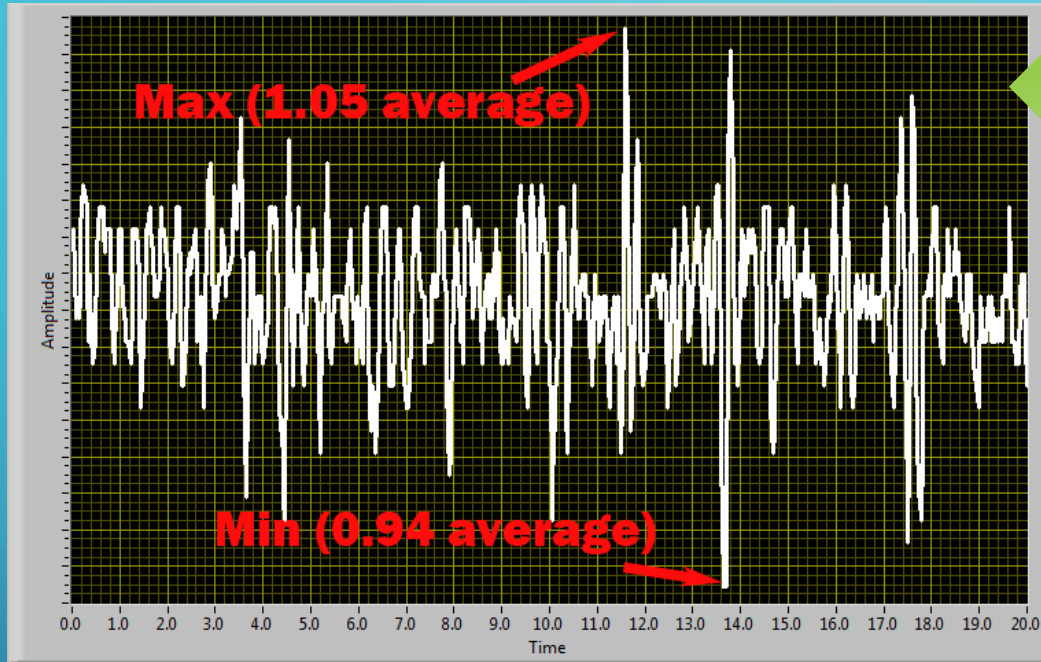


“Good” landing- small peak force

BALANCE CHALLENGE



BALANCE COMPETITION

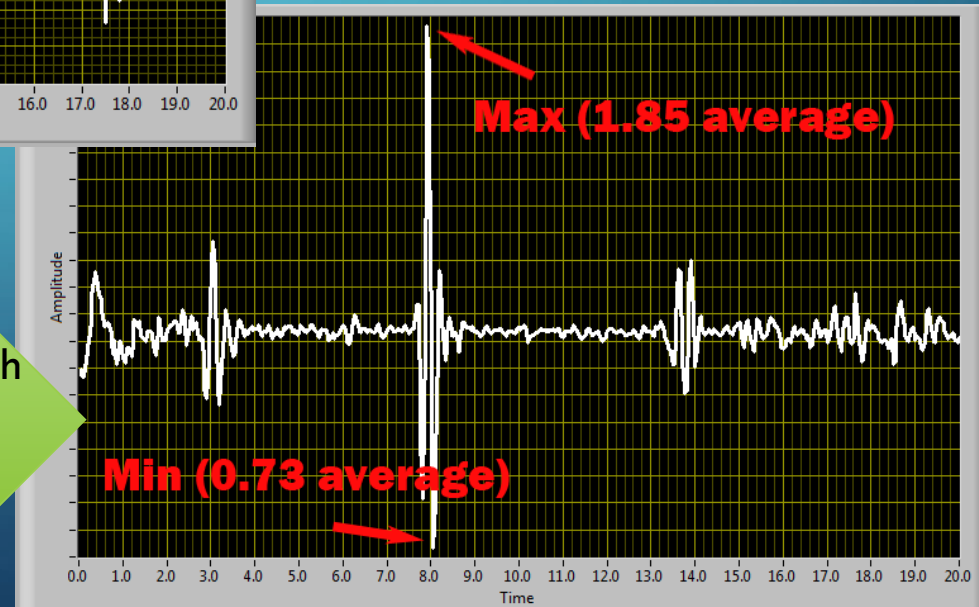


An example of good balance.

Standard deviation:

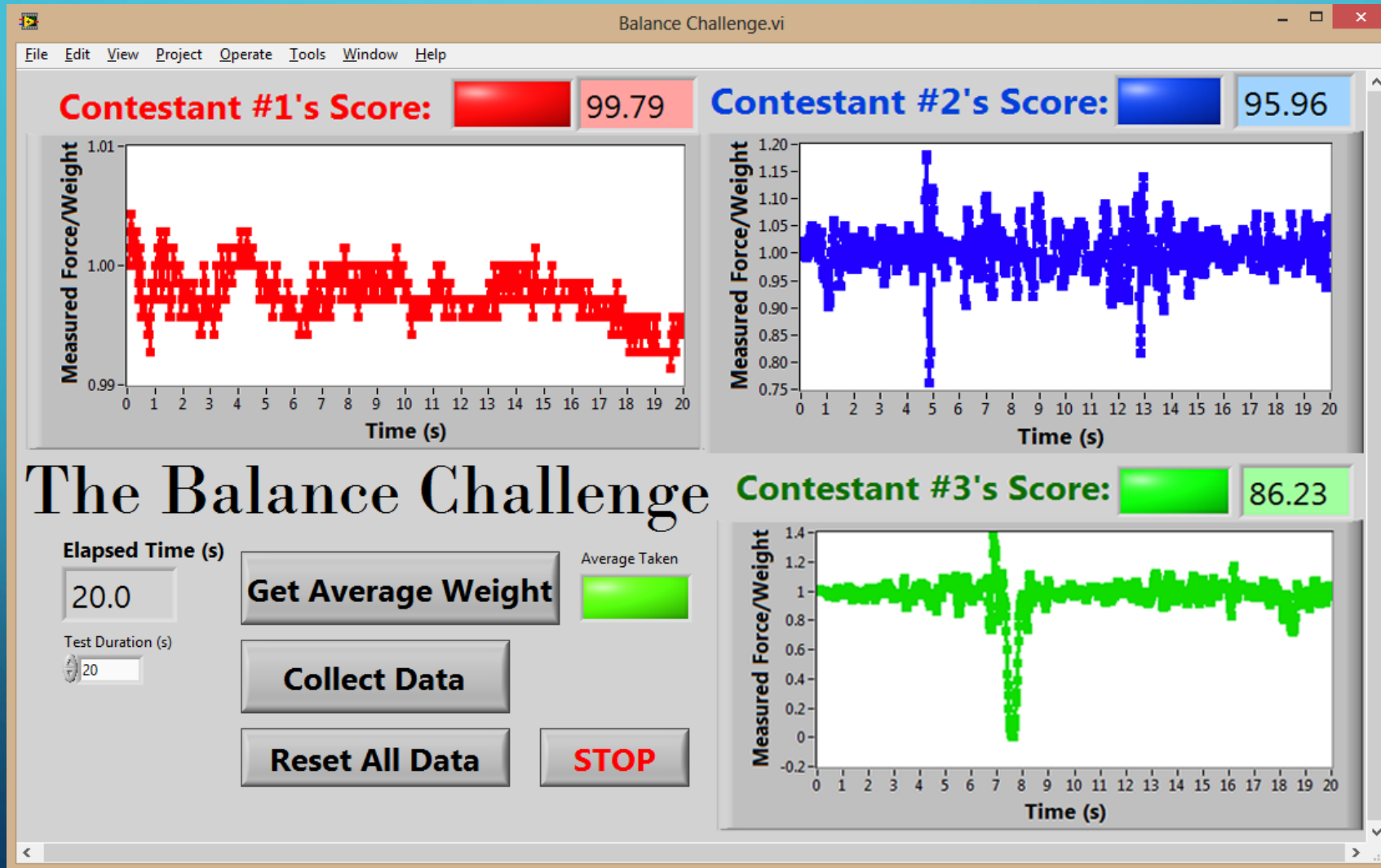
$$S_N = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{x})^2}$$

An example of poor balance. The graph adjusts for the max and min and hides the rest of the data.



BALANCE CHALLENGE

$$\text{Score} = \frac{\text{weight} - \sigma}{\text{weight}} \times 100\%$$

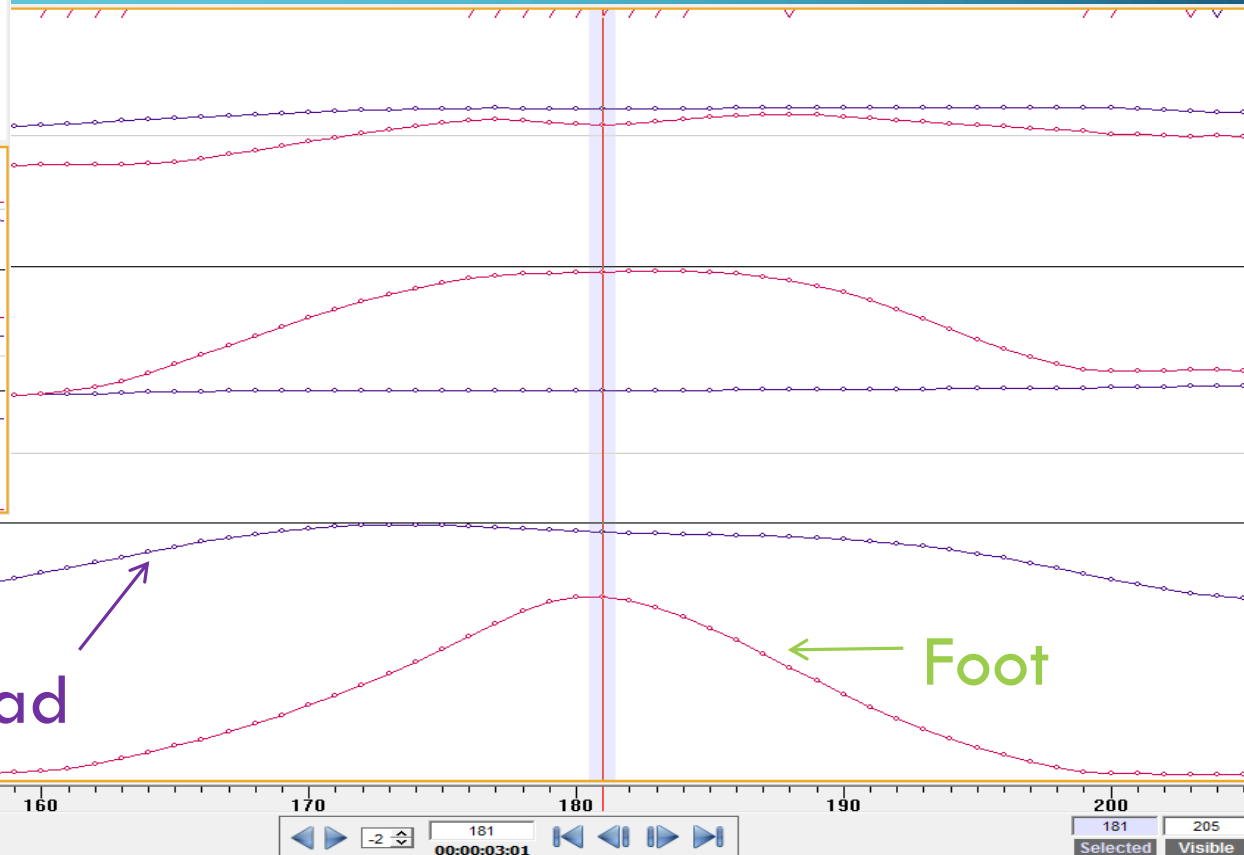
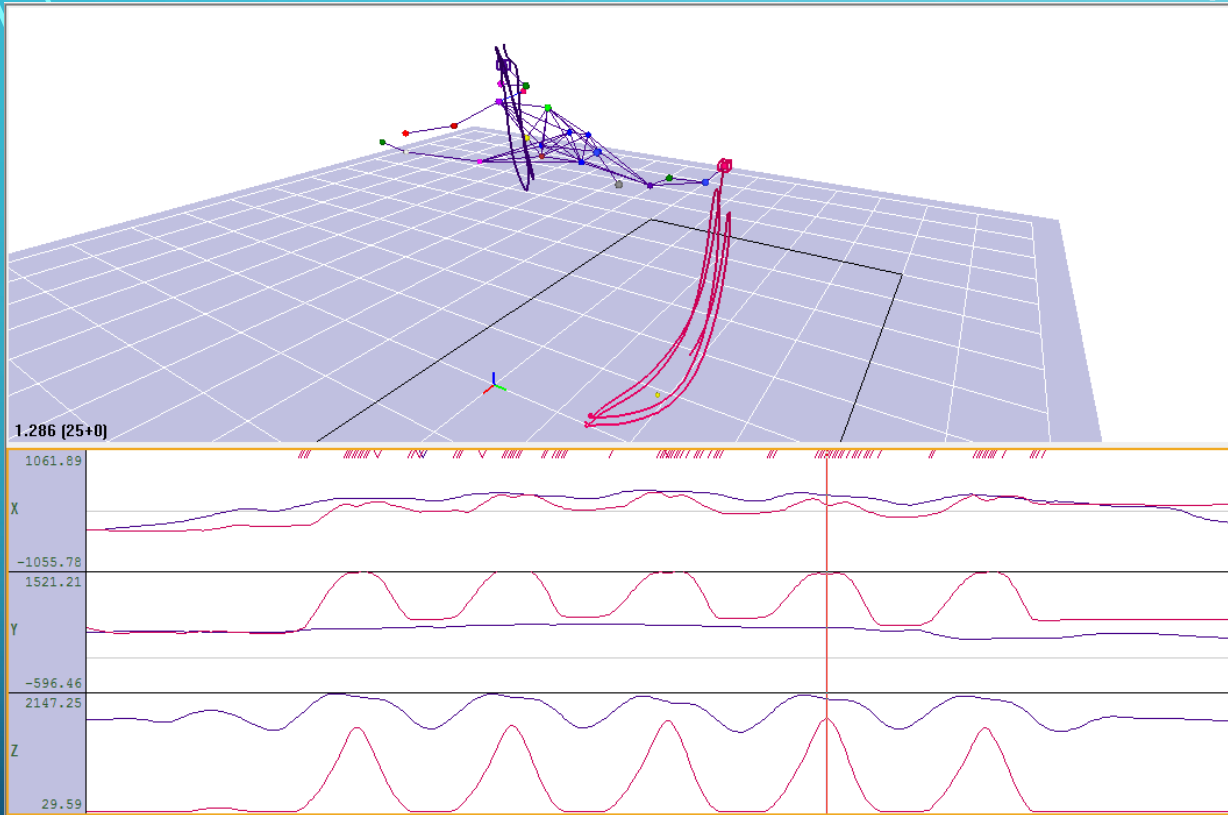


Balance Challenge En Pointe!



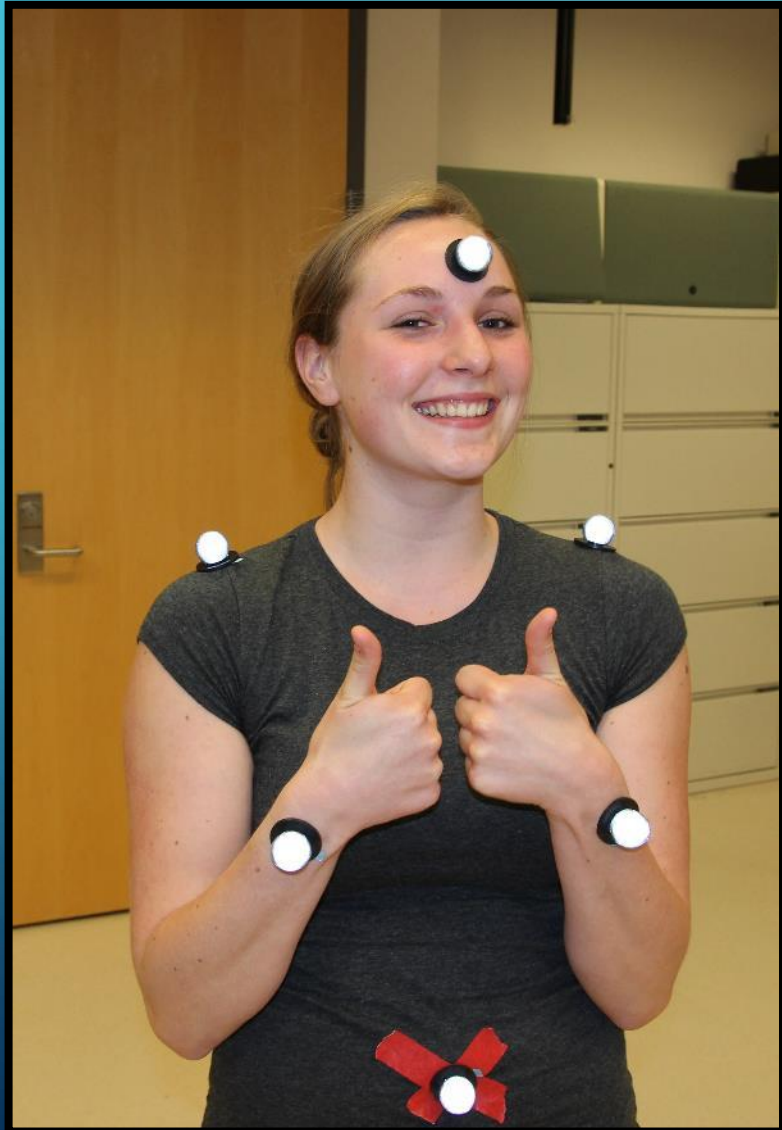
Toe Touches

Cortex- Motion Capture and Analysis



Toe Touches

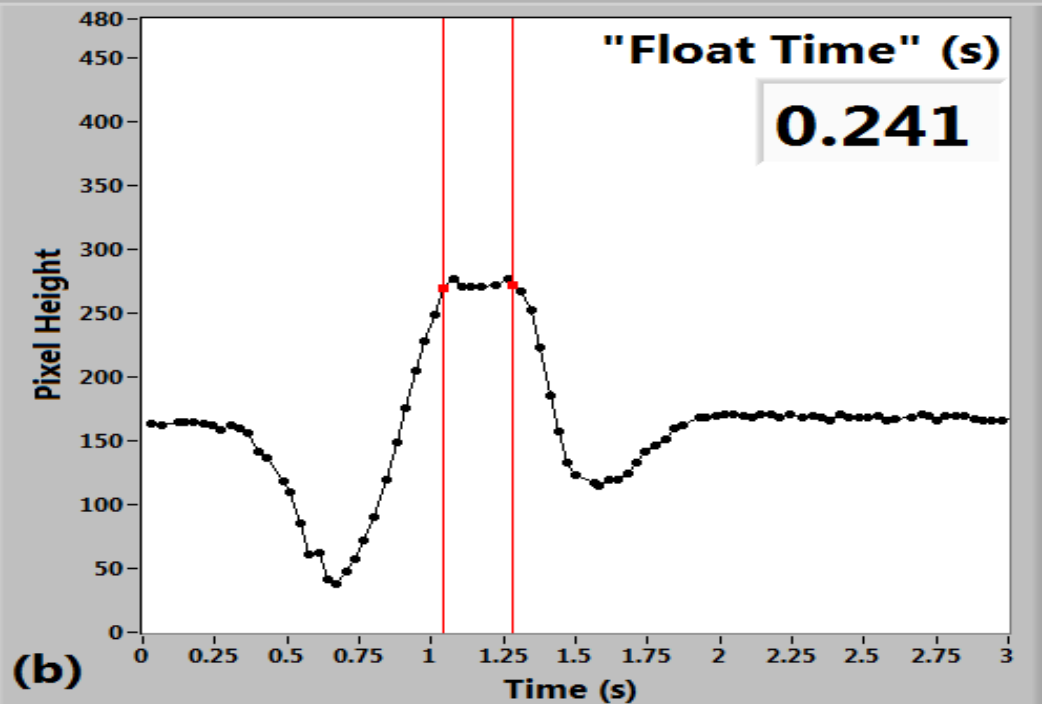
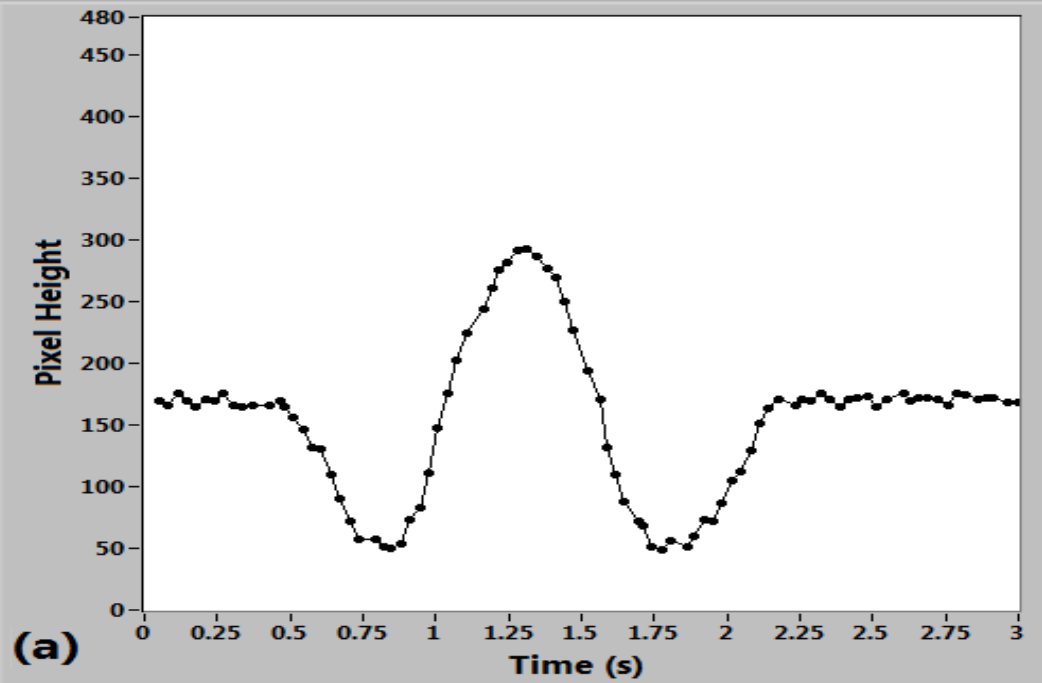
Cortex



LabVIEW

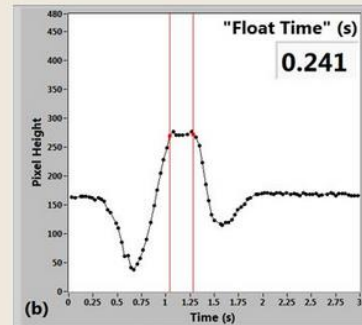
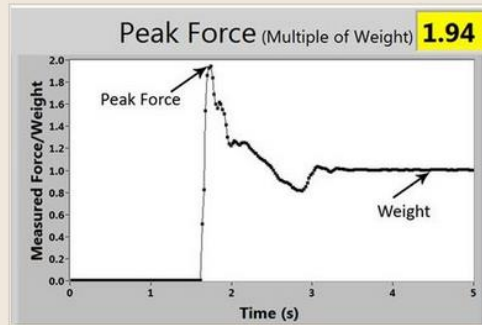


KINEMATICS





Motion Analysis



We developed three activities that allow students to connect with and quantitatively explore key physics principles from mechanics with three fun physical challenges. By presenting these activities as competitions students can be challenged to use what they know about the relevant physics to improve their performance and beat their own score or those of other students. Each activity uses an original, real-time data collecting program, which offers students and educators a simple, clear method to demonstrate various physics concepts including: (1) impulse-momentum, (2) center of mass (COM), and (3) kinematics. The user interface, written in LabVIEW, is intuitive to operate and only requires Vernier Force Plates, a Vernier LabQuest, a webcam, and a computer.

Resources

Kinematic activities (exe) (LabVIEW)

Presentations

OMSI Science Pub "The Physics of Ballet" Venetian theater Hillbore, OR (Sept. 30, 2013)

Thank You!

More information about the Science Outreach Society at

scienceoutreachsociety.weebly.com

Programs and more information available at

web.pdx.edu/~ralfw/motion-analysis.html