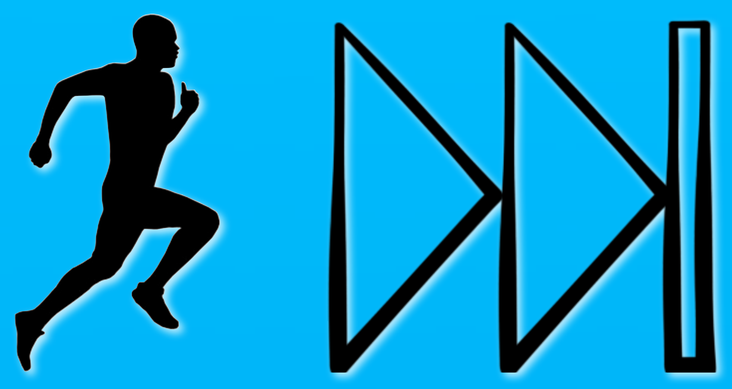
Running Gestures

hands-free interaction during physical activity

Skip to Skip



There are multiple gestures that users may perform while running, and these can be mapped to actions or controls of a system. For example, **skipping several times** may change the volume on a runner's headphones and **switching to sidestep** may answer a phone call.

The prototype presented here used individual skips to change the currently playing music track. A skip occurs when a runner makes **two one-footed jumps** instead of one full stride. The benefits of this gesture are that it does not directly involve the user's hands and does not require visual attention.

Hardware

Running Gestures uses data from an accelerometer attached to a strategic position on users' legs to detect gestures.

The prototype uses an accelerometer in a Nintendo Wii remote which is strapped securely in order to minimize noise.

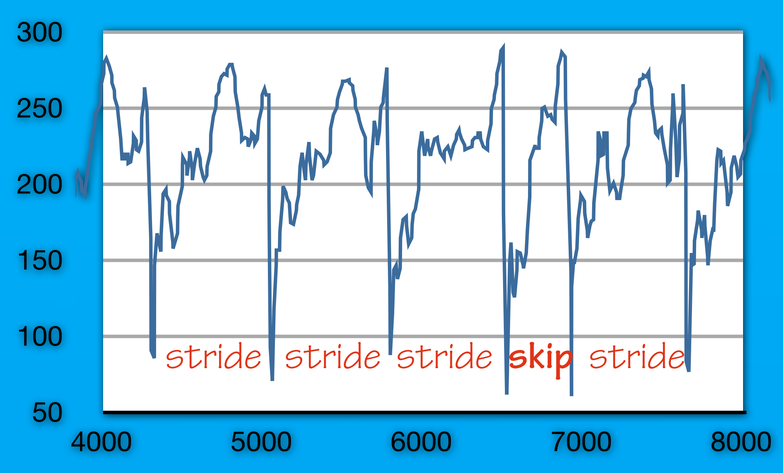
After trying several positions on the lower body, including the foot, the lower leg and the knee, the **exterior of the leg** was the location that yielded the least noise.

Software

The skip-detection algorithm works as follows. Y-values from the accelerometer are smoothed, then peaks are identified and the **time between adjacent peaks** is calculated. These times indicate how long it takes between foot strides.

The mode of the last 5 strides was shown to provide a good approximation for the ongoing step frequency. Skips are detected as steps that occur more rapidly than the main tempo.

A typical skip appears as a stride whose duration is between **50% to 85%** of the ongoing stride frequency.



Usability Testing

A within-subjects study was designed to compare users' performance under three conditions for changing music tracks. Recorded time between command being issued and successful track change.

Smartphone μ=10.03s

Changing tracks with a touchscreen phone is far slower than the other methods. Users commented that taking the phone out of their pocket was annoying, and that the interaction to change a track was difficult, requiring the user to turn the phone on, unlock it, tap the skip button and turn the phone off again.

Headphone Remote μ=3.14s

The headphone remote provided a much more compelling experience. Four participants, however, commented that it was hard to find the remote button because the motion of running caused the wire and their head to bob. Furthermore, having to move their hands up to their head distracted them from their exercise.

Running Gestures μ=2.70s

Six of the seven participants preferred Running Gestures to other methods of changing tracks. Participants reported that the skip gesture was fun and engaging and added variety to their running routine. In some cases, they found it difficult to coordinate a skip in the middle of the run.

Boris Smus – boris@borismus.com
M-ITI, University of Madeira
HCII, Carnegie Mellon University

Vassilis Kostakos – vassilis@cmu.edu
M-ITI, University of Madeira
HCII, Carnegie Mellon University

UNIVERSIDADE da MADEIRA
Carnegie Mellon