

Double-Push Tracks For Chad Hedrick And Barry Publow

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Introduction

While working on the "Fully-Efficient Skating Stroke" I introduced the *video Time-Track* which shows the skater's foot pattern in a manner similar to the older Ground Track. Here the object is to display the skater's sideways position vs. time rather than distance travelled. Because the method is both powerful and simple (if you have the right tools) it can be used to quickly form the track pattern for skaters whose skating motion is captured properly on video. As higher quality videos become available the method should become quantitative and definitive allowing a skater to quickly see how his/her skating pattern compares to the best.

Method And Results

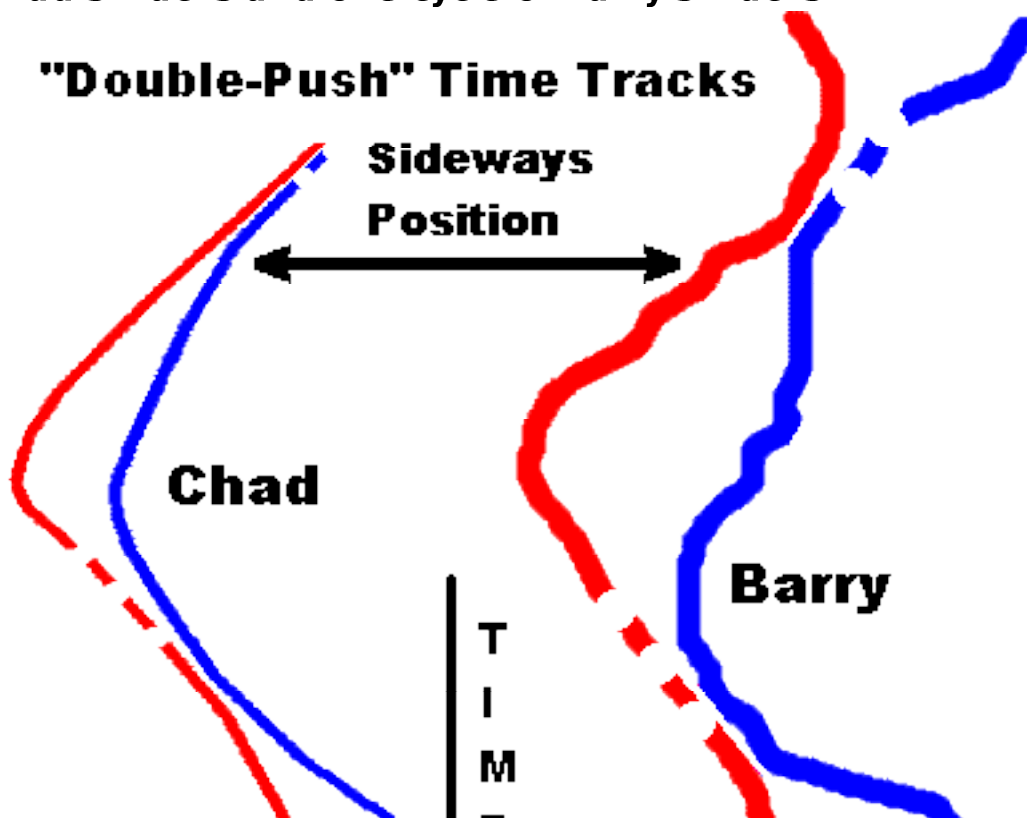
The first need is to capture the skater (especially his skates) on video which stores data in three dimensions (two space dimensions and one time dimension). Then one space dimension is removed to produce an image in one space dimension and one time dimension. To be quantitative the camera should be very stably aimed directly at the skater from the front (rear is nearly as good) to eliminate wobble and shaking which will jitter the final result. A video editor is then used to crop the video down to show only the skater's boots, frames, and wheels. This smaller video with still maybe hundreds of frames, is then exported to a single image in the form of a vertical filmstrip so that the frames fall one below the other with time increasing downward. This filmstrip can then be contrast-enhanced and compressed vertically so that the filmstrip is not so long and thin.

This technique was used first on a video clip of Chad Hedrick supplied by Kim Hendrikse and then on a video clip of Barry Publow which is available for free download on Barry Publow's website. I do not have permission to release the Hedrick video as it is believed to be copyrighted. The Hedrick video was commercially videotaped using a long zoom lens with Chad skating directly at the camera. The camera seemed to be nearly sitting on the ground which made for an excellent view of his skates. Unfortunately, pedestrians walking between Chad and the camera break up the video so I have only displayed one cycle (of one version) of his double-push technique. The Barry Publow video seems to have been

filmed from a pace-truck which maintained a constant distance from Barry. It is also surprisingly stable, remaining focussed on the same part of Barry from frame-to-frame.

The results are shown below with Chad on the left (same cycle repeated) and Barry on the right through a number of cycles.

In the time-tracks above there are some clear differences: Chad's tracks have a single dominant frequency and the left and right feet are closely in phase. Barry's tracks show considerable variability from cycle-to-cycle and there is some fine-structure near the center line which makes it difficult to define a single frequency for the strokes. This fine-structure appears purposeful but I do not know what its' purpose is except possibly to add some net "push" into the double-"push". Barry's two feet are in-phase for only a portion of the cycle. Below I have attempted to trace Chad's tracks and one cycle of Barry's tracks.





If you don't look too closely there is a general similarity between Chad and Barry but the fine-structure clearly distinguishes the two methods. It is possible that this fine structure appears when Barry raises his torso against gravity. This push against gravity does not appear to be part of Chad's technique.

Conclusions

The video time-track analysis is in its infancy now as only two short video clips have been examined so far. So it is probably premature to draw any sweeping conclusions as the clips might not be representative of the skater's preferred methods. However, these clips do raise some questions which need answering. I found the "Fully-Efficient Skating Stroke" to have sinusoidal-like strokes much like those shown here for Chad. So, if Chad is "Fully-Efficient" one wonders why the additional fine structure is needed. Chad's tracks were found to cross the center line corresponding to a constant state of net "pull" force whereas Barry seems to set his foot down nearly straight ahead at the center line leading to the intentional introduction of some net "push" force.

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