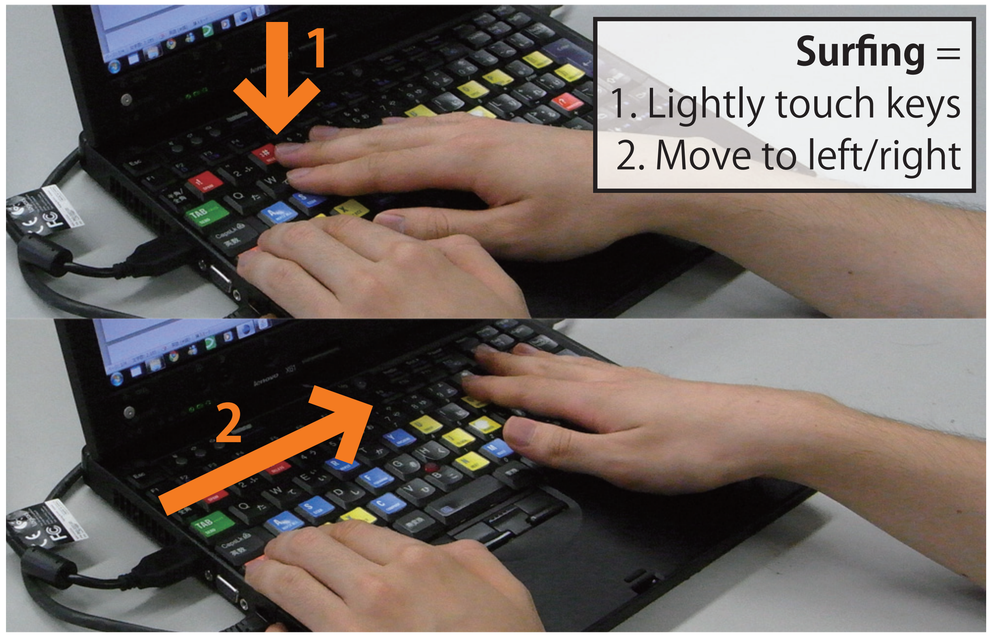
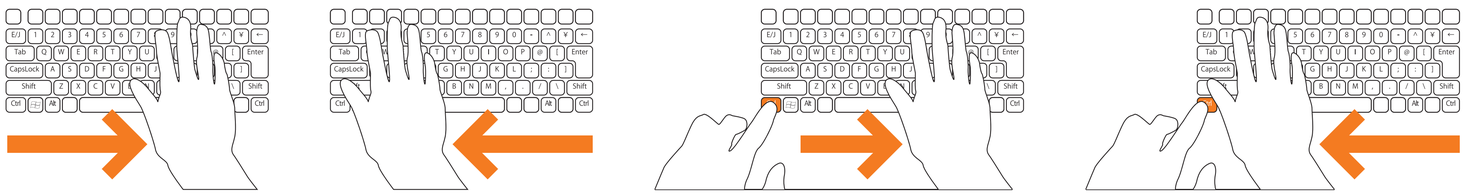
Surfboard: Keyboard with Microphone as a Low-cost Interactive Surface

Jun Kato[1,2], Daisuke Sakamoto[1], Takeo Igarashi[1,2]



Surfboard can detect simple gestures of “surfing”



Surfing from left to right

Go Foward

Surfing from right to left

Go Backward

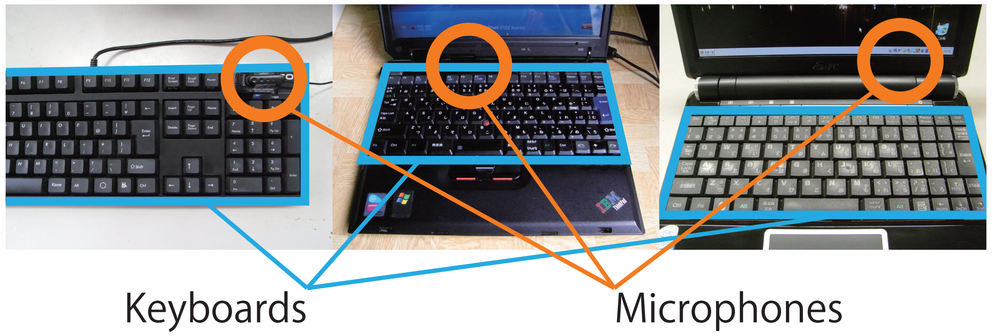
Surfing from left to right
+ Pressing [Control] key

Zoom In

Surfing from right to left
+ Pressing [Control] key

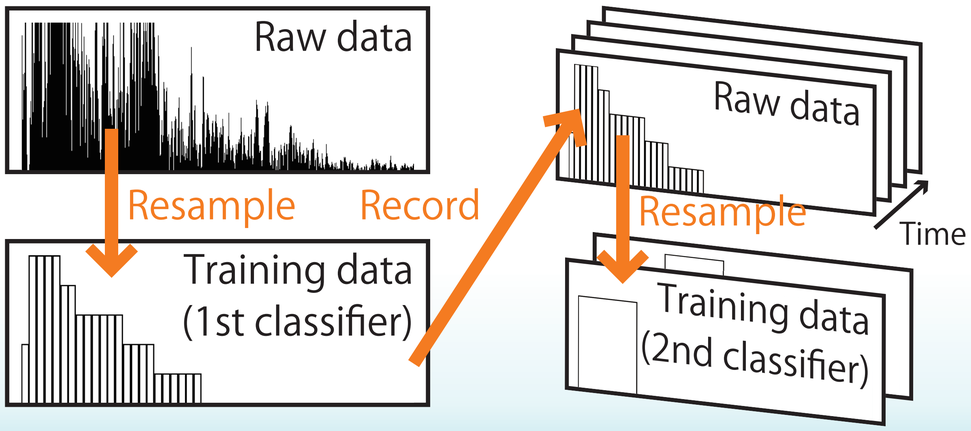
Zoom Out

“Surfing” gestures and example command bindings



on a standard keyboard with a microphone attached close to it

Our prototype implementation uses a monaural microphone attached close to the keyboard of a personal computer. It needs to be attached near the right or left edge of the keyboard to distinguish surfing direction effectively. Fortunately at present, many laptop computers are equipped with a microphone, and we confirmed at both a quiet office and a noisy cafeteria that Surfboard works with built-in microphones that can be located at several different positions as shown in the left figure.



by analyzing recorded sounds in real-time.

The user's surfing sounds on the keyboard are captured at a sampling rate of 44.1 kHz and processed with a Fast Fourier Transform function to get amplitude information by frequencies. Static ambient noise is recorded beforehand and is subtracted from the raw data. The process of surfing recognition consists of two phases of Naïve Bayes classification as shown in the left figure.

The first phase detects whether the user is surfing or not in real-time with resampled low resolution sound data. The second phase starts when the first classifier recognizes the current sound as surfing. Sound is recorded until the end of surfing is detected. At the end, all recorded data is resampled along the time axis to have normalized length which represents change in sound amplitude during surfing.

1) JST, ERATO, IGARASHI Design UI Project, 2) The University of Tokyo

Software will be available soon at **http://digitalmuseum.jp/en/software/surfboard/**