Supporting Information

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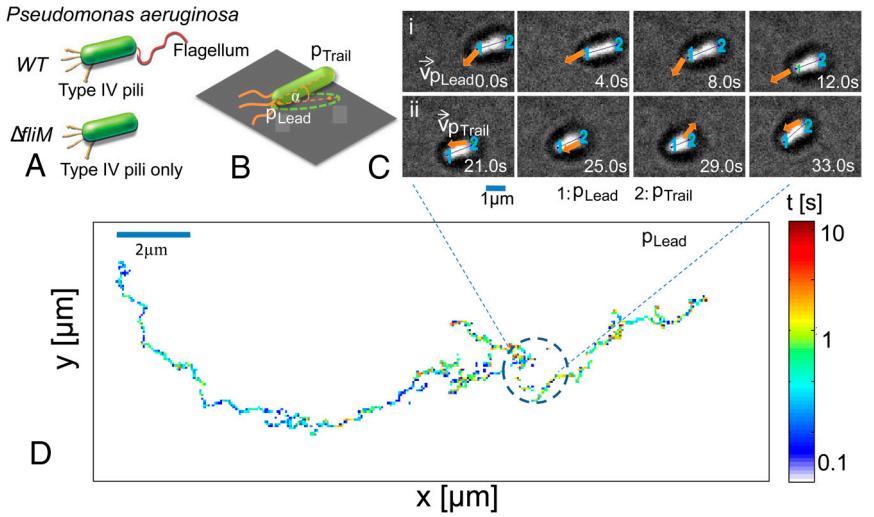


Fig. S1. Two-point tracking quantifies orientation of bacterium. (*A*) The wild-type strain WT possesses two types of motility appendages, multiple type-IV pili and a single flagellum, whereas the flagellum-deficient mutant Δ*fliM* can only move using pili. (*B*) Schematic of the two-point tracking method. An ellipse (indicated by the dashed circle) is fit to each image of a bacterium, and its two foci are identified as the leading pole (p_{Lead}) and the trailing pole (p_{Trail}). p_{Lead} is chosen to be nearest the point at which the bacterium attaches to the surface, and α is the angle between the bacterium and the surface, which is calculated from the distance $l = |p_{Lead} - p_{Trail}|$ between p_{Lead} and p_{Trail} and the maximum length of the bacterium L via $\alpha = \cos^{-1}(l/L)$. (*C*) Time-lapse images (acquired at an interval of 4.0 sec between images) of the Δ*fliM* mutant moving on a glass surface; (i) and (ii) show motion of the two poles p_{Lead} and p_{Trail}, respectively, and the orange arrows indicate the velocity vectors corresponding to each pole. (*D*) Trajectory of the leading pole p_{Lead} for a single Δ*fliM* bacterium, containing 12,000 points from a movie acquired at 10 frames per second. The color of each point indicates the time that the pole spends at this position, measured in seconds as indicated by the color bar.

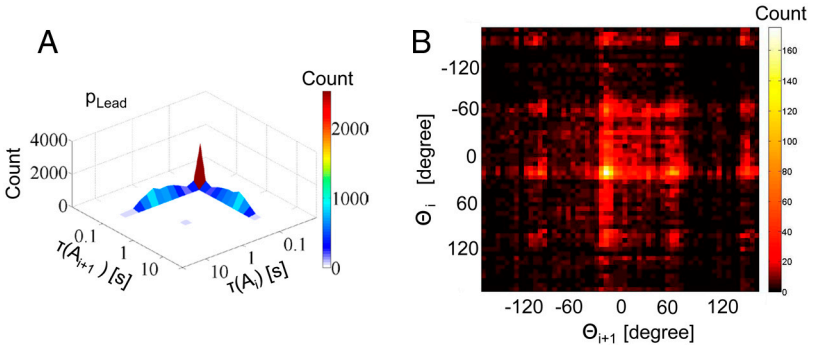
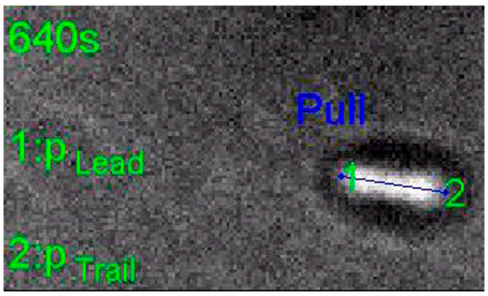


Fig. S2. Bacteria crawl by alternating release and pull actions. (*A*) Two-dimensional histogram of the durations of sequential actions (A_i and A_{i+1}) for the leading pole p_{Lead} of a single cell. Consistent with our hypothesis that the pull and release actions alternate, the histogram shows that when the duration of A_i is short and monodisperse, the duration of A_{i+1} is on average long and polydisperse; conversely, when the duration of A_i is long and polydisperse, the duration of A_{i+1} is on average short and monodisperse. (*B*) Two-dimensional histogram of the deviation angles for sequential actions of a single bacterium, θ_i and θ_{i+1}. The presence of well defined peaks suggests that the set of directional preferences of the cell are preserved in sequential actions. We hypothesize that these directional preferences are related to the directional distribution of TFP in individual cells.

Movie S1. Two-point tracking movie (0–700 sec) of a crawling bacterium (4.0 s interval between frames, playback speed: 10 fps). Symbols 1 and 2 represent the leading pole p_{Lead} and trailing pole p_{Trail}, respectively. All the positions of p_{Lead} and p_{Trail} shown in the movie are obtained from the linear regression analysis.

Movie S1 (AVI)



Movie S2. Two-point tracking movie (640–654 sec) of the pull and release actions (0.1 s interval between frames, playback speed: 10 fps). Symbols 1 and 2 represent the leading pole p_{Lead} and trailing pole p_{Trail}, respectively. All the positions of p_{Lead} and p_{Trail} shown in the movie are obtained from the linear regression analysis.

Movie S2 (AVI)