SUPPLEMENTARY MATERIAL

Recording phase
The subject sat with elbow and wrist resting on a table. In the start position, the hand was in a pinch position with the palm towards the table, aligned with the shoulder. The object was placed at a distance of ~30 cm, and an angle of ~0° between the sagittal plane of the object and the hand starting position. The subjects performed a movement at a natural speed to reach for and grasp an object with all digits, to position it 30 cm to the right, and return their hand to the start position (see Movie 1). Four solid objects (cylinder, trunk, sphere and cube) were used as targets of the grasping movement, with 2 different volumes. Subjects performed a total of 20 trials (4 objects X 5 trials). Mean subject hand length (the distance from the base of the hand at the wrist crease to the tip of the middle finger, measured along the long axis of the hand) was 19.07 ± 1.03 cm (n = 8), mean hand breadth to the thumb (the breadth of the hand, measured at the level of the metacarpal-phalangeal joint of the thumb) was 9.61 ± 0.79 cm (n = 8).

To record hand trajectory during each reach-and-grasp movement, we used a near infrared camera motion capture system (frame rate 100 Hz, Vicon; Oxford Metrics, Oxford, UK). Light-weight retro-reflective markers (21 of 4 mm diameter and 2 of 8 mm) were placed on the center of the nails, joints of all digits, the dorsal aspect of the hand, and the radial and ulnar styloid process (the 8 mm markers, see Movie 1 for examples of the marker positions). Nine recording cameras were positioned in a semicircle 1.5 - 3 m from the subject’s hand. The experimenter adjusted the camera parameters and calibrated the system before recording data to optimize accurate tracking of all markers. The spatial accuracy of the system was 0.15 mm in the x, y, and z planes. After data collection, each trial was individually checked for correct marker identification and then run through a low-pass Butterworth filter with a 5 Hz cut-off. Data processing and analysis were performed with custom software written in Matlab (Natick, MA). 3-D displacement was calculated from the wrist marker to derive tangential velocity of transport (arm velocity). Finger aperture was derived from the distance between the thumb and index finger markers. The reach-and-grasp action movies were clipped by applying a velocity threshold (3% of the peak velocity) to the marker placed on the wrist, defining movement initiation and termination. We recorded five movements for each object and subject, selecting the three sequences with the most reliable signals.

The 2D movies were sampled with 21 dots and for the main experiment (Figure 1 and 2 of the main text) those were linked by lines (for example see Movie 1 and 2). The dot-line movies were presented in forward and backward motion; the allocentric perspective of these movies was also rotated clockwise by 180° to obtain a simulation of an egocentric view movie (Figure 3a, flip condition)).

For the static displays, we selected the last frame of the movie or the frame corresponding to the maximum aperture between markers located on the nails of the
thumb and index finger. These frames were displayed for 250 or 500 ms, an exposure that allowed subjects to have a size discrimination performance in the range between 1 and 3 $d'$. 
Table 1 reports the major kinematic parameters of the 3D and projected movements in the two perspectives for the 4 different objects. The highlighted entries show the values that are significantly different between small and large objects, with p < 0.01. The dimension of size and velocity are given for the movie as they appear on the monitor. The 3D measures are scaled accordingly.
Supplementary movie legend

Movie 1: Example of the grasping action and the position of the marker on the hand.

Movie 2: Example of the 2D biological movie in the egocentric view for the reach-and-grasp of a cube. Each line of the hand was 1’ 33” thick and each dot was 32’ 30” in diameter. The mean dot-line hand length subtends 15°± 1° in width and 13°± 2° in height on the first frame. The luminance of the background was 20 cd/m², and the stimuli had a contrast of about 60%.

Movie 3: Example of the 2D biological movie in the allocentric view for the reach-and-grasp of a cube. Movie 2 and Movie 3 have been obtained from the same reach-and-grasp movement, using two different viewpoints.

Movie 4: Example of the 2D biological movie in the allocentric view for the reach-and-grasp of a trunk.