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  Linearization and diagonalization of arm kinematics in a binocular visual space

  Mapping from visual information to motor commands is an important issue in the study of voluntary arm movement. The joint kinematics of a human-like planar arm, which is generally described as a nonlinear function in a Cartesian coordinate system, can be approximately linearized in a binocular visual space. This relationship makes it possible to generate joint velocities from image observations using a constant linear mapping. This scheme is robust to calibration error, especially to camera turning, because it uses neither camera angles nor joint angles. I also present a musculoskeletal system in which the lengths of the biceps brachii and triceps brachii are in proportion to the distance and direction of the hand position from the head, respectively. In this system, shortening the biceps brachii allows the carrying of a grasped object to the head, while shortening the triceps brachii changes the hand position around the head. The diagonalization simplifies the role of the bi-articular muscles in the arm control.

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