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Anticipation in Purposive Behavior

While it is tempting to think of motor control as a mapping from sensors to effectors, this ignores both what the sensory-motor mappings tries to accomplish and what the sensors are trying to code. We do not see photons even though that is what our photoreceptors detect. Nor do we normally strive to contract muscles even though that is the function of the signals leaving our brain. Instead, we perceive a world around us and perform goal-directed actions on objects. Since the world is not stationary, such actions depend critically on an ability to anticipate the relevant states of the world as well as the consequences of our actions. To this end, sensory and motor information must be processed in a number of interacting time frames ranging from very short-term predictions that compensate for processing delays in the sensory system to an appreciation for the future consequences of actions. These ideas have been implemented in robots that show highly adaptive purposive behavior and and fast learning. The approach differs from both the classical and the reactive approach to robotics in that anticipatory models are short- term and local and result in shorter response times than is possible in a purely reactive system.