Chapter 7

Taking Action

Icebreaker: Controversial Touchdown

1. Locate NFL footage of a controversial football touchdown at NFL.com or YouTube.
2. Students will watch the play and the reactions of team members and referees.
3. Students will analyze the movements of the athlete and debate whether or not the play was accurate.
4. Students will discuss how the positions and movements of team members and referees on the field influence their perceptions of the play.

Chapter Objectives (1 of 2)

07.01 Understand the ecological approach to perception.

07.02 Describe the information people use to find their way when walking and driving.

07.03 Understand how the brain's "GPS" system creates cortical maps that help animals and people find their way.

07.04 Describe how carrying out simple physical actions depends on interactions between the sensory and motor components of the nervous system, combined with prediction.

Chapter Objectives (2 of 2)

07.05 Understand the physiology behind our ability to understand other people's actions.

07.06 Understand what is behind the idea that the purpose of perception is to enable us to interact with the environment.

07.07 Understand what it means to say that "prediction is everywhere."

07.08 Describe what an infant affordance is and how research has studied this phenomenon

The Ecological Approach to Perception

Approach developed by J. J. Gibson (began in the late 1950s)

- Gibson felt that traditional laboratory research on perception was:
  - Too artificial – observers were not allowed to move their heads.
  - Unable to provide an explanation for how pilots used environmental information to land airplanes

Optic flow: appearance of objects as the observer moves past them

- Gradient of flow: difference in flow as a function of distance from the observer
- Focus of expansion: point in distance where there is no flow

Self-Produced Information

Somersaulting

- Can be performed by learning a predetermined sequence of moves
- Thus, will performance be the same with and without vision?
- Bardy and Laurent found that expert gymnasts performed worse with their eyes closed.
  - They use vision to correct their trajectory.
  - Novice gymnasts do not show this effect.

The Senses Do Not Work in Isolation

Experiment by Lee and Aronson

- 13- to 16-month-old children placed in “swinging room”
  - In the room, the floor was stationary, but the walls and ceiling swung backward and forward.
  - The movement creates optic flow patterns.
- Children swayed back and forth in response to the flow patterns created in the room.

Adults show the same response as children when placed in the swinging room.

Results show that vision has a powerful effect on balance, and even overrides other senses that provide feedback about body placement and posture.

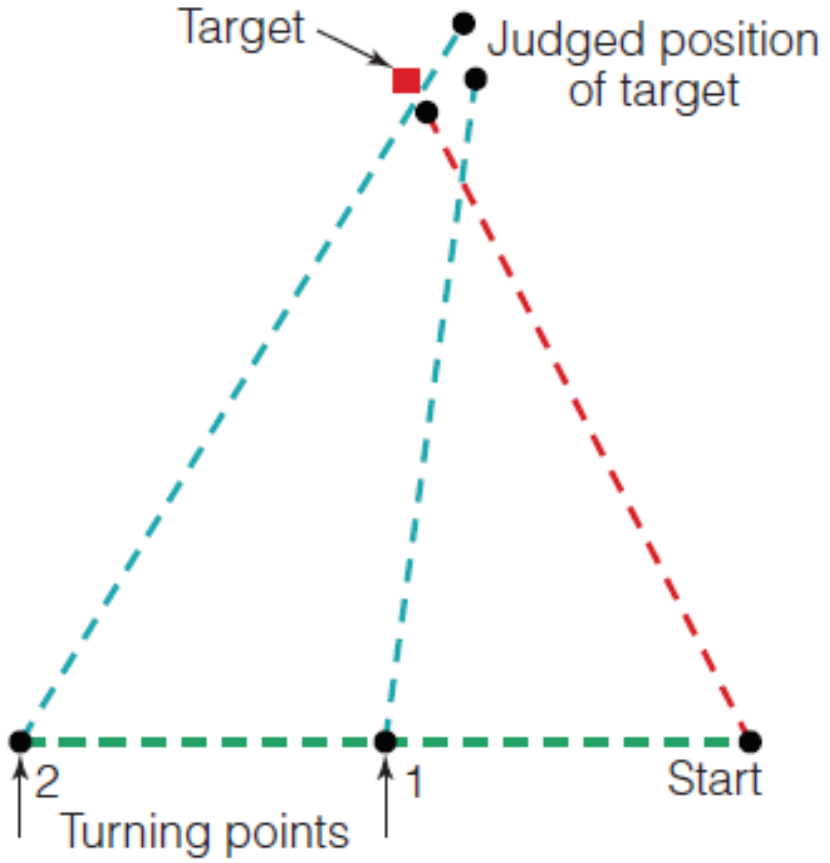
Walking (1 of 2)

Visual direction strategy: observers keep their body pointed toward a target

- Walkers correct when target drifts to left or right.

Blind walking experiments show that people can navigate without any visual stimulation from the environment.

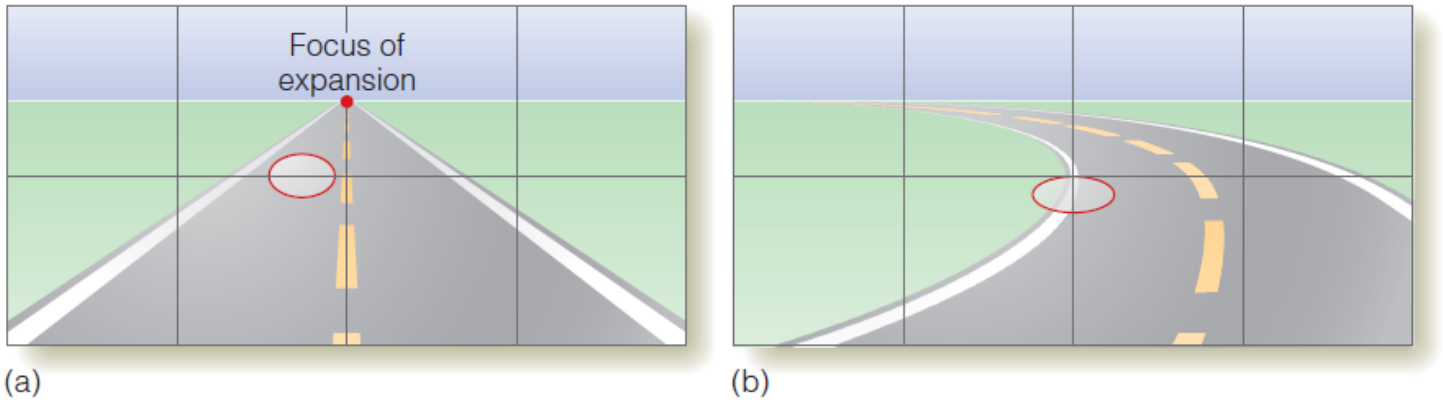
Walking (2 of 2)



Driving a Car

Experiment by Land and Lee

- Car fitted with instruments to measure:
  - Angle of steering wheel
  - Speed of vehicle
  - Direction of gaze of driver
- When driving straight, driver looks straight ahead, but not at focus of expansion.



Wayfinding (1 of 2)

Landmarks involved taking routes that require making turns.

Landmarks are objects on the route that serve as cues to indicate where to turn.

Experiment by Janzen and van Turennout

- Observers studied a film that moved through a “virtual museum.”
- They were told that they should be able to act as a guide within the museum.
- Exhibits appeared both at decision points where turns were necessary and at non-decision points.

Wayfinding (2 of 2)

Observers were given a recognition task while in an fMRI.

- They were presented with objects they had seen as exhibits, as well as ones they had not seen.

Results showed that the greatest activation for objects at decision points (landmarks) in the parahippocampal gyrus.

Tolman's experiments with a rat in a maze

- Rat created a cognitive map.

O'Keefe

- Place cells
- Place field

Moser and Moser

- Grid cells

Affordances – What Objects Are Used For

Gibson believed affordances of objects are made up of information that indicates for what an object is used.

- In other words, they indicate a “potential for action” as part of our perception.
- People with certain types of brain damage show that even though they may not be able to name objects, they can still describe how they are used or can pick them up and use them.

The Physiology of Reaching and Grasping

Dorsal and ventral pathways

- Identify the object (ventral).
- Position hand and fingers to grasp (dorsal).

Parietal reach region

- Fattori and colleagues (2010): monkey hand grip experiment

(a) Perceive cup (b) Reach for cup (c) Grasp cup

Mirroring Others' Actions in the Brain

Mirror neurons in the cortex of monkeys respond when a monkey grasps an object *and* when an experimenter grasps an object.

- Response to the observed action "mirrors" the response of actually grasping.
- There is a diminished response if an object is grasped by a tool (such as pliers).

Possible functions of mirror neurons:

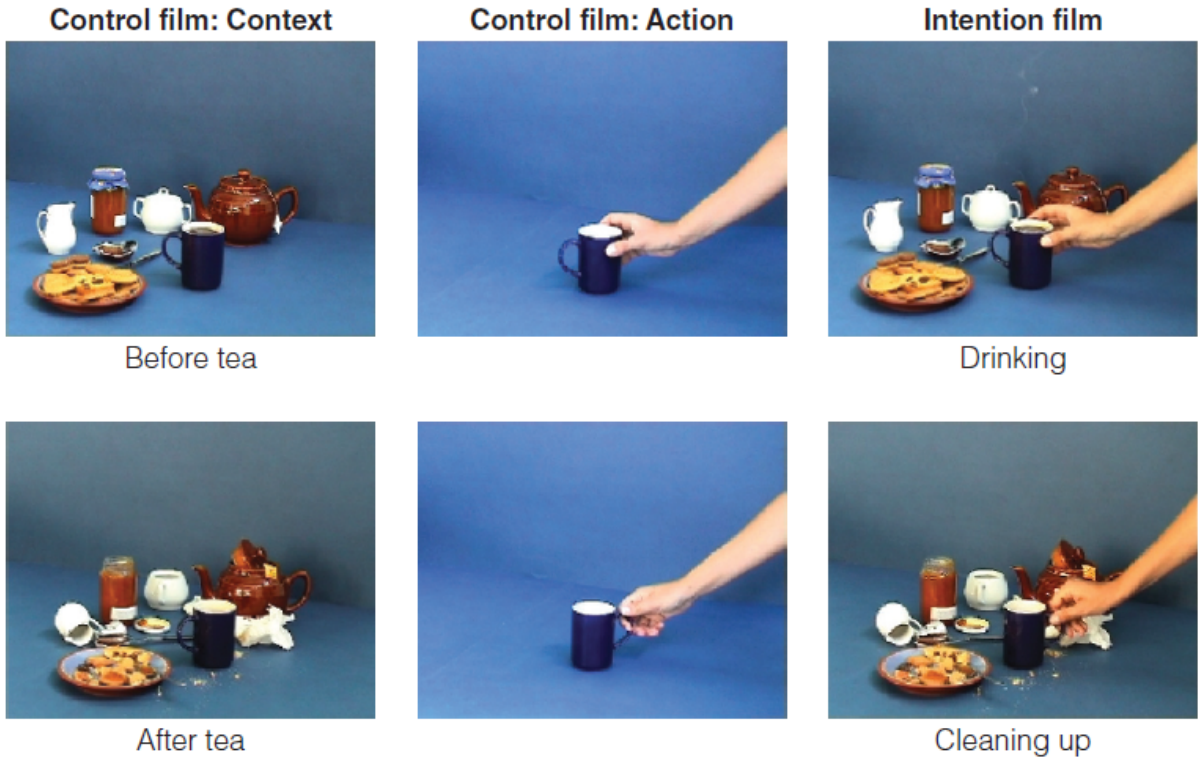
- To help understand another animal's actions and react to them appropriately
- To help imitate the observed action

Audiovisual mirror neurons respond to action and the accompanying sound.

Mirror neurons may help link sensory perceptions and motor actions.

Predicting People's Intentions

Iacoboni (2005): Mirror neurons can be influenced by different intentions.



Action-Based Accounts of Perception

Traditional approach to perception

- Purpose of perception is to create a mental representation of something in the environment

Action-based approach to perception

- Purpose of perception is to guide actions in the environment, enabling survival

Imitating Actions

Capacity to imitate seems present from birth

Meltzoff (1995)

- Successful demonstration group
- Unsuccessful demonstration group
- Control group

Chapter Summary (1 of 2)

Now that the lesson has ended, you should have learned how to:

- Understand the ecological approach to perception.
- Describe the information people use to find their way when walking and driving.
- Understand how the brain's "GPS" system creates cortical maps that help animals and people find their way.
- Describe how carrying out simple physical actions depends on interactions between the sensory and motor components of the nervous system, combined with prediction.

Chapter Summary (2 of 2)

- Understand the physiology behind our ability to understand other people's actions.
- Understand what is behind the idea that the purpose of perception is to enable us to interact with the environment.
- Understand what it means to say that "prediction is everywhere."
- Describe what an infant affordance is and how research has studied this phenomenon.