Unit 4 Sensation and Perception -- Team Problem Solving Assignments

1. **Dark Adaptation Project**

Problem

You may have seen road construction projects taking place during night hours. Use your knowledge about vision, and particularly about dark adaptation, to make recommendations to the highway department for the lighting that should be used around these construction sites.

1. What kind of lighting do you typically see at these road construction sites? Consider different characteristics of the light, such as intensity and wavelength. Think about the advantages and disadvantages of this type of lighting.

2. What kind of lighting would be optimal for these construction sites? Consider the goals of the lighting in terms of maximizing both worker safety and the ability of the workers to complete the construction.

3. Think about the ability of drivers to see and react to workers. Based on Signal Detection Theory, analyze the situation in terms of hits, misses, false alarms, and correct rejections.

Report

Prepare a brief recommendation to the highway department. Your recommendation should include the following:

1. An analysis of the current lighting that is typically used, highlighting potential problems for worker safety and the ability to complete the construction. Use the terminology of Signal Detection Theory as part of your description of potential problems.

2. A set of recommendations for improving the type of lighting that would be used. Explain the reasoning for each recommendation you make.

2. **Visual Pathways Project**

Problem

Design a series of questions that could be asked about the nature of a person's visual perception problems that could help identify the area that might be damaged.

Examples of visual perception problems:

Complete loss of vision – one eye

Complete loss of vision – both eyes

Loss of vision on the right side of the body

Loss of vision on the left side of the body

Loss of color vision

Blurred vision

Loss of night vision

Loss of peripheral vision

Loss of ability to perceive motion

Loss of ability to recognize objects

1. Think about how to determine whether the problem is occurring in the eyes or in the brain.

2. If the problem is in the eyes, think about how to determine whether it is an optical problem or a neural problem. If it is a neural problem, how can you determine what neurons on the retina might be affected?

3. If the problem is in the brain, think about how to determine whether it is in the What (Ventral) pathway or the How (Dorsal) pathway, and then how to narrow down the particular area that is most likely to be affected.

Report

Prepare a list of questions that satisfies the requirements described above. For each question, indicate what each different answer would suggest.

3. **Object Perception Project**

Problem

A new form of space travel will allow astronauts to explore planets in other solar systems. NASA is concerned about the ability of astronauts to correctly perceive the environments on these alien planets. Your job is to design a brief guide that can be used to help astronauts evaluate their perceptions when they are exploring these planets.

1. Consider the importance of top-down processing. How will you educate the astronauts on how top-down processing may affect their perceptions on a different planet?

2. To what extent will Gestalt strategies be helpful or harmful in terms of correctly perceiving objects and patterns?

3. Obviously it will be important to correctly segregate figure and ground. What cues should the astronauts look for to help with figure-ground segregation?

Report

Develop a one-page training guide for astronauts. Be prepared to summarize this for the class.

1. Start with a brief explanation for the astronauts of why their perceptions may be inaccurate.

2. Address each of the three areas above, using specific information from the textbook about object perception.

3. You may also include advice on any additional issues that might be helpful for this task.

4. **Color Perception Project**

Problem

Emergency vehicles such as ambulances and fire trucks should be easily visible in a variety of lighting conditions. Your assignment is to develop recommendations on what color (or colors) should be used for emergency vehicles.

1. Consider the colors that are presently used for emergency vehicles. What do you think are the reasons that those colors are used? What are their advantages and disadvantages?

2. How can the color of an emergency vehicle make a difference? Use specific concepts about color perception from the textbook.

3. What factors can affect how easy it is to see various colors?

Report

Prepare a brief recommendation that could be submitted to a city council, ambulance district, or other agency. Be prepared to summarize your recommendations for the class. Your recommendation should include the following:

1. Advantages and disadvantages of the colors that are currently used.

2. Recommendations for colors that should be used.

3. Advantages and disadvantages of your recommended colors.

5. **Motion Perception Project**

Problem

Suppose an engineering team is trying to design a device that can be used by individuals with motion agnosia to help them navigate their environments. (Developing this device could also help improve the navigation abilities of robots.) You are hired as a consultant to provide advice on the types of information that this motion detector device will need to be able to process.

1. Consider the ways in which we rely on motion perception in our daily lives.

2. Consider the types of information that are needed in order to perceive motion correctly.

Report

Prepare a one-page list of the types of information that the motion detector device will need to be able to detect and analyze. For each type of information, indicate why this information is needed to help the person in daily life. Be prepared to summarize this for the class.

6. **Hearing Project**

Problem

The Senior Center in your community has invited you to give a presentation on age-related hearing loss. Your job is to develop a short presentation about presbycusis.

1. Review the material from the textbook about the structure of the cochlea and think about the physiological reasons for presbycusis.

2. Think about what senior citizens would want to know about presbycusis and about how it might affect their daily lives.

3. Think of questions that you might ask about presbycusis if you were in the audience.

Report

Prepare an outline of your presentation (you will not actually make the presentation). Be prepared to report to the class on the content that your presentation would include.

1. Explain what presbycusis is and what the effects of it are.

2. Explain the physiological basis for presbycusis.

3. Prepare a list of questions that your audience might ask and what your answers would be

7. Auditory Perception Project

Problem

It is important for drivers (and pedestrians) to be able to hear emergency vehicles and to identify their locations. Think about situations where you could not see an emergency vehicle but you heard a siren, and you had to figure out where it was coming from so that you would know what to do (e.g., pull over to the side of the road). Your task is to develop recommendations for sirens on emergency vehicles.

1. Review the material from the textbook about pitch perception. How is the pitch of the siren important in helping people detect and identify it?

2. Consider what you have learned about sound localization. How can this be applied to locating the source of a siren?

3. Also consider the material on auditory scene analysis. How could people perceptually group sound information coming from the same vehicle?

Report

Prepare a brief recommendation that could be submitted to a city council, ambulance district, or other agency. Be prepared to summarize your recommendation for the class. Your recommendation should include the following:

1. Your recommendations for the sirens in terms of frequency, intensity, timbre, timing, and any other factors that you think are relevant.

2. A justification for each aspect of your recommendations. The justification should refer to specific material about pitch perception, sound localization, and scene analysis.

8. **Cutaneous Senses Project**

Problem

Your task is to develop a list of consequences for the loss of cutaneous senses.

1. What are the consequences for a loss of ability to process touch information (pressure, texture, vibration)?

2. What are the consequences for a loss of ability to sense temperature?

3. What are the consequences for a loss of ability to sense pain?

4. What do these consequences suggest about how evolutionary pressures may have influenced the development of the cutaneous senses?

Report

Prepare a brief report outlining your responses to the four questions listed above. Be prepared to summarize your responses for the class.

9. **Taste Project**

Problem

How can knowledge about the sense of taste be useful in the food industry? For this project, you will develop a list of concepts about taste that professional chefs should know.

1. Review the material in the textbook about taste receptors, the taste pathway, and the perception of flavor.

2. Also consider what you know about the sense of smell. What concepts about smell would be important for a chef to understand?

3. Consider differences between people in the perception of taste (e.g., supertasters). How could this information be useful to a professional chef?

Report

Prepare a list of concepts that could be included in a lesson on taste perception for professional chefs. Be prepared to summarize your list for the class.

1. List specific concepts that would be helpful.

2. For each concept, summarize the main point or points you would make about how it would be useful for chefs.