NIP2 Task 2: Disaster Relief Robot

WGU Introduction to Artificial Intelligence - C951

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**A. Describe the disaster recovery environment you chose and the two obstacles you have added to the environment.**

The imaginary disaster recovery environment I chose is a room in a structurally unstable and damaged building after a highly destructive earthquake. Grey cylinders represent the room’s parameters or walls, black cylinders represent immovable building debris caused by the earthquake, and a red cylinder represents a trapped person. The disaster relief robot’s mission is to use its sensors to navigate around the building debris and search for a trapped person.

**B. Explain how the robot will improve disaster recovery in the environment from part A after you have added the two obstacles from part A.**

After a destructive earthquake, a damaged building can be extremely unstable and dangerous for humans to enter. Using a disaster recovery robot to search for survivors will limit the risks emergency personnel are exposed to. This would also help ensure emergency personnel are deployed to prioritized areas with survivors, instead of potentially searching areas that do not have any people.

**C. Justify the modifications you made to CoppeliaSim’s robot architecture, including two sensors you chose to add, and explain how these sensors will aid the disaster recovery effort.**

My disaster relief robot is modeled after CoppeliaSim’s BubbleRob tutorial robot. The robot has two sensors. The first sensor is colored red and serves as a proximity sensor. This allows the robot to change directions if the proximity sensor senses an object in the way of the robot. The second sensor is colored blue and serves as an identifying sensor. In this case, the second sensor is set to turn green and display the output “person detected!”, if it senses a person. Both sensors have had their range extended and angle widened, so each sensor can sense farther, taller, and wider than originally set. By adding these sensors, the robot can navigate and search independently, freeing up valuable human resources for other areas of the disaster recovery effort.

**D. Describe how the robot maintains an internal representation of the environment.**

My disaster relief robot has two sensors, one of which serves as a proximity sensor. The robot starts by moving forward until the proximity sensor is triggered by an object. Once triggered, the robot stops, slowly backs up in a slight curve, and then moves forward again until the proximity sensor is triggered again. This proximity sensor allows the robot to move independently from humans.

**E. Explain how the robot implements the following four concepts to achieve its goal:**

**• Reasoning:** My disaster relief robot uses its proximity sensor and identifying sensor to navigate and analyze the environment it is in. The proximity sensor can detect if an object is in the way of the robot. If the proximity sensor is triggered, then the robot stops and changes direction to avoid the object. The identifying sensor can be set to identify specific objects. In the case of attempting to find trapped people in a building after a highly destructive earthquake, the identifying sensor is set to trigger if it senses a person. If it does sense a person, the sensor is set to change colors to green and produce an output of “person detected!” until the person is no longer in the sensor’s range.

**• Knowledge Representation:** My disaster relief robot uses its two sensors for knowledge representation. The proximity sensor can detect if the robot needs to change directions due to an object being in its path. The identifying sensor can detect specific objects. In this example, my disaster relief robot’s identifying sensor is set to trigger if it senses a person.

**• Uncertainty:** Due to my disaster relief robot’s relatively simple design, it can deal with uncertainty well. This is due to both sensors being binary in nature. The proximity sensor detects whether an object is or is not in the way of the robot’s path, while the identifying sensor detects whether an object is in this case, a person or not. In other words, the robot uses its sensors to detect whether something simply “is” or “is not”, leaving no room for uncertainty.

**• Intelligence:** Similar to how my disaster relief robot responds to uncertainty, due to its relatively simple design, as long as it is deployed in a proper environment, it will be able to act relative to its design, in an intelligent manner. This is due to being able to use its proximity sensor to navigate around obstacles, and its identifying sensor to detect specific objects. In contrast, if deployed in an improper environment, for example, a body of water, the robot would not be able to act intelligently due to not being designed to move in water.

**F. Explain how the prototype could be further improved, including how reinforced learning and advanced search algorithms can improve the prototype’s performance and learning.**

My disaster relief robot prototype could be improved in multiple ways, including using reinforced learning, as well as advanced search algorithms. The robot could use reinforced learning to optimize its movement. The robot could be penalized if it repeatedly ran into the same object, while it could be rewarded if it “remembered” where the object was, and was able to avoid it. Another way to improve the robot prototype would be to use advanced search algorithms to improve the identifying sensor in both detail and efficiency. For example, with advanced search algorithms, the robot’s identifying sensor could be improved to not only detect a person but could identify additional information, such as the person’s approximate age and vital signs.

**G. Submit the robot code that you created.**

Please see the attached zipped file named “C951 PA Task 2 BubbleRob” included with this submission.

**H. Provide a Panopto video recording that describes the robot and demonstrates its functionalities to stakeholders who are nonpractitioners and include each of the following:**

Visit: <https://wgu.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=584c9d0a-2eaf-43ba-b3bb-b0c200110817>

**I. Acknowledge sources, using in-text citations and references, for content that is quoted, paraphrased, or summarized.**

No outside sources were quoted, paraphrased, or summarized.