

# Finding the Optimal Combination of Touch, Color, and Infrared Sensors To Navigate a Robot Explorer Through Simulated Space-Like Conditions

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While humans can see, smell, hear, touch, and taste to help us understand the world around us, robots must use different sensors to interpret their environment and navigate and avoid obstacles. Sensors allow robots to accomplish tasks such as maneuvering around an array of obstacles (touch), detecting beacons to follow (infrared), or following a path by recognizing different colors. The goal of this project was to explore the function and efficiency of different sensor attachments on LEGO EV3 robot prototypes. By creating obstacle courses with different tasks and programming commands for the robot to follow, I gathered data on how the color, touch, and infrared sensors help the prototype function. Reproducibility was measured by the time (in seconds) it took the robot to perform its task. The touch sensor had the best precision, followed by the color and then the infrared sensor. The robot was then tested for completing tasks outside on an icy course. Efficiency was measured by whether the robot with sensors could complete the task. The EXPLOR3R prototype with wheels could not function on the slippery icy surface, so I switched to a tractor-type ICEXPLOR3R prototype. My conclusions are that sensors can be combined to complete distinct tasks at different stages of the obstacle course. The optimal combinations depend on the environment and task being performed. Sensors can guide robots through an obstacle course, however, the ability of the sensors to determine efficiency depends on the environment and design of the prototype. These simulations will provide data to find the best prototype and combination of different sensors to perform in an unfamiliar environment such as unknown planets in space or underwater.

## Awards Won:

Fondazione Bruno Kessler: Award to participate in summer school "Web Valley"