Gesture Recognition Utilizing Infrared Sensors

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This project utilizes infrared sensors in conjunction with a mobile robotic platform to recognize, interpret, and respond to human gestures. The robot captures input from its mounted infrared camera, filters the data through binarization of the raw image and further processing, and is fed into a convolutional neural network which is used for classification of user-defined gestures. Additionally, the robot utilizes a tracking algorithm and a corresponding Raspberry Pi controlled stepper motor which keeps the user centered in frame regardless of their location in the robot-relative environment.

The current design features a dynamic library which can be used to assign any user-defined gesture as a command for the robot. The robot currently moves in response to commands, but with further programming can be used in conjunction with any connected device.

We envision this project having applications in aiding physically-disabled individuals with the specific goal being to help improve the quality of life for these individuals and allow them to perform day-to-day tasks without the assistance of others. With modifications to our current design, the technology could also be used for Department of Defense applications as well as integrated systems in the consumer market to control smart-home devices such as lighting, HVAC control, and home security products.

Keywords: Infrared, Gesture Recognition, Neural Network