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Requirements

1. The vehicle contains a rear proximity sensor array, which continuously emits a signal or is put into a binary ‘detection’ state if an object is detected within 1 meter distance of the sensors. These sensors are installed on the rear lower vehicle exterior, face parallel with the vehicle, are spaced 6 inches apart each, and enough sensors are contained in the array to fill the entire rear linear surface area.
    a. This assumes a communication connection exists between the sensor array and a centralized control system of the vehicle.
2. While the vehicle is in reverse mode and the proximity sensor array is in an object detection state at any point, an emergency stop procedure is activated. The emergency stop procedure signals to the throttle control system to prevent any further reverse movement, and the brakes are applied automatically to halt existing movement.
    a. The emergency stop procedure requires a standard throttle control system to allow for automated braking and the prevention of reverse acceleration.
3. The vehicle contains a 4K resolution, 180-degree FOV, “backup” camera installed in the center rear vehicle exterior to provide reverse visibility.
    a. The camera assumes a communication connection with sufficient bandwidth to the centralized control system of the vehicle.
4. The vehicle contains a visual display interface adjacent to the driver’s seat, installed on the front interior dashboard. While in reverse mode, the interface will always display the backup camera data stream.
    a. This assumes the interior vehicle design has the capacity to house the visual display interface. As well as a centralized control system to interrupt the display with the camera datastream whenever the vehicle is put into reverse mode.

Global Invariants

- If the proximity sensor array detects an object within the specified range, reverse movement will always be halted and prevented.
- The backup camera data stream will always be displayed on the visual display interface while the vehicle is in reverse mode.
- The system must ensure the mitigation of false positives with respect to the emergency stop procedure and the object detection system.

Sources of Uncertainty

- The reliability of the proximity sensor array object detection with respect to their placement configuration. What if the object is too small or comes at the moving vehicle from an unexpected

side angle? Object detection may fail with these edge cases, thus potentially failing to prevent injury.

- In the event of poor weather conditions (snow, slush, dust, rain, etc.) obstructing the proximity sensor array, the driver may be prevented from reversing at all due to the emergency stop procedure. This would cause irritation to the driver, thus failing the secondary requirement.