A Warning System Based on Sensor Technology and Chemical Analysis to Detect Distracted Driving

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Over 1,100 people in the U.S. are either injured or die from distracted driving crashes everyday. Distractions can be visual (eyes off road), manual (hands off wheel), or cognitive (mind off driving). Safety devices in vehicles today are based on reducing collisions through external sensors (distance to car ahead, blind spot indicator, reversing camera). This project was aimed at using sensors and chemical analysis to develop a holistic, self-contained system, capable of detecting and warning against distracted driving behaviors inside the vehicle. A device consisting of ultrasonic sensors to monitor head movement, accelerometers to determine cell-phone usage, a decibel meter to detect sound levels, and an alcohol sensor to measure the presence of alcohol or other volatiles (cannabinoids) was built, and incorporated into the headrest of a car. Chemical sensor information was compared with Fourier Transform Infrared Spectroscopy analysis for completeness and establishing a lower detection limit on volatiles. Since cannabis legalization poses additional risk on the road, theoretical calculations on viable concentrations were performed on the efficacy to detect cannabis with FTIR in a vehicle. Sensors were calibrated and strategically placed in the headrest, triggers were programmed for suspected distracted behaviors, and auditory warnings were subsequently administered. When the above elements were combined, the system was successfully able to detect distracted driving and serve as an effective interrupter to the behavior (much like the seatbelt sensors alert drivers). This project is an active and novel step towards providing a platform capable of actively assessing and warning against distracted driving.

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