HazeGuard: Advanced Safety Glasses for Enhanced Safety in Haze Weather Conditions

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Haze affects the worst in terms of health, safety, and visibility. Low visibility conditions in haze increase the risk of road accidents. According to the American Federal Highway Administration (FHWA), over 38,700 vehicle crashes occur in fog and haze annually in the US, resulting in over 600 deaths and more than 16,300 injuries, which were worsened by PM2.5 haze particles, causing serious vision problems after long exposure. Current approaches such as smart glasses for the blind, which aim to improve navigation only address some challenges while costing up to $6,000, are not applicable to haze, which is more life-threatening. Our project aims to develop advanced safety glasses with four main systems: a traffic warning unit, customized impermeable safety glasses, polarised lens engineering, and an Air Quality Index (AQI) unit with fundamentals using the HB100 Doppler Sensor, which emits frequencies of 10.15 GHz tested through the spectrum analyzer. By applying the SEFR model, our system can classify detected motion based on frequency emission (Accuracy=0.976). The results show that the mechanism alerts drivers statistically extremely significant to avoid collisions ($p<0.0001$). HazeGuard protects the eyes from hazardous air particles by using yellow polarised lenses, since our studies show yellow increases visibility the most in haze. The AQI unit achieved a significant result of 93.544% accuracy using the Spearmen Rank Analysis ($p>0.005$) compared to professional readings. Overall, this project aims to assist users in navigating through haze, providing early warnings of dangers, increasing visibility whilst protecting the eyes, and greatly enhancing safety in haze.

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