

Conference Abstract

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Current state of Safety Tracking and Race Monitoring Devices in Cycling

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Abstract

Recent race incidents in professional road cycling have renewed concerns regarding rider safety, with multiple high-profile crashes resulting in severe or long-term injuries. Data from ProCyclingStats show an increased frequency in reported rider injuries over the past years¹. These trends coincide with rising average race speeds, denser peloton dynamics, and increasingly complex road infrastructures, all of which contribute to elevated crash risk and more serious injury outcomes. As a result, the demand for effective technological solutions that support real-time monitoring, rapid incident detection, and coordinated race response has intensified.

In response, several safety tracking and race monitoring systems have been introduced in

recent years, aiming to improve situational awareness for race organizers and enhance post-incident response times. However, despite notable technological progress, the current ecosystem of cycling safety trackers presents significant limitations that hinder widespread adoption and operational effectiveness. This abstract outlines the current landscape of safety tracking technologies in cycling, highlighting technical challenges, deployment constraints, and gaps relative to the practical demands of race environments.

One of the primary challenges is coverage reliability. Professional cycling races frequently traverse remote, rural, or mountainous regions where cellular connectivity is unstable or absent. Continuous, low-latency data transmission remains difficult to guarantee in such environments, limiting



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the effectiveness of real-time monitoring and automated alerting systems. Closely related is the issue of reliable crash or event detection. Many existing race monitoring solutions including systems developed by Live Insiders, 3BO, Swiss Timing and GeoDynamics prioritize rider positioning and performance-related data . While valuable for race management and broadcast applications, these systems are not primarily designed for robust incident detection, often relying on indirect indicators such as abrupt speed changes or signal loss, which can generate false positives or missed events.

Hardware design represents another critical consideration. Safety tracking devices must be unobtrusive, lightweight, and ergonomically integrated into existing equipment to avoid interfering with rider performance or comfort. Feedback from professional riders has consistently emphasized the importance of minimizing additional physical or cognitive burden during competition. Pilot testing conducted in collaboration with teams such as Soudal-Quick-Step underscored the necessity of incorporating cyclist feedback early in the

design and validation process, particularly with regard to wearability, device placement, and perceived intrusiveness.

Finally, technical and operational requirements from race organizers play a decisive role in system viability. Solutions must integrate seamlessly with existing race infrastructure, comply with regulatory constraints, and offer clear value in terms of safety decision-making and emergency response coordination. Without standardized requirements and interoperable frameworks, the deployment of safety tracking technologies risks remaining fragmented and inconsistent across events.

In conclusion, while current safety tracking and race monitoring devices represent an important step toward improving rider safety in professional cycling, substantial gaps remain in coverage reliability, incident detection accuracy, hardware integration, and organizational alignment. Addressing these challenges will be essential to realizing the full potential of in-race safety technologies and reducing the human cost of competitive cycling.