

# Movement optimization training tool

## XR-supported movement optimization with real-time feedback

### Invention

Success in different types of sports often depends on the correct performance of movement patterns that must be learned by repeating them over long periods of time until the brain can call them up even in stress situations. To optimize their movements, athletes need feedback on them. That is the only way that errors can be corrected and the right movement learned.



So far, this feedback has been given only after a delay (discussed with a coach or provided with video analysis, for example). This delay makes it hard to immediately develop a feel for the right movement and internalize it. Immediate feedback is especially important if a series of movements is to be learned as quickly and precisely as possible. This technology can increase both effectiveness and efficiency, providing real-time feedback with an extended-reality (XR) approach. The movement is tracked with motion-capture technologies and can be shown in real time with XR technology and an ideal movement (in the form of an avatar, for instance) programmed ahead of time. Feedback on deviations and so on can be output visually (XR goggles with superimposed instructions, for instance) and tactilely (by such means as vibration motors) to prevent incorrect movements from being trained.



### Commercial Opportunities

The system can be used wherever movements must be performed correctly in order to achieve success and avoid such hazards as overloading and the resultant injuries arising from incorrect movements. This can be achieved both for athletic activities with complex movements (dancing, Nordic walking, golf) and in rehabilitation and prevention so that skills can be learned or regained. For the future, use in production procedures (correct performance of work processes) and e-learning are conceivable.

### Current Status

Prototypes of the system have already been implemented for individual movements, and the system is being refined as part of a German Federal Ministry of Education and Research (BMBF) project. On behalf of the German Sport University Cologne, we are offering the technology for cooperation projects and commercial licenses.

### Relevant Publications

A patent application for potential protection in the PCT area has been submitted for the technology upon which the German Sport University Cologne's invention is based. System integration into movement training has been proposed as part of an international publication.

Geisen, M. & Klatt, p. (2021). Real-time feedback using extended reality: A current overview and further integration into sports. *Journal of Sports Science & Coaching*. <https://doi.org/10.1177/17479541211051006>

An invention of German Sport University Cologne.

### Competitive Advantages

- Learn to perform complex movements correctly
- Real-time feedback
- Visual/tactile feedback
- Avoid incorrect performance
- Can be adapted to a number of movements and types of sports
- Suitable for rehabilitation and prevention

### Technology

#### Readiness Level

1 2 3 4 5 6 7 8 9

System prototype demonstration in operational environment

### Industries

- Medical technology
- Sports and e-learning

### Ref. No.

5975

### Contact

Dr.-Ing. Oliver Kower  
E-Mail: [ok@provendis.info](mailto:ok@provendis.info)  
Phone: +49(0)208-94105-61

