Trackstar

Trackingsystem for Blind Elite Sprinters

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Introduction: Para-sprinters with visual impairments participate in competitions such as 100-meter races with a guide. They are necessary to lead the sprinters on the track. However, guides are not available for every training session. This results in athletes not being able to fully tap into their potential and train at their maximum speed. The present work deals with the evaluation of various technologies for tracking and feedback. A prototype for a tracking system is presented. The goal of this system is to capture the position of the sprinters within the lane and provide the athlete with appropriate feedback. This is intended to assist the sprinters in their training, enhance their running performance, and boost their sense of security. The application area focuses on the 100-meter sprint.

Approach / Technology: Various technologies such as laser distance sensors and computer vision for tracking, wireless data transmission using radio modules, feedback mechanisms through vibrations and acoustic signals, as well as suitable microcontrollers for information processing were evaluated and tested for potential prototype deployment. Based on the results of these tests, the corresponding technologies were selected for the prototype and subsequently developed and evaluated.

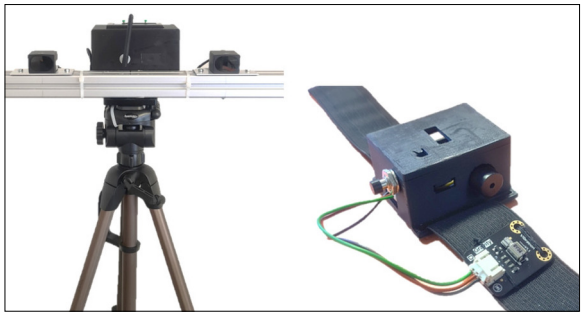
The created prototype utilizes laser distance sensors for tracking the sprinters. The feedback mechanisms of the prototype encompass vibration motors and piezo speakers, which are attached to the sprinters' wrists in the form of bracelets. Minor deviations on the track are communicated to the sprinter through vibrations, while more significant deviations additionally trigger an acoustic signal. Arduino microcontrollers are employed for data processing, which process the sensor signals and wirelessly transmit the feedback to the bracelets. The wireless data transmission remains stable over a distance of more than 100 meters.

Result: The developed prototype underwent a practical test with visually impaired elite athletes, trainers, and guides. Using the feedback signals, they were able to independently complete runs. The feedback from the test subjects was predominantly positive. Insights gained from the points of criticism led to adjustments of the system and a list of potential improvements for future developments. The practical test demonstrates that the prototype, in its current form, can already be successfully used for straightforward applications, though enhancements and further developments are meaningful.

Following the practical test, several adjustments were made to the prototype and potential improvements and developments were documented. For instance, the system could benefit from additional distance lasers for more precise position tracking. Simplifying the alignment of the base station and enhancing the comfort of the feedback bracelets are also considerations. Furthermore, extending the application to other sports, such as long jump, is conceivable.

Practical test with a blind sprinter at the Olympic Training Center in Freiburg (D)
Own presentment

Basestation with measurement system (left) and wristband for feedback (right).
Own presentment



Prototype system overview.
Own presentment