



ViennaFES | Cybersport Day 2025

...a FES-Cycling race for people with paralysis

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Background

A **spinal cord injury (SCI)** causing complete lower limb paralysis leads to musculoskeletal degradation, including muscle atrophy and bone loss.

Functional electrical stimulation (FES) uses electrical pulses to activate paralyzed muscles. When used regularly, it can lead to improvements thus promoting the overall fitness.

FES-Cycling is a particularly appealing training modality, as it combines therapeutic benefits with sportive and recreational value.



International competitions

Competitions trigger innovation

FES-Cycling is becoming increasingly popular, also in the context of competitions.

Comparable international competitions

- The **Cyathlon** is a large international event, held every four years similar to the Olympic Games. Unfortunately, the last two editions (2020 & 2024) featured only stationary races on home trainers.
- The **Lyon Cyberdays** are cycling races held during a public cycling event with an accompanying sports fair. Participants had to complete five laps on a set course, with time recorded. Each rider had two attempts, with only the best time counting.



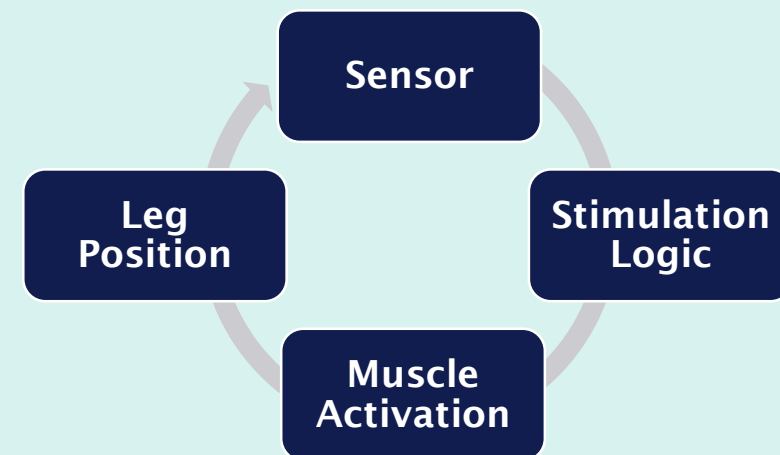
What is FES-Cycling?

... paralysed muscles under current

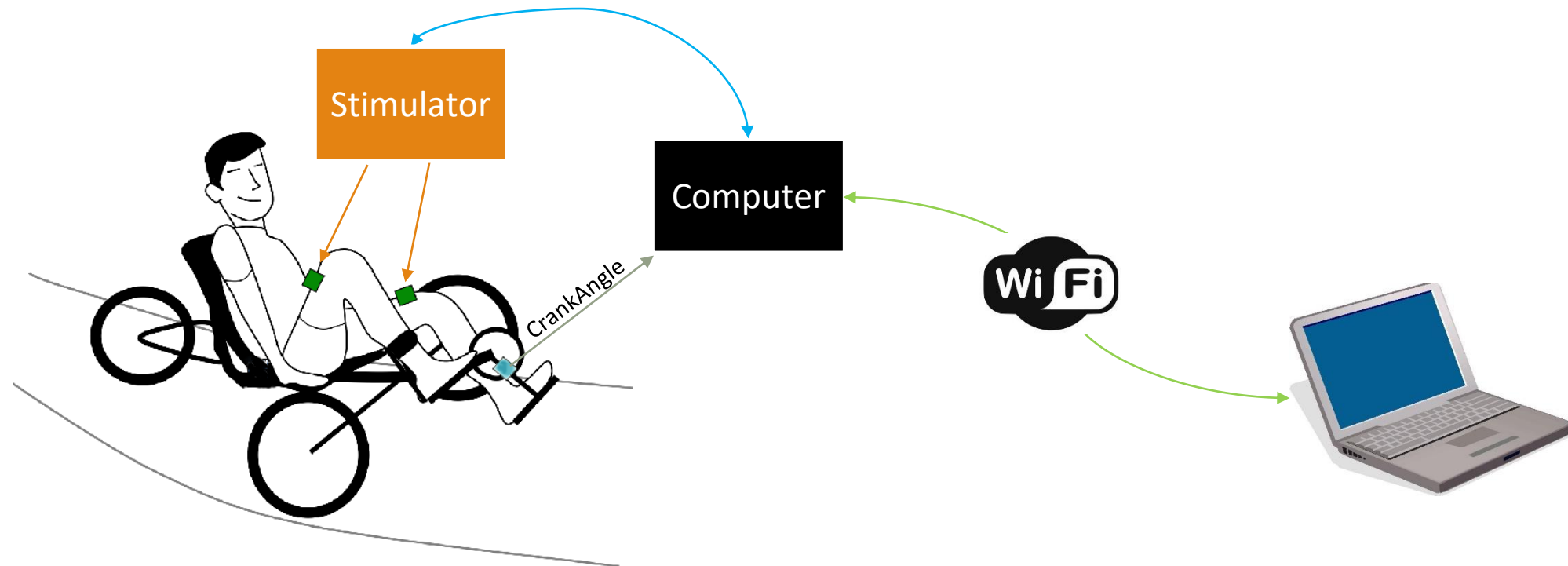


FES-Cycling

- Functional Electrical Stimulation (FES)
- Artificial activation of **paralysed** muscles
- Timing is key
- Estimation of the current position of the legs (Sensor)



FES-Cycling



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To raise awareness for people with disabilities and to demonstrate current advances in the field of assistive technologies, we are organising a **FES-Cycling race** within the frame of the <15th International Vienna Workshop on FES>

Pilots are invited to compete in a **400 meter** midrange race on a flat asphalt track.

Criteria

- Motor-complete paralysis of the legs
- Cycling device must exclusively powered by FES-controlled paralysed legs



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Specifications:

Race location (GPS):	N48.219576, E16.344883
Track length:	133.33 m
Number of Laps:	3
Total race length:	400 m
Type of race:	Head-on-head race (2 pilots)
Race mode:	Qualification: Best out of 3 races Finals: Knock-out-races
Track material:	Asphalt
Track profile:	Mostly flat with slight inclines and declines ($< \pm 1\%$)
Time limit:	5 min
Min. required average speed:	5.5 km/h
Starting area:	10 m
Max. speed at Start:	5 km/h



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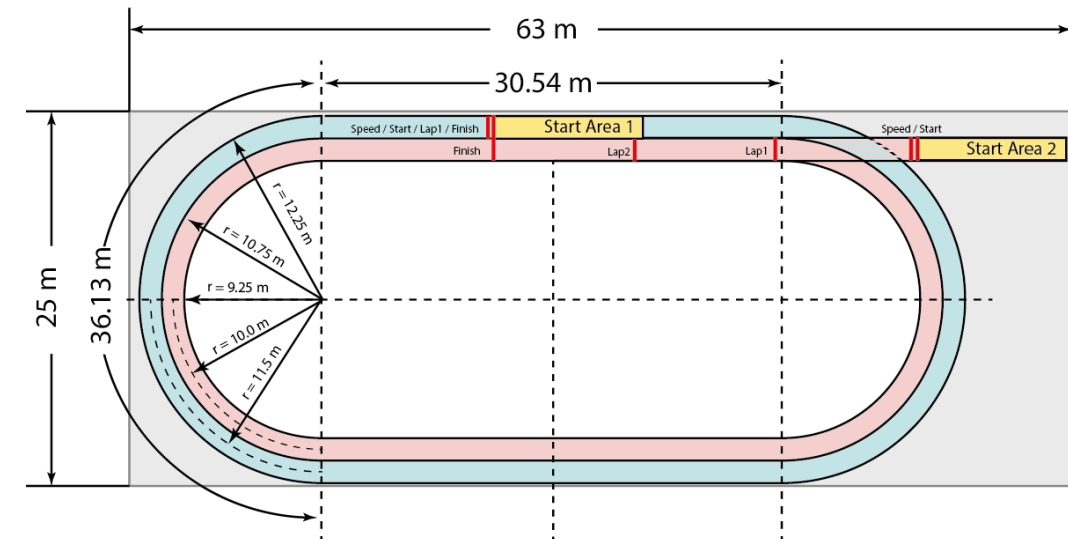
Starting procedure

The race begins from standstill. Within a designated **start area**, the pilots may use their legs, hands, arms, or trunk to initiate movement.

Race

After a clear audible signal, pilots can begin the starting procedure. They must leave the starting area within 30 seconds. The START line must be crossed at a low speed (max. 5 km/h).

Each pilot completes 3 laps within a 5-minute time limit. Timing starts when the first wheel crosses the START line and ends when the first wheel crosses the FINISH line or when time runs out.

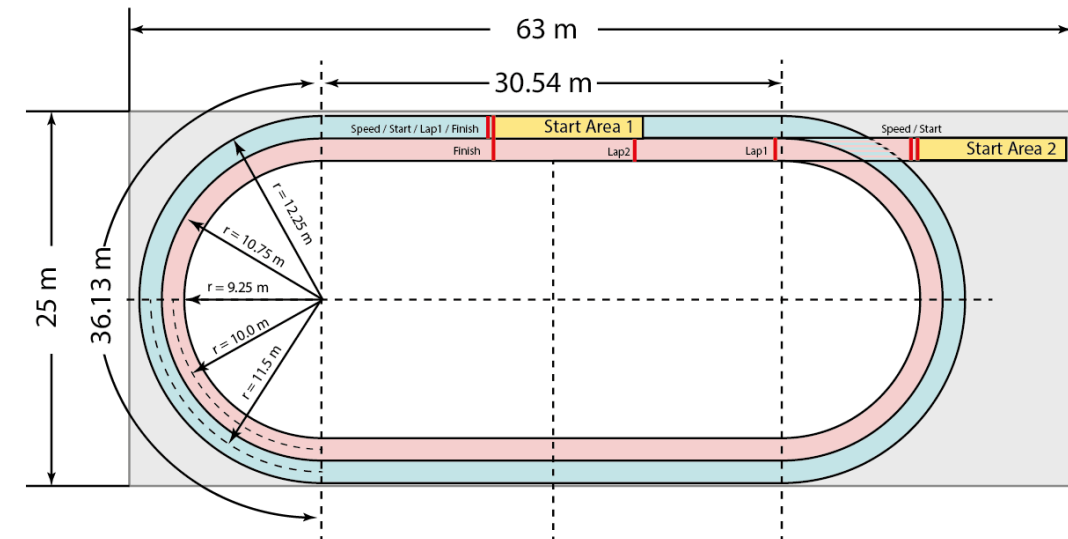


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Scoring

The track is split into 20 equal segments (10 per lap). If a pilot doesn't finish within the time limit, their last completed segment counts.

Each segment earns 5 points (max. 100 points). Ranking is based on total points. If points are equal, time decides. If both are equal, the same rank is given.



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Qualification

Each pilot will be allowed a total of **3 runs** against a random other pilot or alone. For the ranking only the **best run is counted**.

Finals

The four highest-ranked pilots from the qualification will be invited to the final races. The finals will follow a knockout format. Based on the qualification ranking, Rank 1 will compete against Rank 3, while Rank 2 will compete against Rank 4. The winners of these races will advance to the final to determine 1st and 2nd place. The remaining two pilots will compete in a separate race to determine 3rd and 4th place.

