

Forcething speed

Abstract

Training equipment is often very expensive, especially if a plenty of gym weights is bought, the cost can easily run away. The whole weight stack could be replaced with a single training equipment which provides the same function. The speed monitoring is one of many functions that are available. This provides a good training session with much less mess and cost. Besides the speed monitoring, force data and actual lifted weight is shown on a display with help of a AC-DC motor which can be used in explosive training sessions like sprinting.

Background

Training equipment has been used years back and is always evolving to be more concentric per muscle [1]. These training equipments tends to be very expensive, especially the current Motion 1080 which costs around 20k dollars. Studies have shown that students that exercise tend to focus and perform better in school [2].

Design

The Forcething Speed design prioritizes functionality and simplicity. It mainly consists of a AC-DC motor with an O-drive system capable of measuring speed and set force during exercise. The device is designed to track user performance in real-time. The primary application of the prototype is to provide an wide-range of equipment with various exercises possible.



The AC-DC motor housing.

Results and Evaluation

Initial testing of the Forcething Speed focused on tracking upper-body exercises like bicep curls, where the validation of the motion speed is in focus. That is also one of the most crucial things when tracking training to develop.

One of the key challenges during development was the coding of the speed calculation function. With this function the user is able to track his speed when he runs connected to the forcething speed.

The validation of the speed was carried out in a controlled environment with a measuring tape together with a user of the prototype. With this it was possible to test the actual speed with the algorithm in the O-drive system, which gave valid results (see diagrams). In more explosive movements the O-drive motor receives more current than it can accumulate and shuts off, even if it should not due to its current capacity (The over-current situation can be seen in a separate folder in github together with a functional situation).

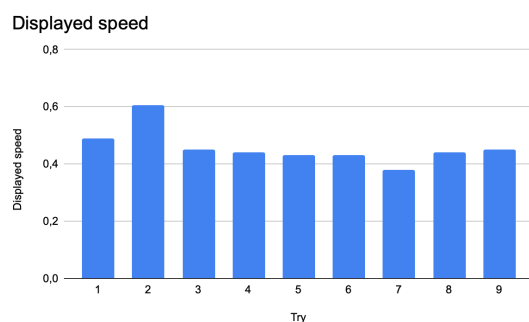
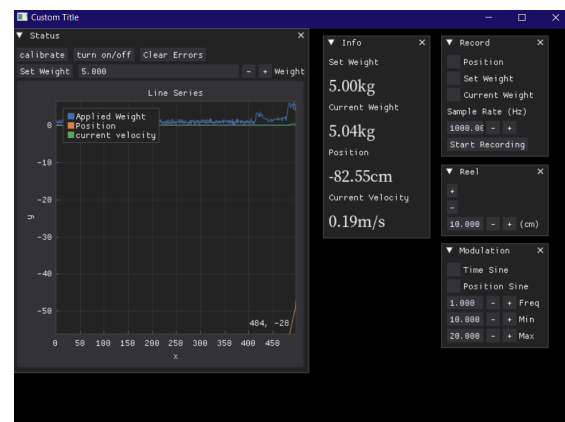


Diagram displayed speed.



The user's speed is shown in the diagram and info column,

Conclusion

The Forcething Speed prototype shows great potential as an affordable and accessible training tool for students. It provides valuable real-time feedback on exercise performance, allowing users to track their progress in strength training, and cardio exercises with focus on speed. While there are challenges to overcome, the product in whole will be very functional in the end.

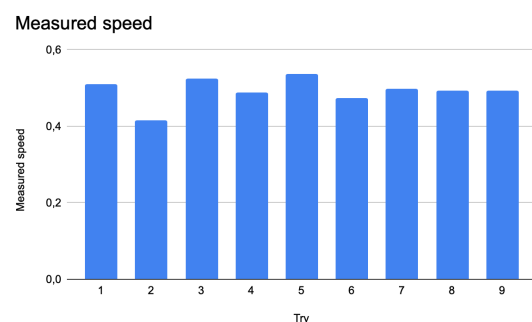


Diagram measured speed.

References

- [1] Jon Feld, 2020, Health and Fitness Association. *The Constant Evolution of Fitness Equipment*,
<https://www.healthandfitness.org/improve-your-club/the-constant-evolution-of-fitness-equipment/#>
- [2] NA, 2020, University College London. *Study-boosting benefits of exercise*,
<https://www.ucl.ac.uk/students/news/2020/may/study-boosting-benefits-exercise>