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On deploying the Artificial Sport Trainer into practice

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Motivation

- Computational Intelligence methods for automatic generation of sport training plans in individual sport disciplines have achieved a mature phase.
- Several methods have been developed for generating well formulated training plans on computers automatically.
- However, monitoring the realization of the performed training sessions still represents a bottleneck in automating the process of sport training as a whole.

Introduction

- The concept of the Artificial Sport Trainer (AST) is utilized mostly on the theoretical level and in simulations.
- Here we pay special attention to the realization phase of sport training sessions for cycling.
- We developed a custom embedded device (AST-Monitor) that actually represents an interface between an athlete and the algorithm/method.

Goals to be accomplished

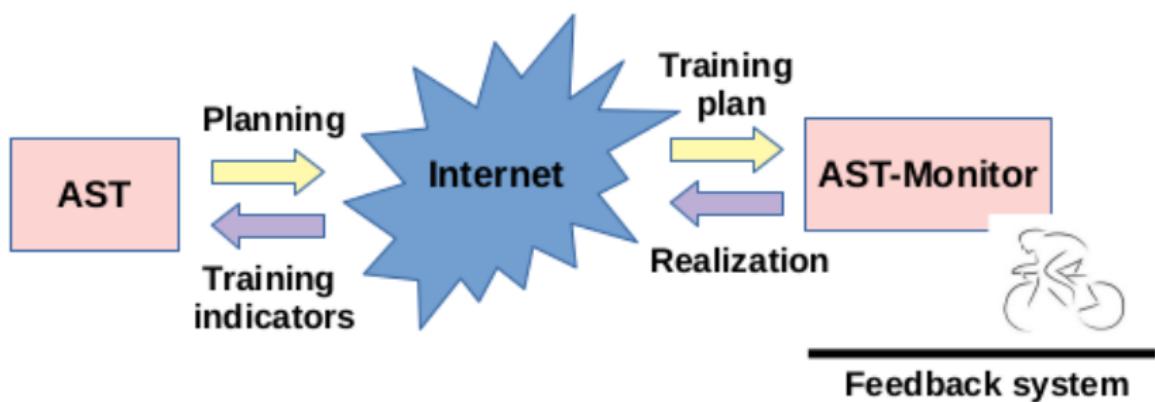
The designed AST-Monitor needs to accomplish the following goals:

- the device must be small enough to be embedded on the bike,
- the device must be flexible for adding different sensors measuring the additional training load indicators,
- the device must allow us to build a personalized GUI,
- the device must be able to run at least some computational intelligence algorithms as demanded by the AST,
- the device must be able to connect to the Internet,
- the device must allow the presentation of the load indicators in graphical form, which is the easiest way to forward information to the cyclist,
- the device must give us complete access to the filesystem.

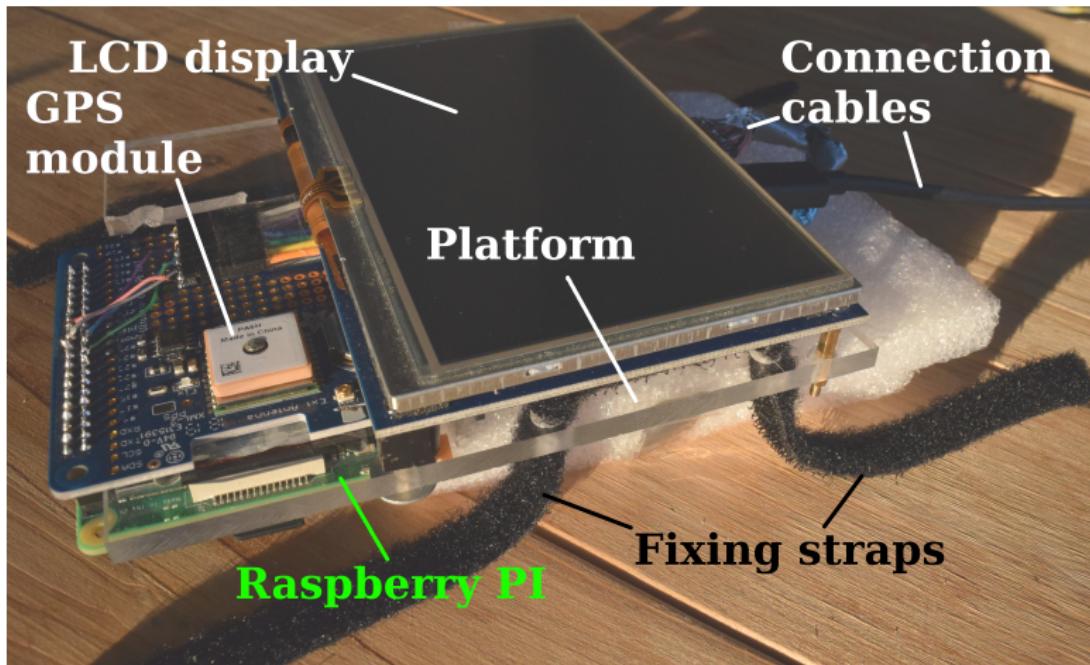
Contributions of this study

- A new embedded device is built (Raspberry Pi device equipped with different external sensors for monitoring real-time data),
- A new GUI is developed for interaction with the cyclist during the training session,
- A practical utilization of the proposed system is tested in the real-world,
- many goals and challenges are identified for future works.

Design of the AST-Monitor



Hardware architecture of the AST-Monitor



Illustrative example

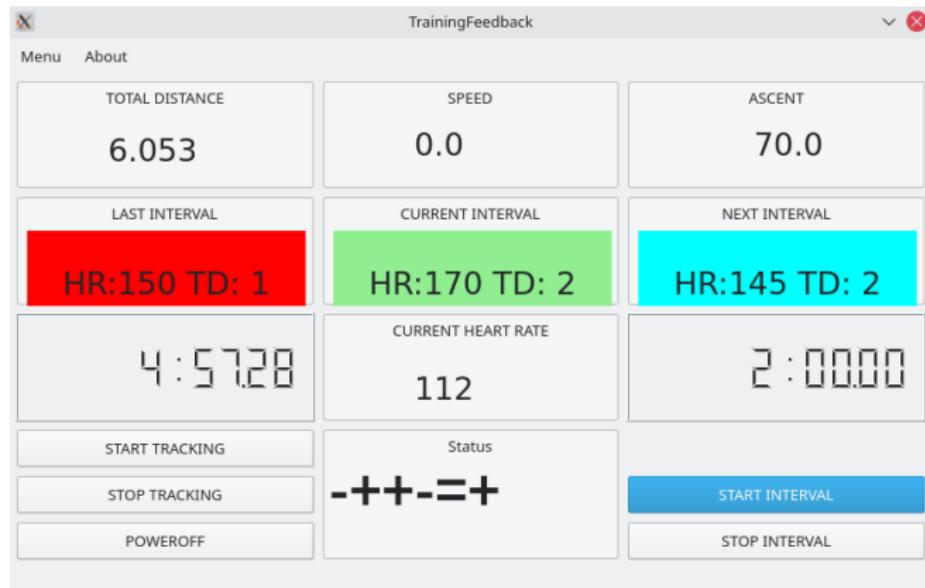
- Purpose of our experimental work was to show that the concept of the AST-Monitor works, and that it is appropriate for use in practice.
- Proposed wearable device was tested in a simulated environment, where we focused on particular functionalities of the solution
- A training plan for cycling consisting of interval training sessions was selected in our study, due to the short duration and repeating of the same exercises

ID	\overline{HR}_{ID}	$t_{ID} [\text{min}]$
1	150	1
2	170	2
3	145	2
4	180	1
5	182	1

Deployment of the AST-Monitor on a real cycle



Graphical user interface



Conclusion 1/2

- AST-Monitor was proposed that represents a wearable Raspberry Pi computer.
- This device is mounted on the bicycle, and is able to monitor a palette of sensors, measure different training load indicators and communicate with the AST.
- The illustrative example using the proposed device during the interval training sessions in the simulated environment showed that this device is capable of measuring a large number of different training indicators.
- It was warmly greeted by the cyclists that tested it.

Conclusion 2/2

There are many directions for the future development

- connecting the new sensors to the Raspberry Pi,
- improving the GUI for interacting with the users
- automating data transfer to the central (personal) AST computer from the terrain (via a mobile data connection)
- calling for a social note of the AST-Monitor, either by live tracking or separately, and competing with other cyclists (possible integration with the sport social network Strava)
- downsizing the current AST-Monitor.