



ProCardio

HL2032/HE1040/HL2041 HT22 Medical
Engineering, Project Course

Á.Ó. Ásmundsson, S.A.R. Rafay, S. Karchut,
S. Wronska and Y. Huang

The team and project idea

- The team background
- Run through Central Park on a treadmill
- Real-scene running



Why is this a problem that needs a solution?

- Popular trend of at-home workouts
- Increasing home time due to Covid
- Lack of motivation to normal running
- Lack of treadmills that can synchronize incline and speed with a video



Previous solutions

- Zwift and Technogym



Video



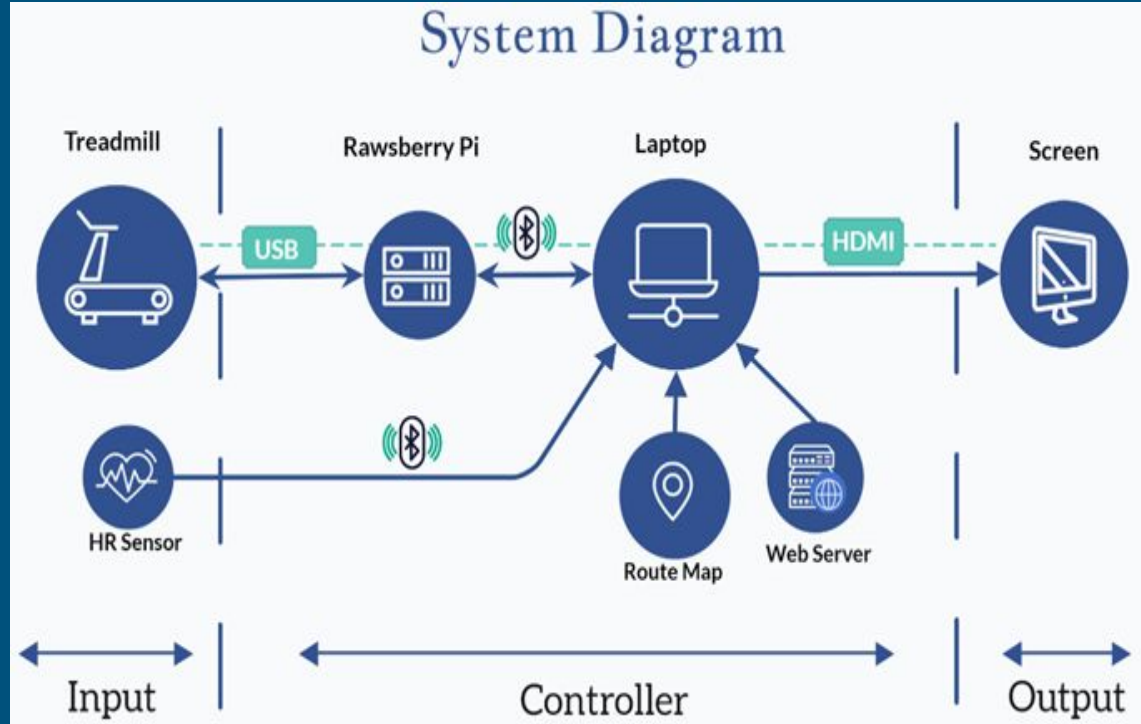
<https://treadmill.dev.kthcloud.com/home>

Solution and why we chose this path from a end user perspective

- Increased motivation for indoor running exercise
- More controllable with less variables (Weather, Traffic , Crowds)
- Ideal training device for professional runners
- Potentials for vocational training (Police, Fireman, Military use)
- High learnability for end users
- Ready to go solution with wide applicability for any treadmills and gyms

Solution and why we chose this path from a technical perspective

- Bidirectional communication
- Optional sensor choices
- Real-time Synchronization
 - Re-occurrence of route
 - Synchronization of user feedback
- Screen display

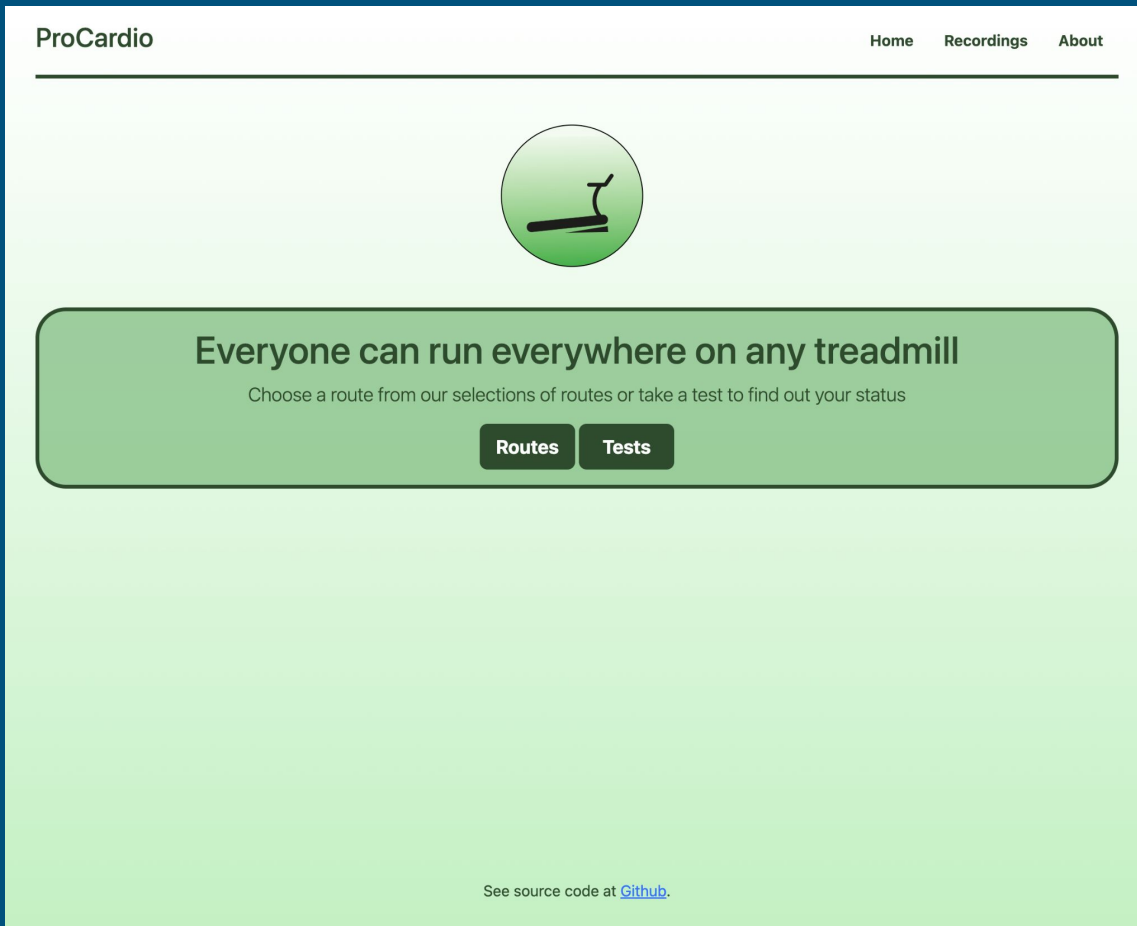


Our thoughts on the outcome

- Real running experience
- Various route choices for different individual preferences
- Synchronous health condition monitoring
- Training data (Feedback such as speed change, total distance and inclination)
- User-friendly user interface
- Github (<https://github.com/asmundur31/ProCardio>)

Results

- User interface
- KTH Cloud
- Useability tests
- Real data
- Feedback



KTH Cloud

The screenshot displays the Kubernetes dashboard interface. At the top, the 'kubernetes' logo is on the left, a search bar with 'treadmill' entered is in the center, and user avatars are on the right. A blue navigation bar highlights the 'Workloads' section. On the left, a sidebar lists various Kubernetes resources: Workloads (selected), Cron Jobs, Daemon Sets, Deployments, Jobs, Pods, Replica Sets, Replication Controllers, and Stateful Sets. Below this, other categories like Service, Ingresses, and Services are listed, followed by 'Config and Storage' which includes Config Maps, Persistent Volume Claims, Secrets, and Storage Classes.

The main content area is titled 'Workload Status' and features three large green circular progress indicators. Each indicator is connected by a line to a label and a 'Running' count: 'Deployments' with 'Running: 2', 'Pods' with 'Running: 2', and 'Replica Sets' with 'Running: 11'.

Below the 'Workload Status' section is a 'Deployments' table. It has columns for Name, Images, Labels, Pods, and Created. Two deployments are listed: 'treadmill-db' and 'treadmill'.

Name	Images	Labels	Pods	Created ↑
treadmill-db	postgres:10.1	-	1 / 1	17 days ago
treadmill	registry.kthcloud.com/treadmill/treadmill	app.kubernetes.io/name: treadmill	1 / 1	17 days ago

<https://treadmill.dev.kthcloud.com/home>

Usability tests

We classify the severity of the errors:

Small error (S)	Has no big impact on the subject, he becomes slightly irritated.
Medium error (M)	The subject is able to finish the task but has to take a detour or takes an unusually long time finishing the task.
Large error (L)	Subject cannot finish the task and/or loses data.

Table 2. Classification of how severe the errors are.

Usability tests

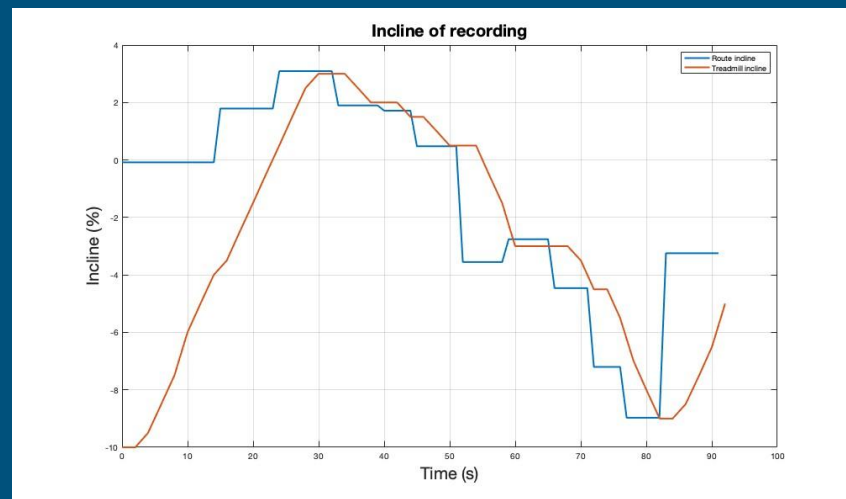
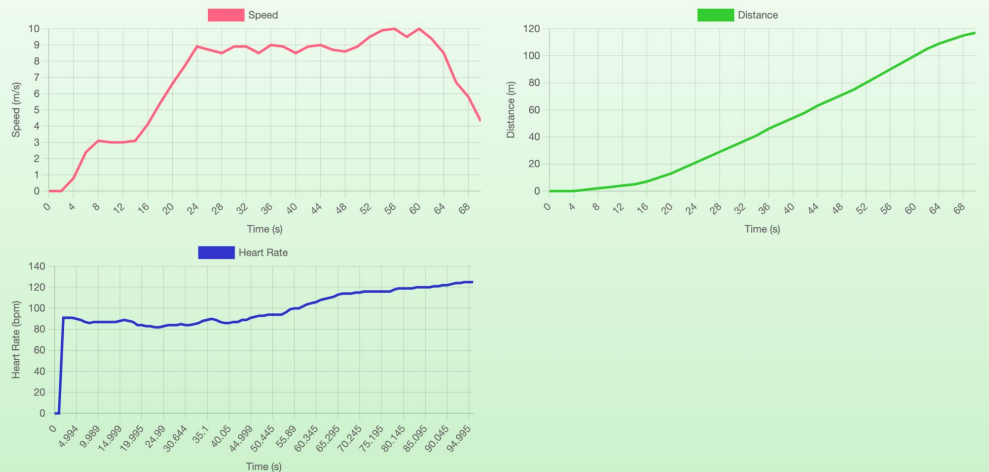
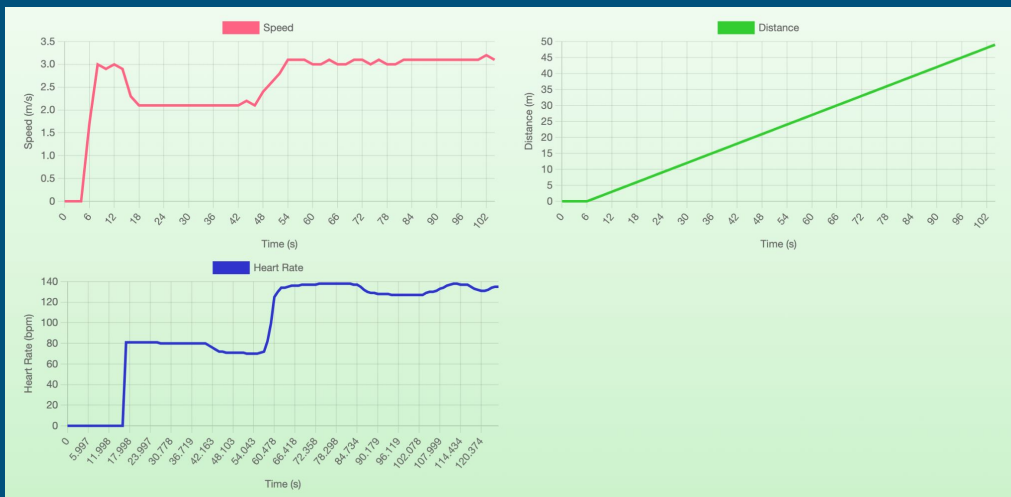
System	ProCardio
System version	2.0.0

Tasks for subject to perform:

Task nr.	Task name	Task description
1	Access our software	On a computer open a browser with bluetooth support (ex. Google Chrome) and go to https://treadmill.dev.kthcloud.com . You should see our home page.
2	Choose a route	Choose a route to run, select routes and from there select a route of your choice. You should see the video you chose.
3	Connect to the treadmill, heart rate device and start	Now you need to connect to the heart rate device by choosing 'Connect HR'. A list of bluetooth devices comes up, choose the Polar device. Next connect to the treadmill by choosing 'Connect treadmill'. A list of bluetooth devices comes up, choose 'raspberrypi'. You should see a message with a successful connection. To start the route you press 'Start'. Go to the treadmill and start running.
4	Speed change	While running select any speed you can handle. You do so by pressing the speed controls on the treadmill. Enjoy the view while running and feel the inclination change.
5	Stop running / Cool down	When the route finishes you automatically enter to cool down. If at any point you want to stop, press the 'Start/Stop' button on the treadmill and wait for it to stop.
6	Results	Go into recordings on top of the page. Here is a list of all recordings. Find your recording and view your results.
7	Question	How satisfied are you with the system? Answer from 0 (not satisfied) to 10 (completely satisfied)

Table 1. List of all tasks the subjects have to perform.

Real data



Feedback/Improvements

- Feedback

- Control software from treadmill
- Presentation of data
- Tutorial of usage
- More testing (usability, 2 subjects)

- Improvements

- Mobile application to record and upload routes
- Users and login system
- More professional data processing for the feedback (Cadence, stride, energy demand)
- Implement more tests

Summary and reflection of project methodology

- Agile/Scrum project methodology used

What went well?

- Fast progress on making the prototype
- Meetings and Communications
- Full consideration more from a product perspective than a technical solution

What should you have done differently?

- Distribution of work
- More thorough study about current solutions and markets

Questions?

Thank you for listening