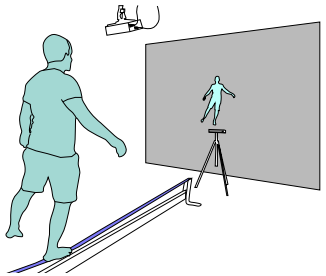

Figure 1: Setup of the Slackliner demo: A Kinect facing the user tracks her movements. Real-time feedback on the display instructs the trainee during her exercises.

Slackliner 2.0: Real-time Training Assistance through Life-size Feedback

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ABSTRACT

In this demo, we present *Slackliner 2.0*, an interactive slackline training assistant which features head and skeleton tracking, and real-time feedback through life-size projection. Like in other sports, proper training leads to a faster increase of skill and lessens the risk of injuries. We chose a set of exercises from slackline literature and implemented an interactive trainer which guides the user through the exercises giving feedback if the exercises were executed correctly. Based on lessons learned from our study and prior demonstrations we present a revised version of *Slackliner* that uses head tracking to better guide the user's attention and movements. Additionally a new visual indicator informs the trainee about her arm posture during the performance. This has been also included in an updated

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post-analysis view that provides the trainee with more detailed feedback about her performance. The present demo showcases an interactive sports training system that provides in-situ feedback while following a well-guided learning procedure.

CCS CONCEPTS

• **Human-centered computing** → **Gestural input**; • **Applied computing** → *Interactive learning environments*.

KEYWORDS

Slackline; sports technologies; projection; real-time feedback.

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INTRODUCTION

Slacklining is a form of tightrope walking, the difference being is that much less tension is involved. This allows the material to stretch and bounce, resembling a very narrow trampoline, which enables experienced athletes to jump and flip. For the hobbyist, the usual way to exercise in this sport is to go to a park, set up the slackline between two trees, and try to walk from one side to the other. This requires a substantial amount of balance, core body strength, and focus [4].

The use of technology in sports has given athletes and trainers new possibilities in training. Simple measures such as video recording and manual analysis are now widely used for professional athletes whether for running, swimming, or even rock climbing. Today, these practices are getting more and more accessible for non-professionals by using off-the-shelf hardware like smartphones and consumer 3D cameras like the Kinect [13]. Our work is related to other research projects that have used the Kinect for rehabilitation [2, 5] and balance training purposes [11]. Several technological advances like video feedback, virtual environments, and auditive information can be applied for providing feedback in sport activities [6–8, 10]. The work presented in this paper is also related to topics of technology-aided motor skill learning [1, 14]. In this demo, we present *Slackliner 2.0*, an interactive slackline training assistant which features life-size projection, skeleton tracking, and real-time feedback. Like in other sports, proper training leads to a faster increase of skill and lessens the risk of injuries. We chose a set of exercises from slackline literature [4, 12] and implemented an interactive trainer which guides the user through the exercises giving feedback if the exercises were executed correctly. Additionally, a post-analysis provides the trainee with more detailed feedback about her performance. The results

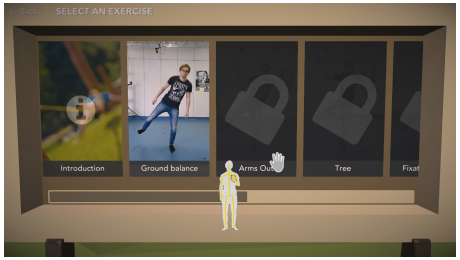

Figure 2: The system guides the trainee through structured exercises that she has to unlock.

Figure 3: Specific exercise instruction and a short video clip help the trainee to prepare for the correct movement.

Figure 4: In the exercise execution screen the trainee is provided with real-time feedback in form of a checklist of specific instructions, a timer, a repetition counter, and gauge to display the confidence of the current execution.

from a study comparing the interactive slackline training system to a classic approach using a personal trainer indicate the interactive slackline training system can be used as an enjoyable and effective alternative to classic training methods.

Based on the lessons learned from our study and prior demonstrations [3, 9], we present a revised version of *Slackliner* that uses head tracking to better guide the user's attention and movements. This has been also included in an updated post-analysis view that provides the trainee with more detailed feedback about her performance. The contribution of the present demo is to showcase an interactive sports training system that provides in-situ feedback while following a well-guided learning procedure. The design and implementation of the system informs many potential applications ranging from rehabilitation to fitness gyms and home use.

SLACKLINER 2.0

Our system consists of several components: a mobile slackline (*alpidex POWER-WAVE 2.0*) stands in front of a projected screen and a Kinect v2 faces the trainee (see Figure 1). The actual recognition of the movements during the training employs a *rule-based* and a *gesture-based* approach. Unity 3D is used to handle the program logic and visualize a graphical user interface on the projected screen. The user interface of *Slackliner 2.0* consists of several screens that allow the trainee to navigate between different levels and exercise views (see Figure 2). In the exercise overview screen, the trainee is first instructed via text after which a video clip shows the correct execution of the exercise (see Figure 3). On the exercise execution screen, a small silhouette of the trainee is always shown in the center of the screen to provide feedback on the status of the tracking system. Textual and visual feedback indicators provide necessary information related to the current execution of the exercise in real time (see Figure 4). The revised version of *Slackliner 2.0* addresses further known problems with slackline beginners. It is recommended to focus on a specific point in front of the person to calm the visual sense. Therefore, *Slackliner 2.0* provides a new visual attention guidance. The trainees head is tracked to identify the persistence of her visual sense. If her attention to a focus area is lost, the system notifies her to regain a focus point and the attention. A further problem with beginners on a slackline is to have their arms above the shoulder for counterbalancing unpredictable body movements. *Slackliner 2.0* solves this problem with a new balance indicator, which locates arms and hands of the user for being at the desired area. If this is not the case, the system provides her with visual feedback at the hands of the silhouette, to get her arms up above the shoulder. The post analysis is extended by parameters of the attention during the execution and the arms above the shoulder in percent.

CONCLUSION

This demo presents *Slackliner 2.0*, an interactive slackline training assistant which features real-time feedback through life-size projection. At the conference each CHI attendee – no matter slackline

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novice or expert – can try out selected exercises of the training program in a novel interactive and entertaining way. We aim to foster the discussion on how interactive user interfaces can be used to learn complex motor movements in sports and beyond.

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