LEAD AUTO-BELAY SYSTEM

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An auto-belay device for lead climbers, with safe soft catches and slack management to make climbing accessible to individual climbers who want to lead a route without someone around to belay them. This device prioritises safety for climbers in climbing gyms, targeted at gyms in Mpumalanga, South Africa.

A DEVICE THAT WILL CHANGE THE FUTURE OF LEAD CLIMBING

Rock climbing combines physical prowess and mental fortitude with the right equipment. Lead climbing, where the climber must carry the rope and clip into anchors as they ascend, introduces a higher risk of falls compared to top-rope climbing. Traditionally, human belayers manage the rope, but even experienced belayers are not immune to error. The new auto-belay system is designed to enhance safety by managing rope slack, detecting falls, and instantly arresting them, reducing the reliance on a second person in lead climbing.

THE NEED FOR INNOVATION IN CLIMBING SAFETY

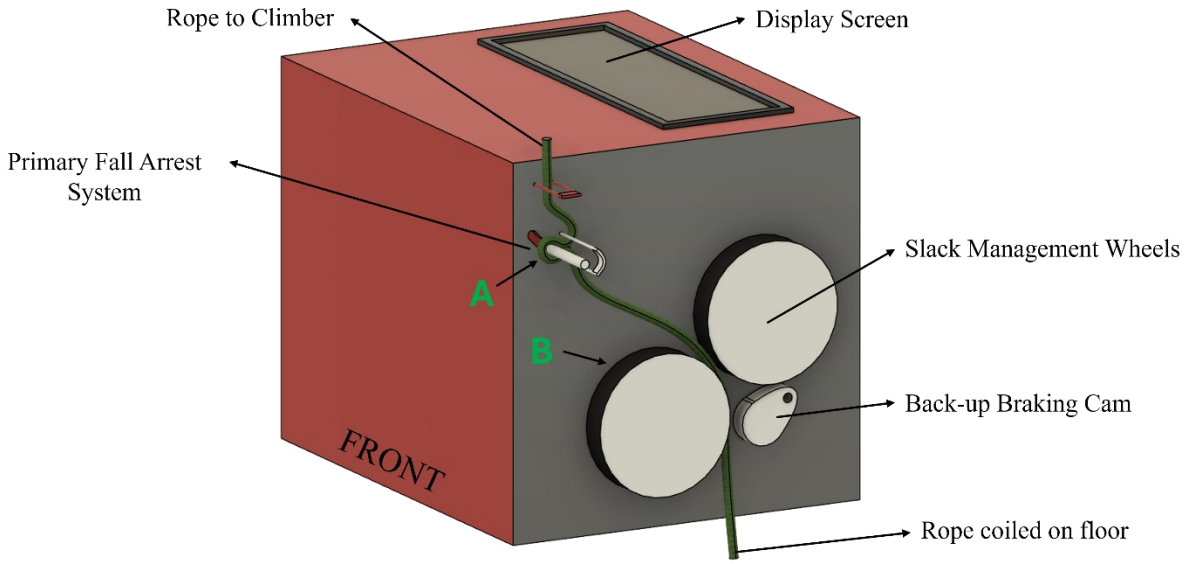
Lead climbing is inherently more dangerous than top-rope climbing because the climber ascends with the rope below them. A fall may result in a significant drop, especially if the climber has not yet clipped into the next anchor point. In this context, an auto-belay device that can effectively manage rope slack, detect falls, and arrest them instantly is not just a convenience—it's a necessity.

Existing auto-belay systems have proven their worth in top-rope climbing, where they automatically lock the rope and ensure a controlled descent in the event of a fall. However, these devices have yet to be adapted effectively for lead climbing, where the challenges are more complex. The new auto-belay system for lead climbing aims to fill this gap by offering a device that can handle the unique demands of this climbing style.

HOW IT WORKS

At its core, this auto-belay device is designed to replace the human belayer in a lead climbing scenario. The system is equipped with a series of sophisticated mechanisms that ensure the climber's safety from the moment they leave the ground to the moment they reach the top—or in the event of a fall, when they need to be safely lowered to the ground.

The auto-belay system is engineered to ensure climbers' safety with meticulous slack management, fall arrest, and multiple safety redundancies. Using brushless DC motors and rubber-sleeved wheels, the system efficiently retracts excess rope, preventing tangles and hazards. Upon detecting a fall, it increases friction on the rope, smoothly arresting the fall and reducing the abruptness and severity of the catch. Designed for climbers weighing between 30 kg and 150 kg, it includes fail-safes like a backup cam-style brake and an uninterruptible power supply (UPS) to maintain operation during power failures. Additionally, a buddy-check mechanism pulls on the rope to verify the knot is tied well and can withstand a fall, while chemically bonded anchors and rubber shock absorbers ensure stable mounting on the wall. The sustainability of the device was kept in mind throughout the design influencing choices made and making sure the device is as safe as possible for as long as possible.



Operation Guide

The design of this device boasts ease of use as one of the main features. With the freedom to use ropes between 9,6 mm and 10,3 mm, it proves to suit the preferences of many climbers. The following step-by-step guide shows how the device should be used.

1. **Thread rope through the device as shown on the screen (and in the picture above).**

This shows how the rope should be threaded and is normally performed by staff at the gym to ensure correct usage.

2. **Tie yourself into the device with a figure-of-eight climbing knot.**

This knot is tried and tested to be the best way to secure yourself to the device in climbing gyms.

3. **Step back and allow the device to perform a "buddy-check".**

The device will use the motors to pull tension onto the rope and make sure your knot is strong enough.

4. **Choose your mode**

The device can be used in either "Project" or "Competition" modes. "Project" mode allows you to keep climbing after a fall, but in "Competition" mode you will descend immediately.

5. **Start climbing and let the device take care of you.**

You are all set! Time to chalk up, tackle your project or reach a new goal in a competition.

Why this Innovation Matters

By reducing reliance on human belayers, this system minimises risks associated with human error, which remains a concern even among the most experienced climbers. In high-traffic environments like climbing gyms, this innovation ensures consistent safety, reducing the likelihood of accidents. This system also allows for climbers to practice and progress their skill level without always needing another person to belay them during a lead climb.

Looking Forward

The auto-belay system marks a significant advancement in climbing safety, aiming to set new industry standards. As it undergoes refinement through testing, it has the potential to become essential in climbing gyms worldwide. This innovation allows climbers to focus on their ascent, assured by a meticulously engineered and built-to-last system, and signals a new era of safety and technological progress in the climbing community. Ultimately, this system is more than just equipment—it's a game-changer that enhances safety, accessibility, and enjoyment for climbers of all levels.