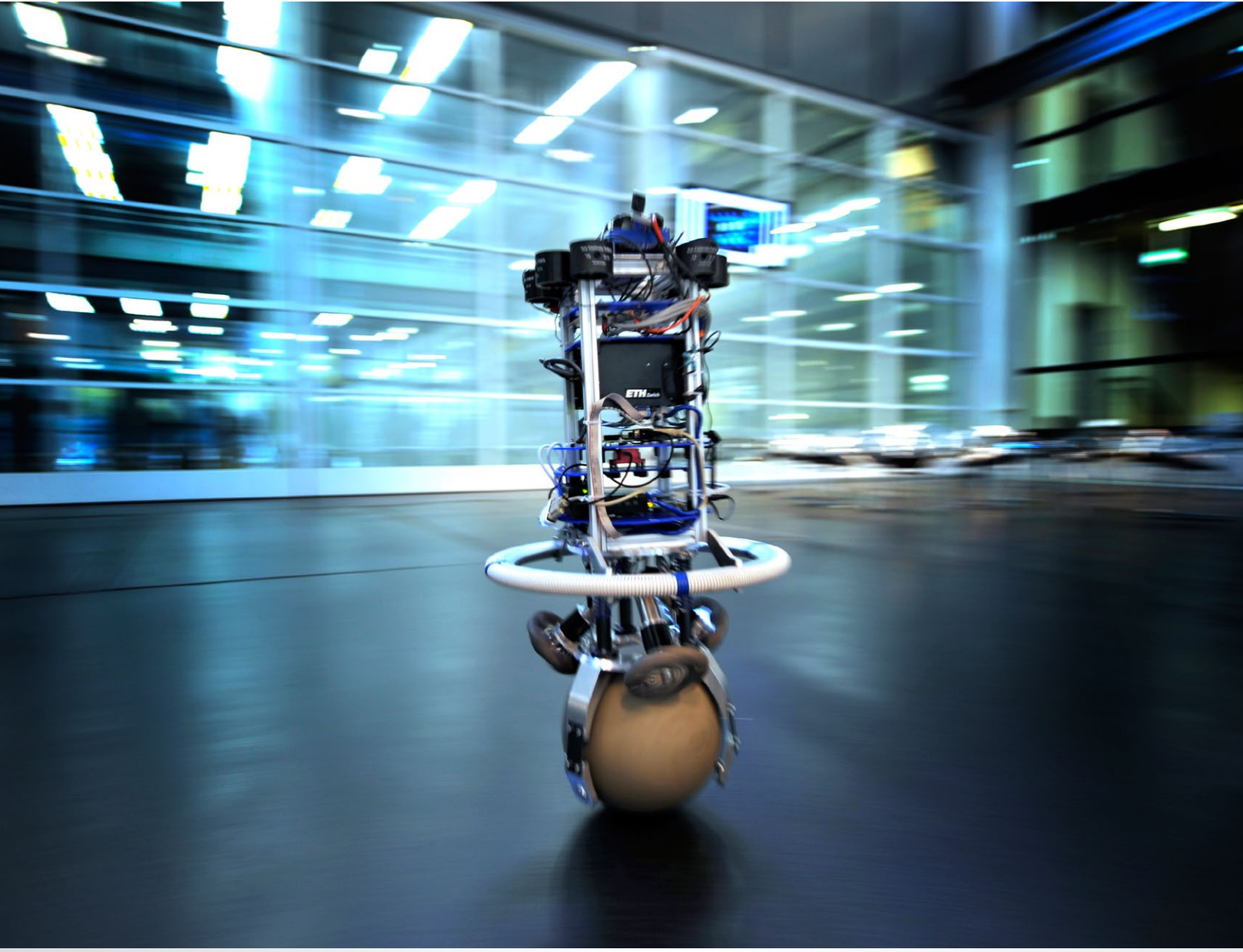

rezero

a new kind of agility

ETH

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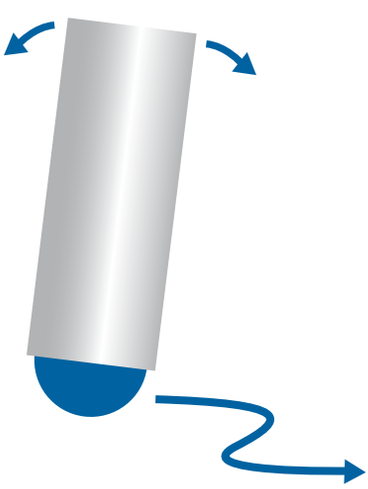
Rezero is a unique ballbot, a robot balancing on a single ball, which is able to move in a very agile, fluid and elegant way. Born as a research project, it moves away from slow, clumsy robots and introduces a new kind of agility, eagerly awaited by the service robotics industry. Rezero has fascinated and inspired people around the world and has brought about technological innovations that have already found applications in industry. Motivated by this early success, the team behind Rezero continues to push the cutting-edge ballbot technology even closer towards further real world applications.



„Rezero introduces a new kind of agility, eagerly awaited by the service robotics industry."

Our Motivation

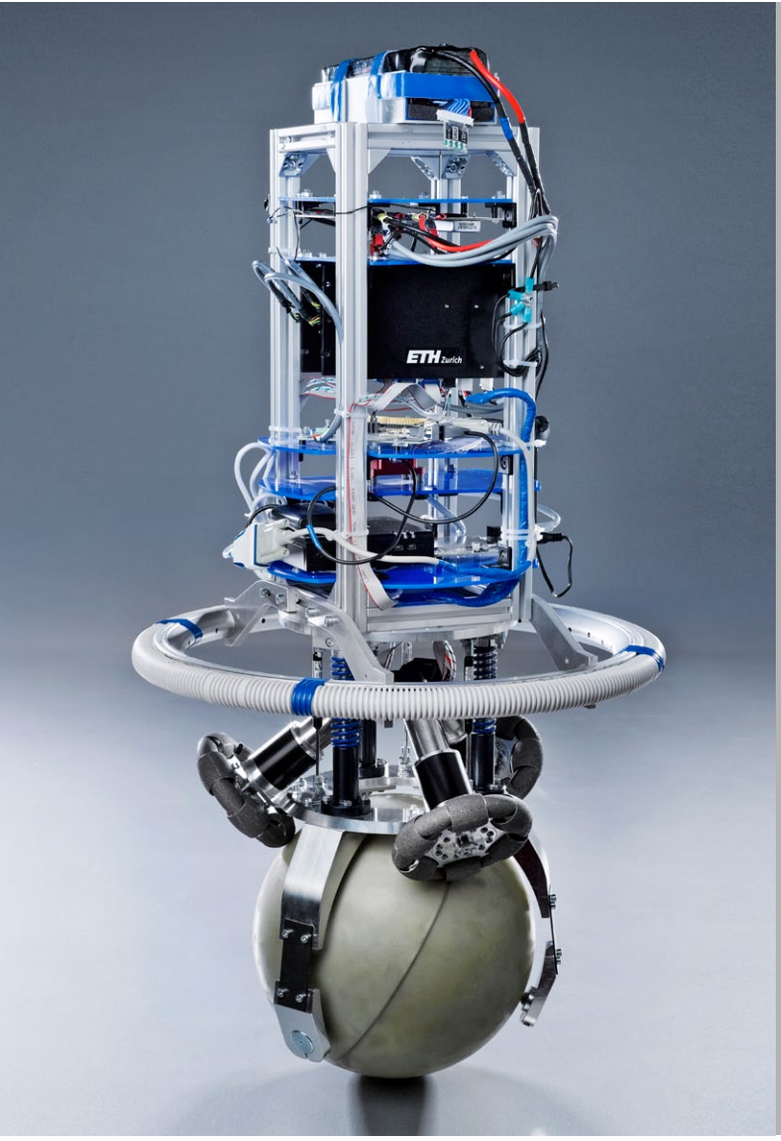
With more and more robots entering our daily life, there is an increasing demand for robots which human-like mobility, which may be perceived as a valuable aid rather than an obstacle. Most existing robots are slow, clumsy and when built tall and slender they easily tip over. In order to overcome these limitations, we envisioned and created Rezero to be slim, agile and able to react to disturbances in crowded environments.

Dynamic Stability for High Agility

By balancing on a single ball, Rezero has a natural tendency to tilt, but with its sophisticated control algorithms, Rezero becomes dynamically stable in operation. The controller assures that the tilt motion goes into the desired direction, and leverages the robot's natural instability in order to create a unique agility. Additionally, the ball allows Rezero to move in all directions at any time, and thus it can easily handle unexpected contact. This makes Rezero especially well-suited to crowded and narrow environments like exhibitions, companies and households.

Rezero in everyday life

With its agility and human-like motions, Rezero blends naturally into everyday environments, making it the perfect candidate for a service robot. Equipped with several sensors, it can detect and follow humans and perform complex interactions, like playing games. Extending these capabilities even further, Rezero could serve as a mobile tele-presence device in an office, as a service robot carrying medical equipment in hospitals or even as an intelligent companion for elderly people - becoming an indispensable aid in everyday life.



How It Works

Rezero is equipped with an IMU (Inertial Measurement Unit), a highly precise sensor that constantly measures the robot's pitch angles. Using this information, Rezero continuously computes how to counteract in order to avoid toppling over. It does so by turning the ball appropriately using three omnidirectional wheels. A laser range sensor mounted on top allows Rezero to perceive its environment and helps it to interact with humans.

Research Platform

Rezero is research platform and was developed with a modular and extensi- ble architecture. Students of various engineering fields form an interdisciplinary team to strengthen and extend Rezero's capabilities. The primary aim of the ongoing development is to improve the robustness of the ballbot and to increase its versatility. Our long-term strategy is to retain the lead in the growing field of ballbots and drive the Rezero technology further towards a market-ready state. Maintaining a continuous investigation and development cycle, we are able to deploy market-ready technology to our partners on a regular basis.

Market-Ready Technology Today

Already during the early development of Rezero, market-ready technology has emerged from the project and is about to be deployed in industry and other research projects. As an example, the ball drive algorithm developed for Rezero is going to be used in production and quality control machines for sport and gymnastics balls in the near future.

Also, Rezero's omnidirectional wheels are experiencing growing market demand from industry and research projects. Motivated to provide an affordable solution, we have made them available to customers worldwide in 2012. The wheels' great functionality and their wide field of use opens up new possibilities for various applications, enabling unprecedented motion and agility.

Rezero – Seen by Many, to Be Seen by More

Despite the fact that Rezero is a research project, it has drawn major attention from around the world. The project has been featured on TV channels in Switzerland, Germany, USA, India and China. It has also been presented at major conferences including the world famous TED Global 2011 (Scotland), IEEE IROS 2011 (USA), Front End Innovation Europe 2012 (Switzerland), Techkriti 2012 (India), Automatica 2010 (Germany) and many more.

Rezero has become an ambassador for Swiss engineering and represents Europe as a key location of innovation. Together with our partners we work on Rezero's evolution from being a prestigious demonstrator to become a part of everyday life.

„Market-Ready Technology Today“

Partners

In order to maintain the leading position in the emerging ballbot technology we closely cooperate with different partners from industry. Within these partnerships we create mutual benefits and promote exchange of knowledge and experiences. Our platform helps to conduct product innovation from both parties, sharing ideas and creating synergies. As a cutting-edge application, our project can provide valuable user feedback to help your company to further improve your products and services. By joining this research project, your company demonstrates innovative thinking and becomes part of a technology that changes the way we think about robotics.

As Rezero is the ideal show case for our partner's products, it has been featured at our partners' conference appearances and at their customer events. Additionally, Rezero has appeared as a product application in our partners' application notes, articles, newsletters and brochures.

About the Project

Our research project was founded by thirteen undergraduate students at the end of summer 2009 at the Autonomous Systems Lab at ETH Zurich (Swiss Federal Institute of Technology Zurich). The original idea was to create a robot that is able to travel in a very agile and natural way by balance itself on a single sphere. Our goal was to create a robot that is technically sophisticated, yet, which is also able to grab the attention of each and every spectator with the beauty and elegance of its movements.

Eight months later, in 2010, Rezero, the world's fastest ballbot, made its public debut. Since then, Rezero has travelled the world, appeared at many renown events and received extensive media coverage. This overwhelming feedback has proven a strong interest in Rezero's technology and is a motivation to us, the Autonomous Systems Lab and our partners to continue to invest time and energy into this project.

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