

Student project proposal

Project title: Design and construction of a batteries charging station for remote autonomous robots in CERN accelerator's complex

Project type: MSc thesis, MSc semester project

Project description

In the following years, Mechatronics, Robotics and Operation section at CERN will proceed with the installation of autonomous mobile robots accelerator's complex for inspection, radiation surveys and environmental monitoring. The robots are required to stay for more than ten years inside the underground galleries of the particle accelerators. For this reason, high reliability and availability of the robots are required.

As the robots can only navigate in the accelerator in the absence of particle beam, the robots may stay on charge for a long time. However, their operation may be required at any moment, to inspect possible problems to the accelerator.

The goal of the present project is to design a highly reliable and safe charging station for such robots. The charging station must optimize the charging procedure to preserve the life of the robots' batteries, ensuring however at all times enough charge to perform possible requested operations. Moreover, as installed in underground areas, the charging station must provide high levels of safety, to prevent fire risks, explosions or hazardous material leakage from the batteries. The charging station must equip a highly reliable control system, capable of monitoring at all time the charging process. Finally, the charging station must provide particular features to ensure an autonomous approach by a robot.

Tasks of the student

- Design of the charging station mechanics, electrical system and supervision system
- Failure mode analysis of batteries under such charging conditions and definition of the set of sensors to ensure a safe monitoring of the charging process
- Propose and choose multiple designs to be adaptable to different environments

Requirements

- The student should be able to work in team, committed and willing to learn.
- Knowledge of electrical system design and monitoring is preferred