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Concept studies for lunar landers and sample return missions: challenges for robotics

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We present the results of a study for a lunar polar lander conducted at ESA CDF Concurrent Design Facility and follow up activities. The goal is to demonstrate lunar landing, survival and exploration technologies for the future, geochemical studies of the piles, and search for ice in permanent shadows. We describe the top objectives, mission analysis, design and associated lander and rover. We also describe the rationale for Lunar Sample Return missions, and give some ongoing concept studies performed at ESA. Finally, we discuss the required advances in planetary robotics, required for the polar lunar lander and for the sample return missions.