

Rover for Mobile Log Scanner

Thank you Wood: <https://www.youtube.com/watch?v=nsmUQ3gUqRU>

FPIInnovations: <https://www.youtube.com/watch?v=r4vhLQ8OEP0>

Introduction:

Logs are typically scanned in sawmills to optimize sawing patterns and improve recovery. The most common type of scanning is done with lasers to determine the physical shape. X-ray scanning can be used to help determine the internal structure and defects of logs, but x-ray scanning in processing plants requires a significant shielding infrastructure to protect workers from radiation. Scanning logs in the logyards or standing trees can help making critical decisions before logs are cut into shorter sections or allocated to final products. One advantage of performing x-ray scanning in the field is that operators can be shielded or kept away at a safe distance to reduce the amount of required shielding. However, this means the scanner must operate as a semi-automatous rover and on unpaved and potentially rough surfaces. For safety and power requirements, the rover will be always be tethered to a wired interlock kill switch and an external power supply.

FPIInnovations has built a mobile scanner (see Figure1) based on a commercial semi-customized, radio-controlled, rover platform (designed for DIY hobbyists). This system is currently being tested for x-ray scanning. This provides better understanding of the requirements, as well as stability and controllability issues that must be addressed to build a better rover.

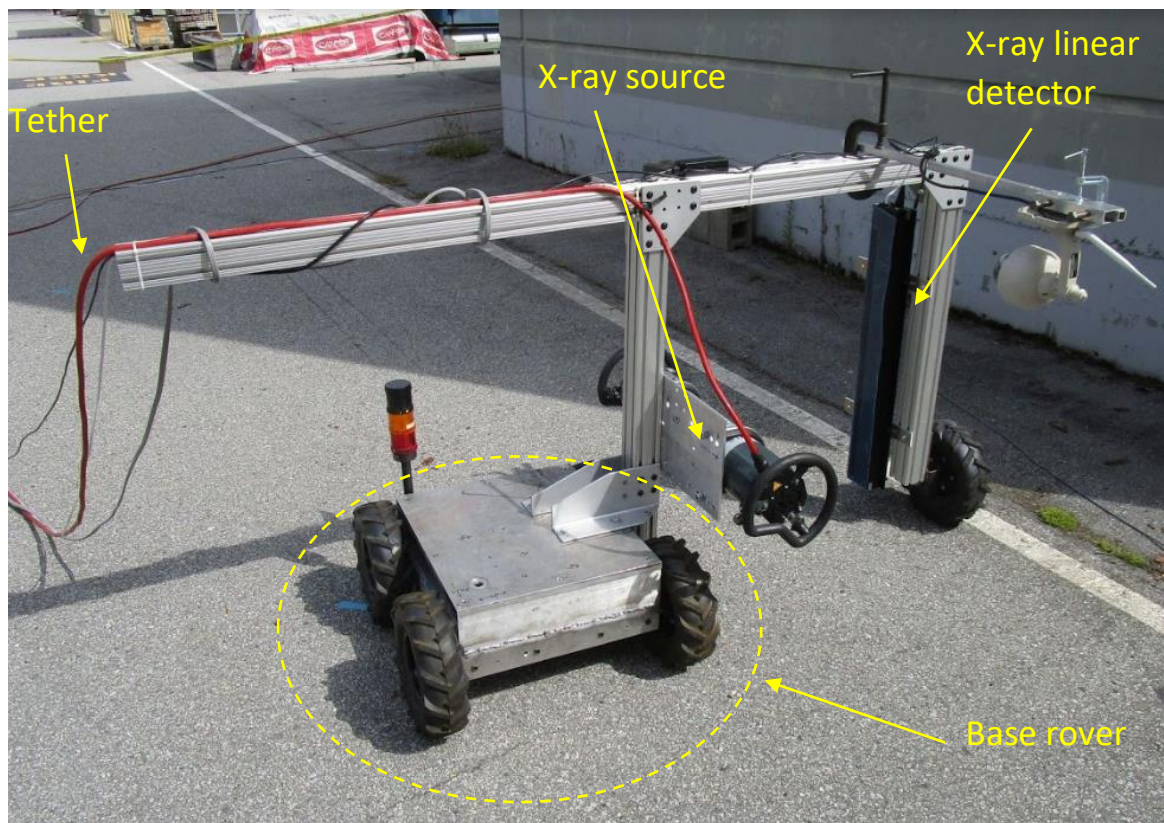


Figure 1 FPIInnovations' mobile x-ray scanner

Brief Project Description:

The objective of this project is to design and build a new rover for the scanner. Due to the specific radiation, shielding weight, safety/power source tethering, rough terrain, and alignment requirements of x-ray scanning, the rover must meet unusual design criteria. X-ray scanning requires an x-ray source (tethered), which is heavy due to lead shielding (not shown in the figure) and a detector (usually a linear array). The source and detector must be on the opposite sides of the log (see Figure2) and the distance between them limits the diameter of the log being scanned. The detector must stay aligned with the source, regardless of vibrations or uneven ground. The current rover platform requires a cantilevered design for the source-detector holding structure. This limits the distance between the source and detector as well as the stiffness of the holding structure, which is needed to keep the source and detector aligned. A fifth wheel is put under the detector to support the weight, but this wheel can lose contact with the ground easily reduce rover stability. If each pair of wheels of the rover were to straddle the log, the scanning infrastructure could be hung from the top with more stability and a wider span. There may be other design options, which could be explored through simulation before a new system is built. Using parts, such as motors, motor controllers, wheels, control system, radio receiver/transmitter, etc. from the same provider of DIY platforms (SuperDroidRobots, superdroids.com) as the existing rover, reduces the burden of design for the electronics and controls, and the project can focus on the mechanical aspects of the rover design.

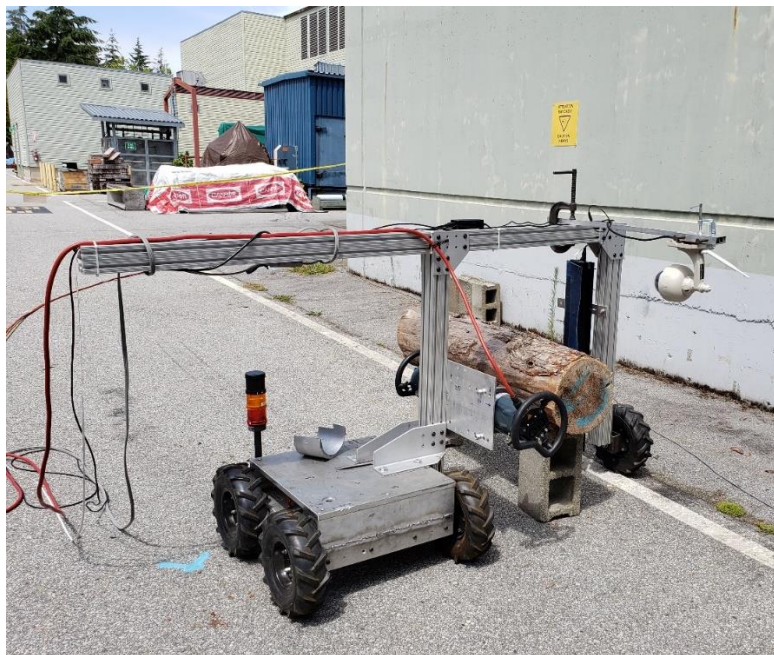


Figure 2 FPIinnovations' mobile x-ray scanner with a short log sample

Expected Outcome:

Design pro/con exploration and simulation results for at least two design options. A functional mobile platform, capable of carrying FPIinnovations' x-ray scanning system, which is modularly designed and can be easily fitted on another platform.

Resources available from the Customer:

The original rover was purchased from SuperDroidRobots (superdroids.com), which sells both parts and custom solutions. FPIInnovations will purchase parts (motors, wheels, controllers, etc.) from the same source, as well as other structural parts, as long as they are compatible with material used at FPIInnovations. The experts, software libraries, the user community of superdroids.com may also be helpful resources.

FPIInnovations has some in-house expertise, a test yard/pilot plants, tools, and lab infrastructure, which may potentially be available to students for short periods of time, subject to approval (especially given strict Covid-19 restrictions).

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