

Automated High-Voltage Wire Inspection Robot

Minimizing Human Effort through Automation

01

Problem Statement:



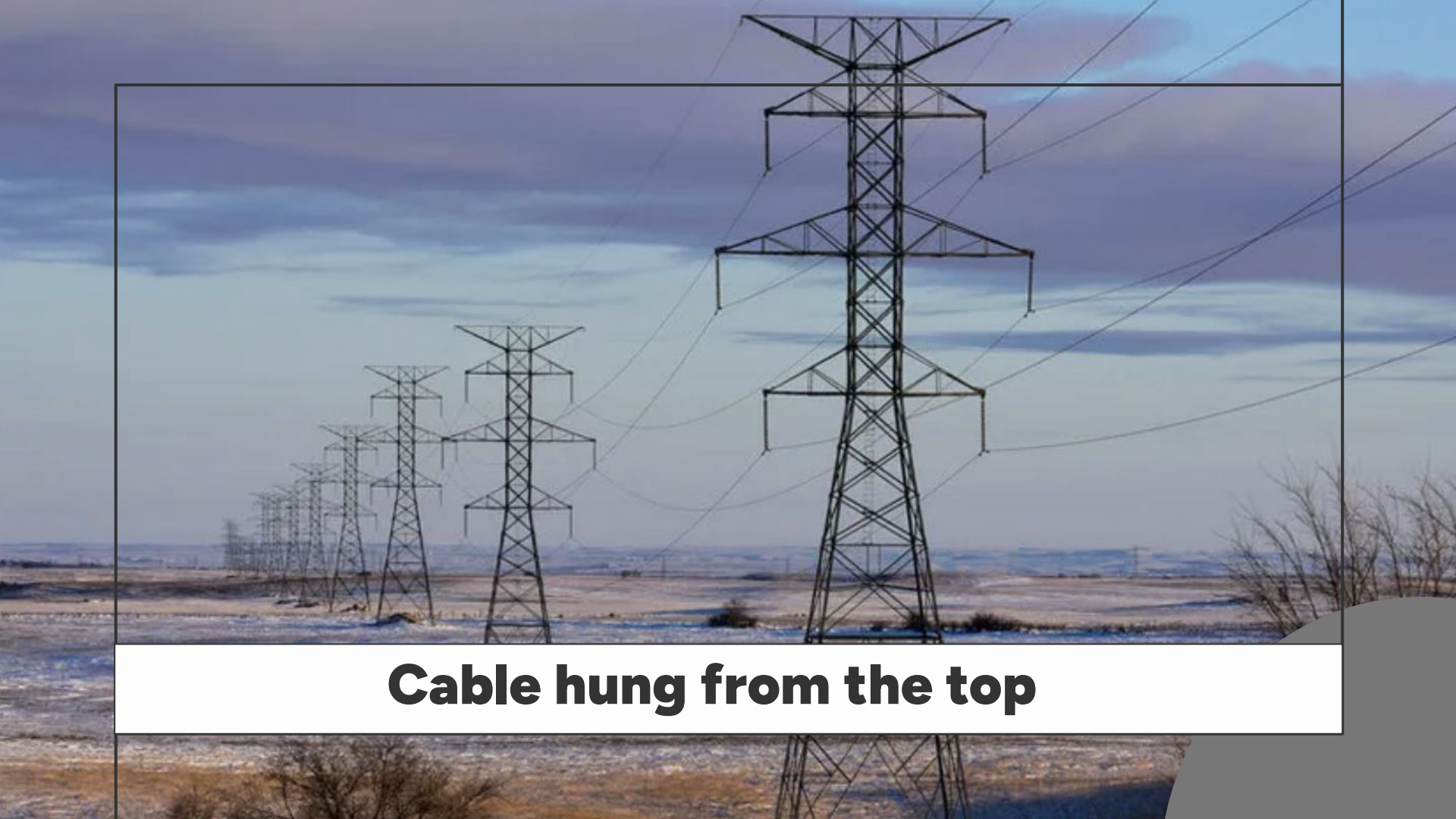
- High-voltage wire inspection is **risky** and **labor-intensive**.
- Manual inspection exposes workers to danger (e.g., electrical shocks, height risks).
- Need for an automated solution to minimize human intervention.

Our Solution:

- A **robot** that moves **along** high-voltage wires to perform inspections using sensors and a mechanical arm system.

WHY

- Increased safety for human workers.
- Continuous and consistent wire inspection with less downtime.
- Potential to reduce maintenance costs by identifying issues before they become critical.
- Applicable in environments that are difficult or dangerous for humans to access (e.g., power lines, remote areas).

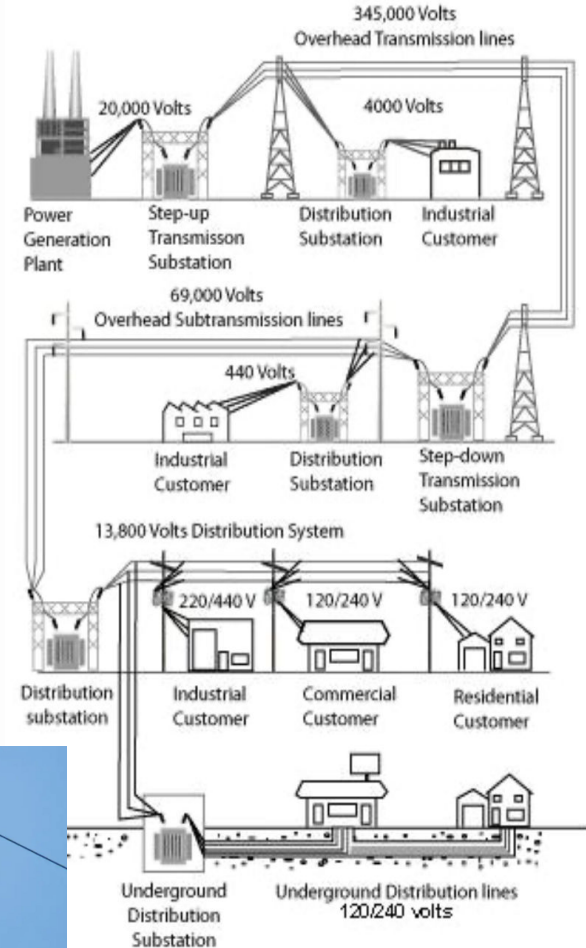
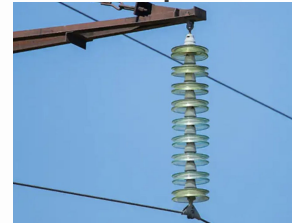


Cable hung from the top

Which lines

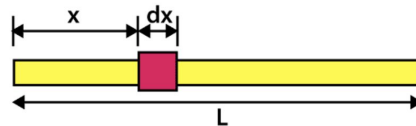
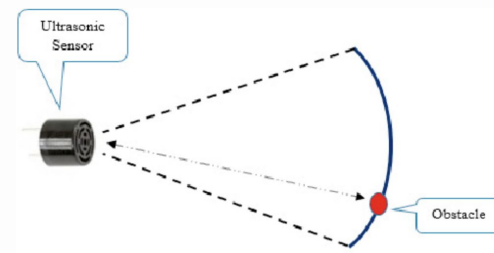
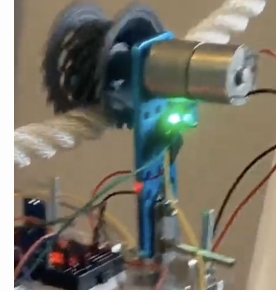
From main power station to distribution substation the transmission voltage range between

- long transmission lines-
345 kV | >150Km | 30mm | $\Phi 65\text{mm} \times 15$ disc
- medium transmission lines
69 kV | b/w 150Km & 50Km | 20mm | $\Phi 65\text{mm} \times 8$ disc
- short transmission lines
11 kV | <50Km | 10mm | $\Phi 65\text{mm} \times 4$ disc
- ACSR Cables | 0.12

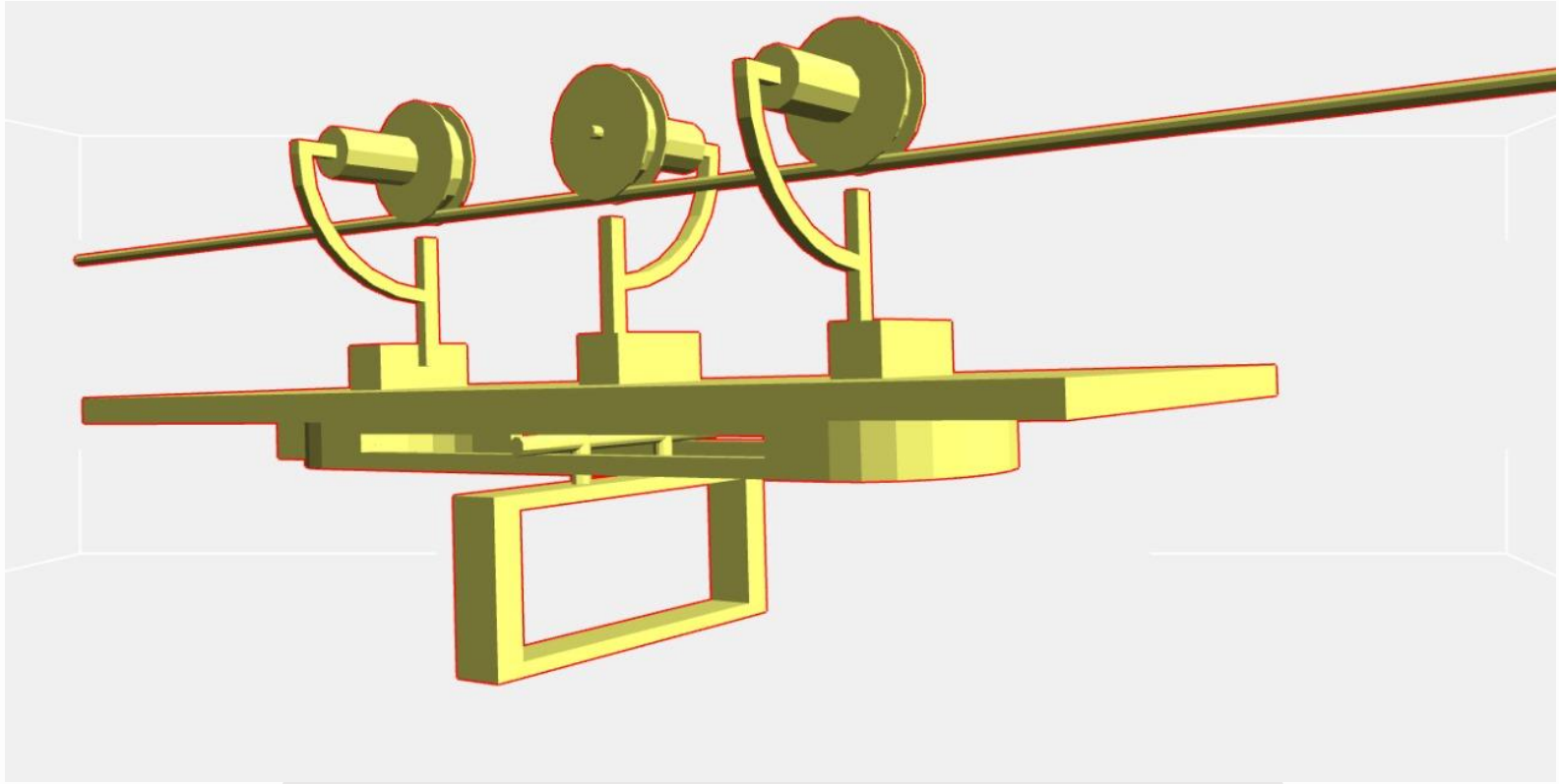


Concep

- The robot hangs on the high-voltage wire using three motorized arms with wheels for mobility.
- Uses cameras and other sensors for wire inspection.
- Automatically navigates through junctions and insulators without falling off or causing vibrations by using various sensors and calibration of them.
- COM management mechanism for the movement of battery.



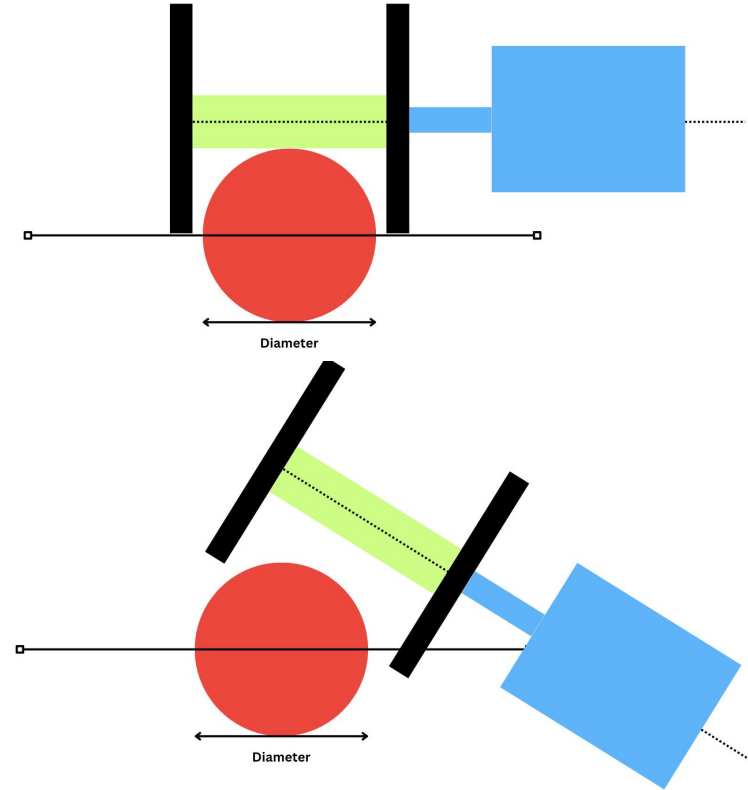
Rough Prototype



How the Robot Crosses Junctions

Key Steps:

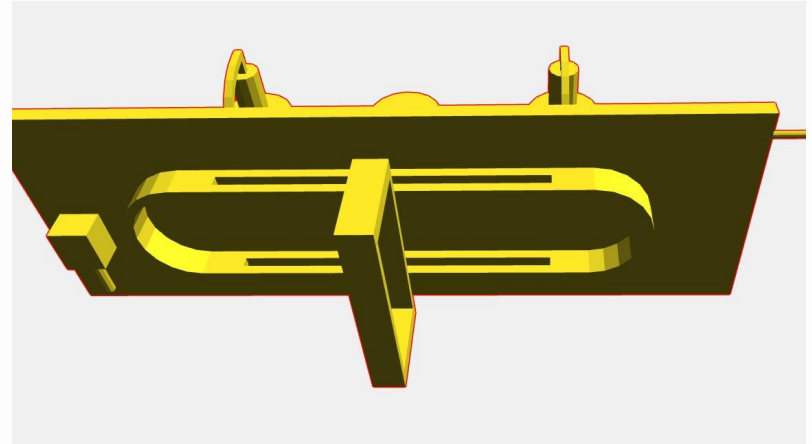
1. Robot detects an approaching junction (using proximity sensors or cameras).
2. The first arm opens at 45° and detaches from the wire.
3. The robot moves until the first arm is past the junction.
4. The arm reattaches to the wire, the sensor checks the proper fitment of the wheel
5. The second and third arms repeat the process.



How the Robot Crosses Junctions

Balance Mechanism:

- To avoid tipping, the battery (CoM) is shifted towards the remaining two arms during the crossing process.



Challenges yet to overcome



Proper engagement and disengagement of wheel



Sensors to mount, and data processing



Stability, calculation for the centre about which rotation of arm will happen.

Feedback 😊

Thanks!