

Introduction

• Elevator Pitch

Safe and affordable inspection robot for oil and gas facilities, the RCMPV offers modular sensors, real-time monitoring, dual mobility with wheels or tracks, and onboard data buffering—delivering reliable inspections while keeping workers out of harm’s way.

• Problem Statement

This project will design and prototype a modular inspection vehicle that uses real-time sensing, dual mobility, and interchangeable sensors to detect hazardous conditions in pipelines, improving worker safety, inspection reliability, and overall operational efficiency.

Objectives

• This project aims to design a modular, remotely controlled inspection vehicle capable of operating in hazardous industrial environments, detecting gas leaks and structural issues, providing real-time monitoring, and allowing workers to safely conduct inspections from a distance.

Constraints

- Budget less than 8000 SAR
- Size: ≤ 350 mm width, ≤ 500 mm height
- Weight not exceeding 10 kg
- Remote control range ≥ 200 meters
- Operating time ≥ 3 hours
- Mobility on wheels and tracks
- Sensor accuracy within $\pm 1\%$
- AES-256 encrypted communication
- IP67 dust and water resistance

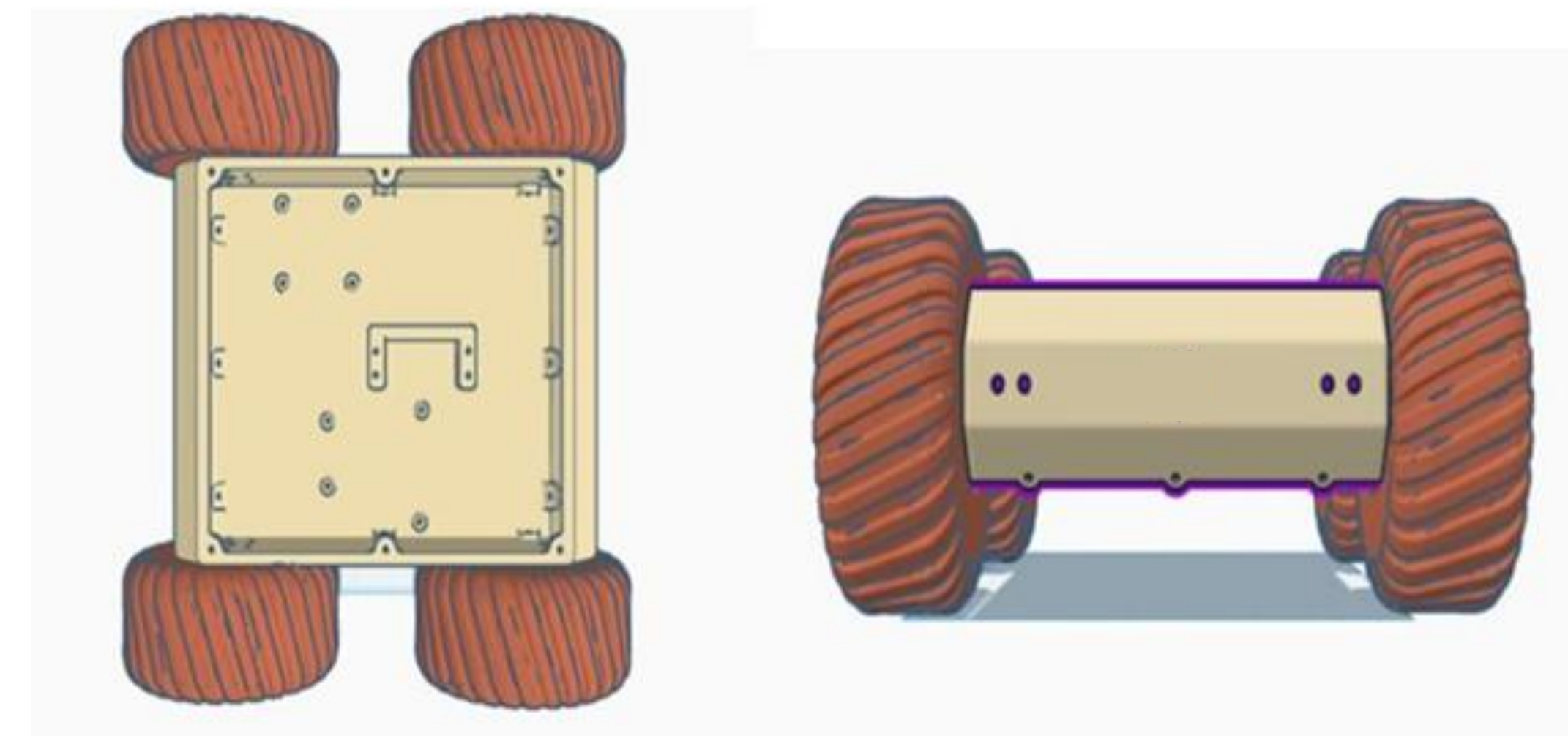
Specifications

- Real-time monitoring, 1080p camera
- Dual mobility: wheels and tracks
- Gas sensors (CH_4 , H_2S , O_2) with $\pm 1\%$ accuracy
- Sampling rate ≥ 10 samples/s
- Onboard data buffering for images and video
- Runtime ≥ 3 hours per charge
- Remote control range ≥ 200 m

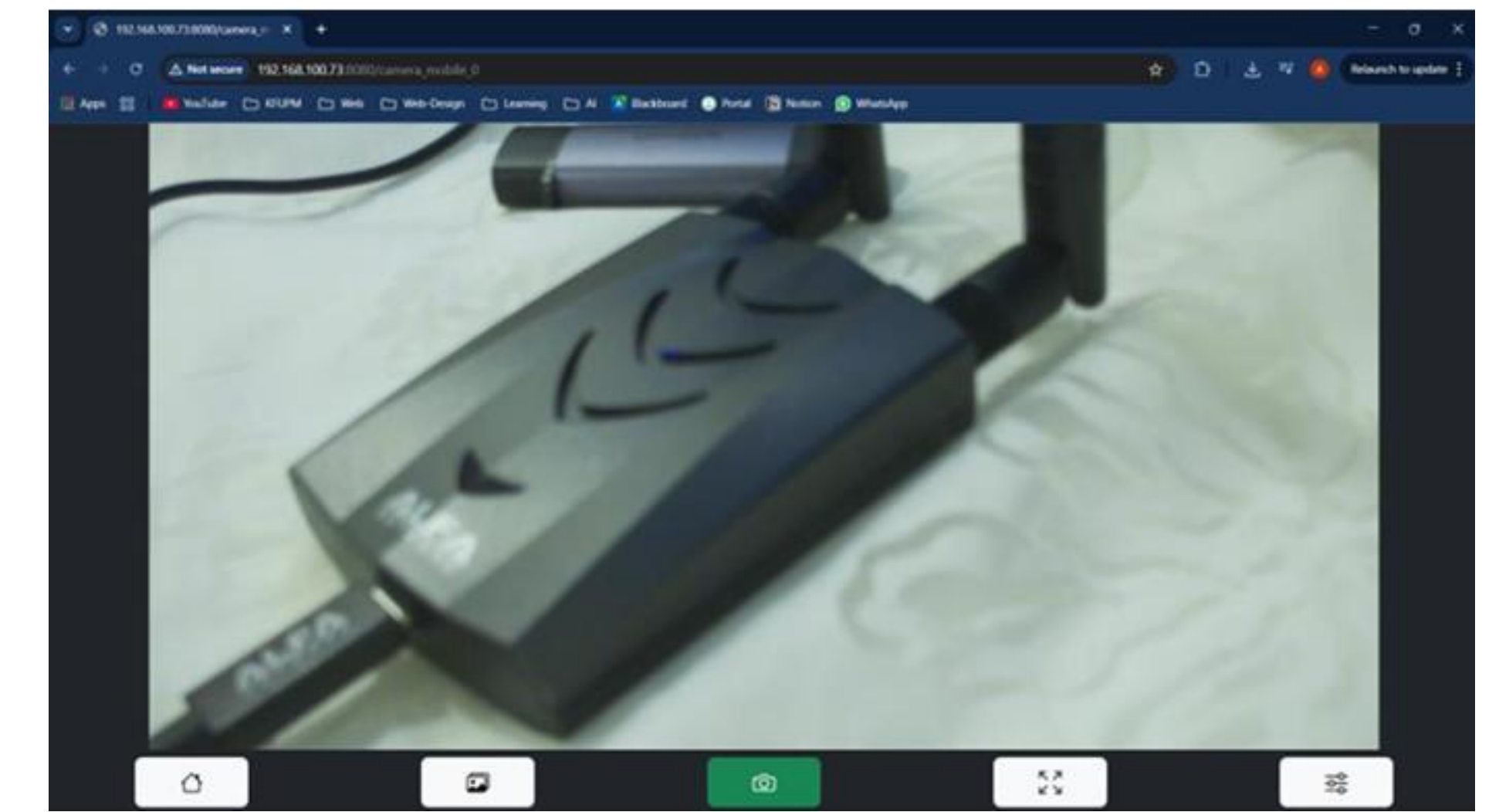
Discipline Contributions

- **ME:** Chassis design, mobility system, and assembly.
- **EE:** Power system, motor control, and sensor wiring.
- **CS:** Communication, remote control, and data processing.

Prototype Design & Validation



• Body design



• Real-Time Camera View through Wi-Fi

Analog Value	Voltage
522	2.55 V
523	2.56 V
523	2.56 V
520	2.54 V
518	2.53 V
518	2.53 V
518	2.53 V

• H2S Sensor test result



• Prototype & Testing

Conclusion

• The RCMPV prototype was successfully designed and assembled to support safe, real-time inspection in hazardous industrial environments. It achieved low cost, modular sensor integration, hybrid mobility, and secure remote operation, demonstrating a practical and reliable solution to reduce human risk during pipeline monitoring.