

# Developing Robot SHARE-C's Full Autonomy

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## INTRODUCTION

Healthcare systems face major challenges during infectious disease outbreaks, especially in managing immunocompromised and highly contagious patients.



These issues highlight the urgent need for innovative solutions to protect healthcare workers and improve patient care efficiency.

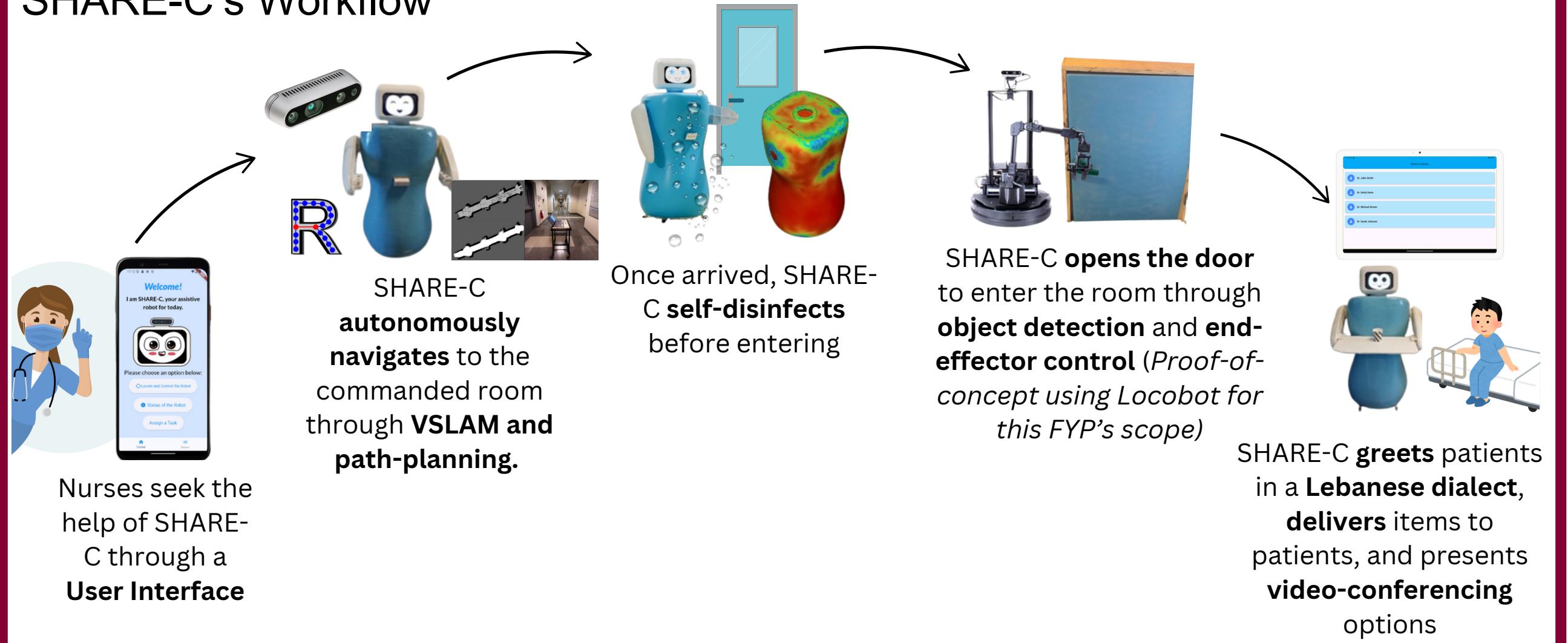
## RESEARCH GOAL

The main aim of this project is to advance Robot SHARE-C's **autonomous capabilities**. The following systems are developed and integrated:

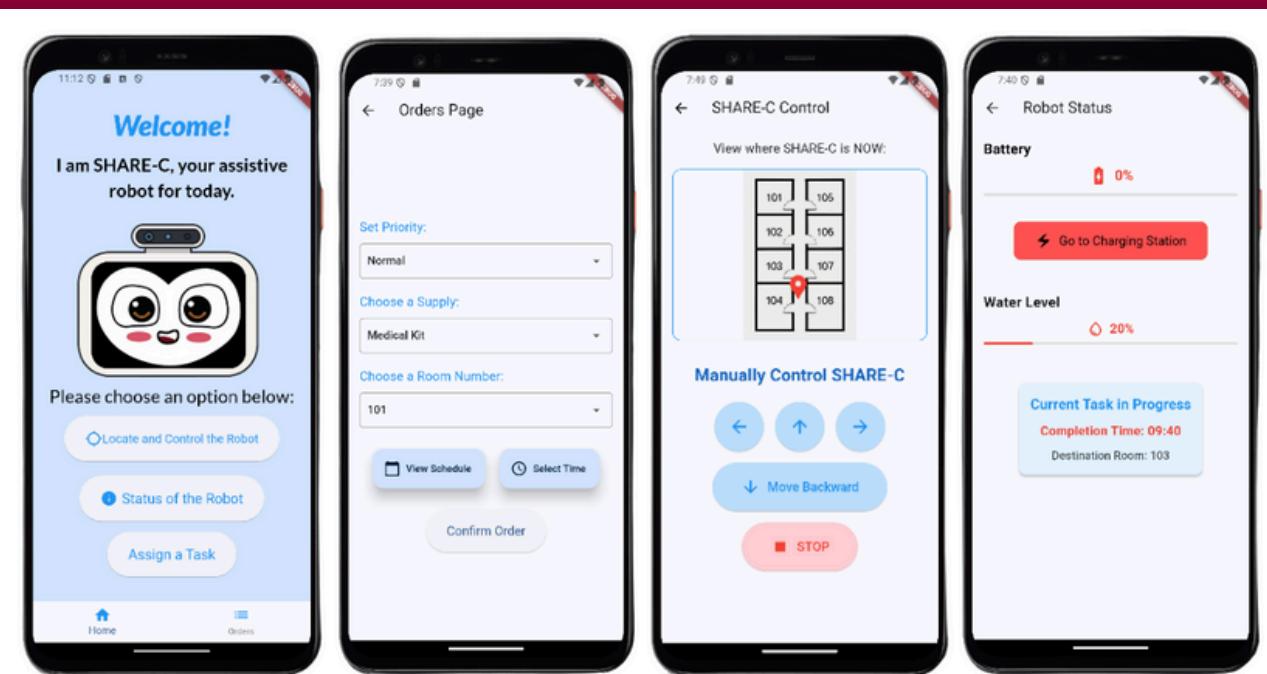
- Graphical User Interface
- Autonomous Navigation
- Differential-Drive Locomotion System
- Self-Disinfection System
- Door Opening Mechanism

## METHODS

### SHARE-C's Workflow

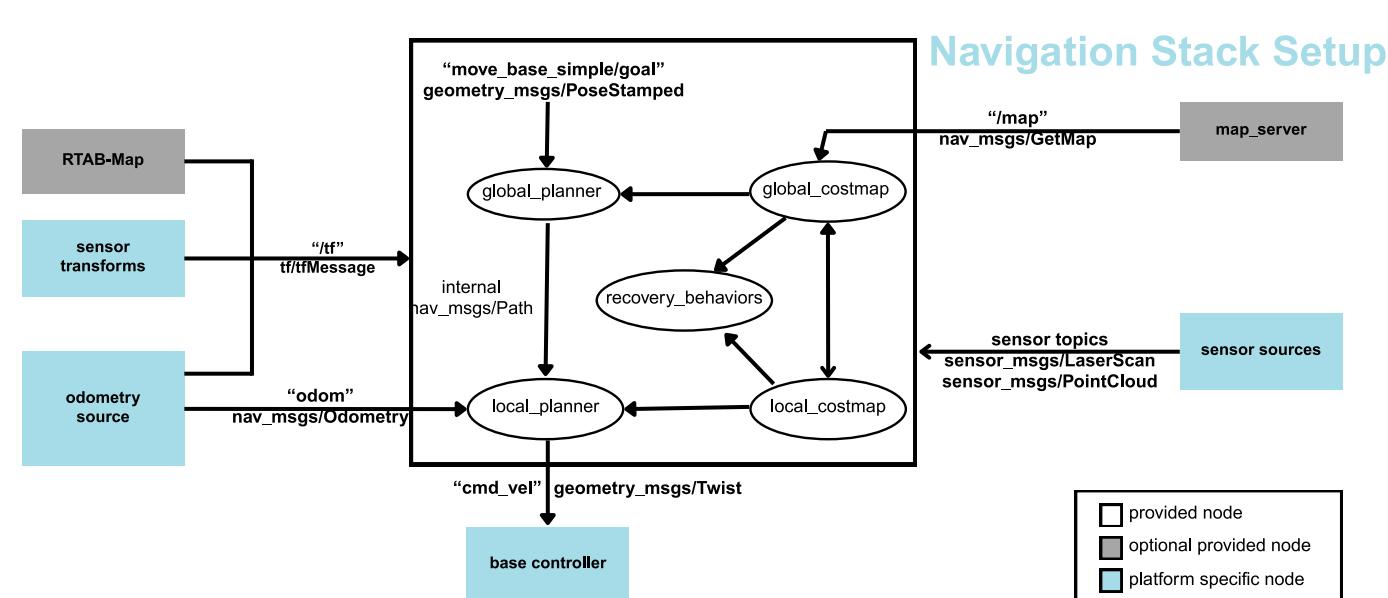
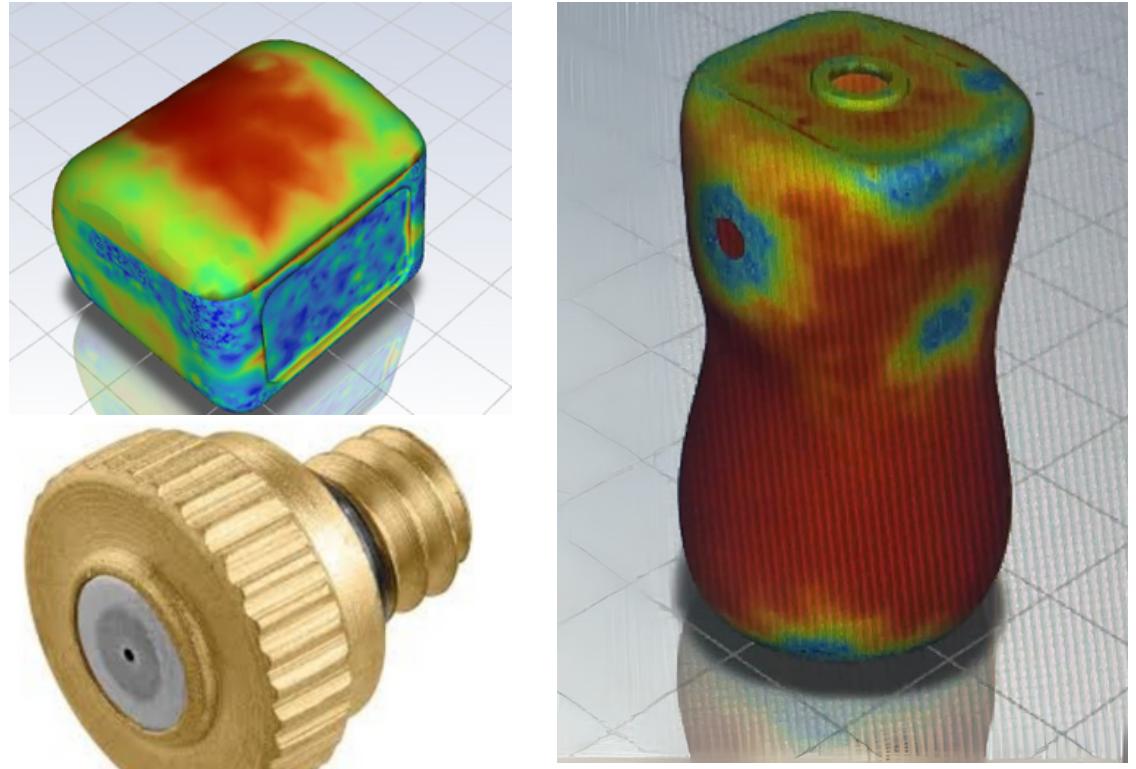


## FIGURES AND RESULTS

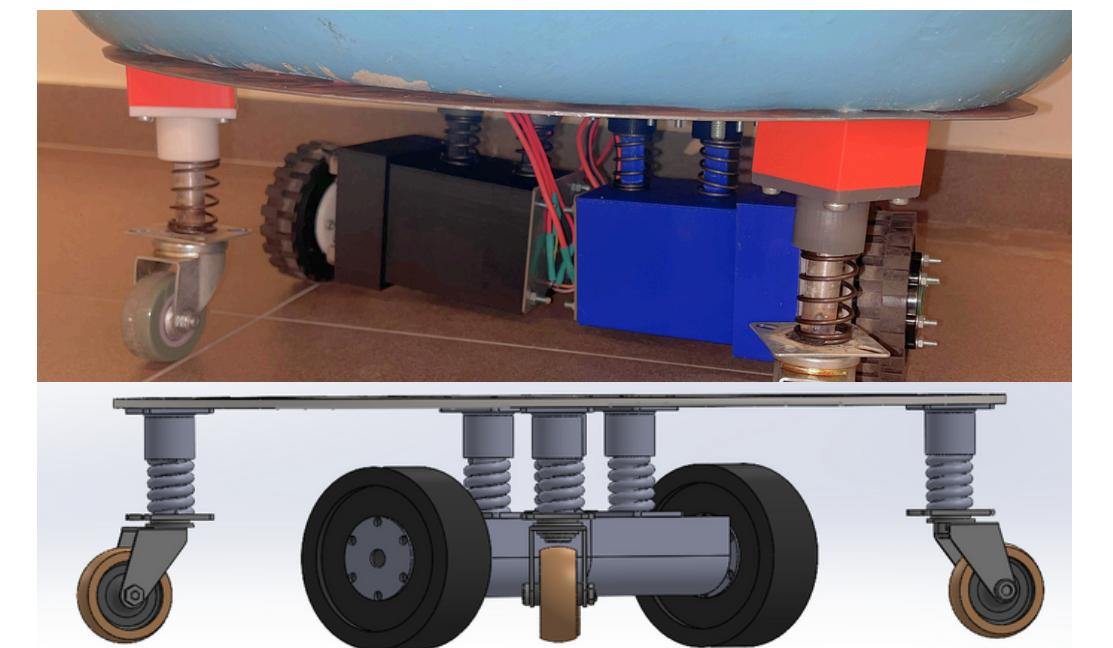


The developed **user-interface** is a mobile application designed for medical staff to easily schedule tasks, monitor the robot's live location, track battery and fluid levels, and access manual control functions—all in one intuitive platform.

The **self-disinfection system** involves: (1) designing and positioning spray **nozzles**, (2) simulating coverage using **ANSYS Fluent**, and (3) optimizing flow rates and nozzle angles to achieve efficient **surface sanitization** with minimal fluid use and overspray.

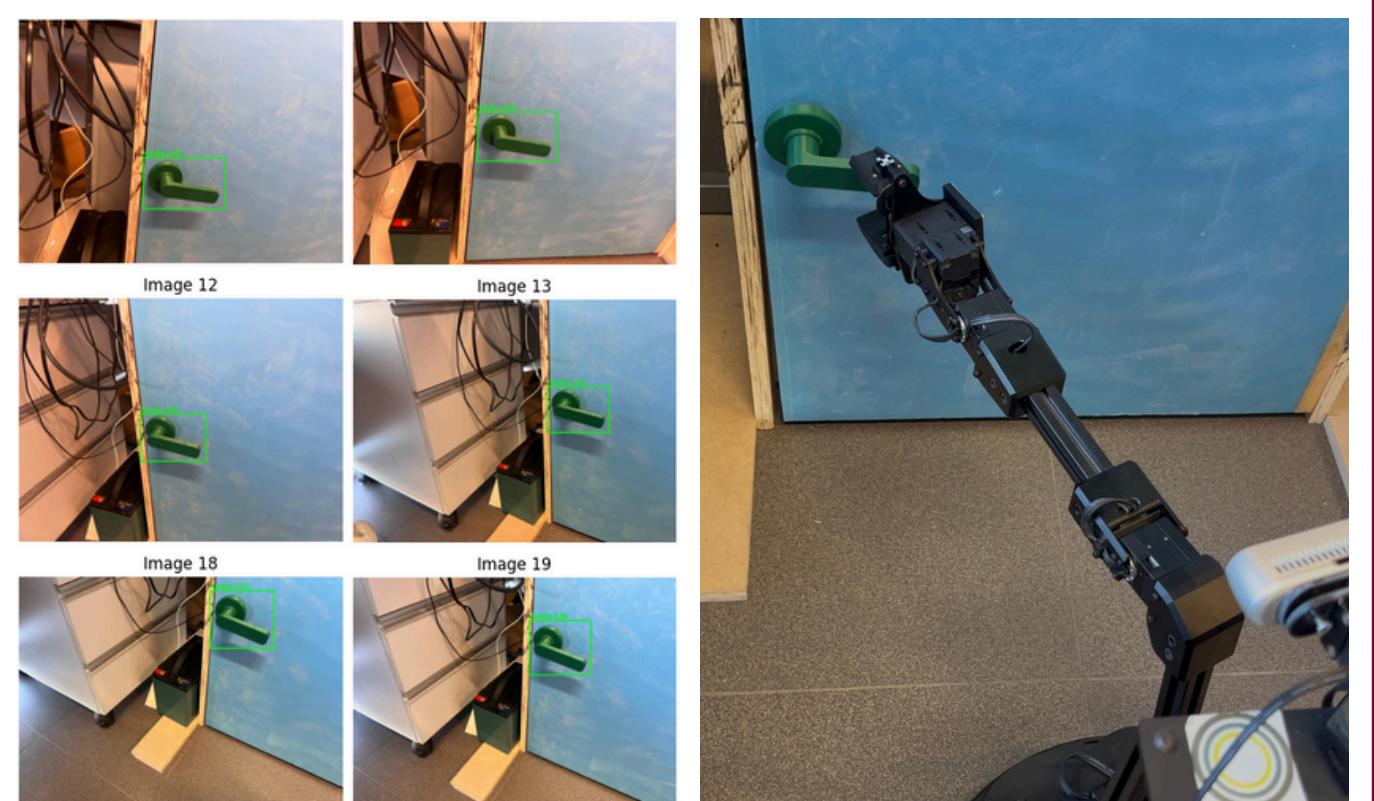


A full **Autonomous Navigation** (RTAB-MAP SLAM and Path Planning) system developed using the **ROS Navigation Stack**

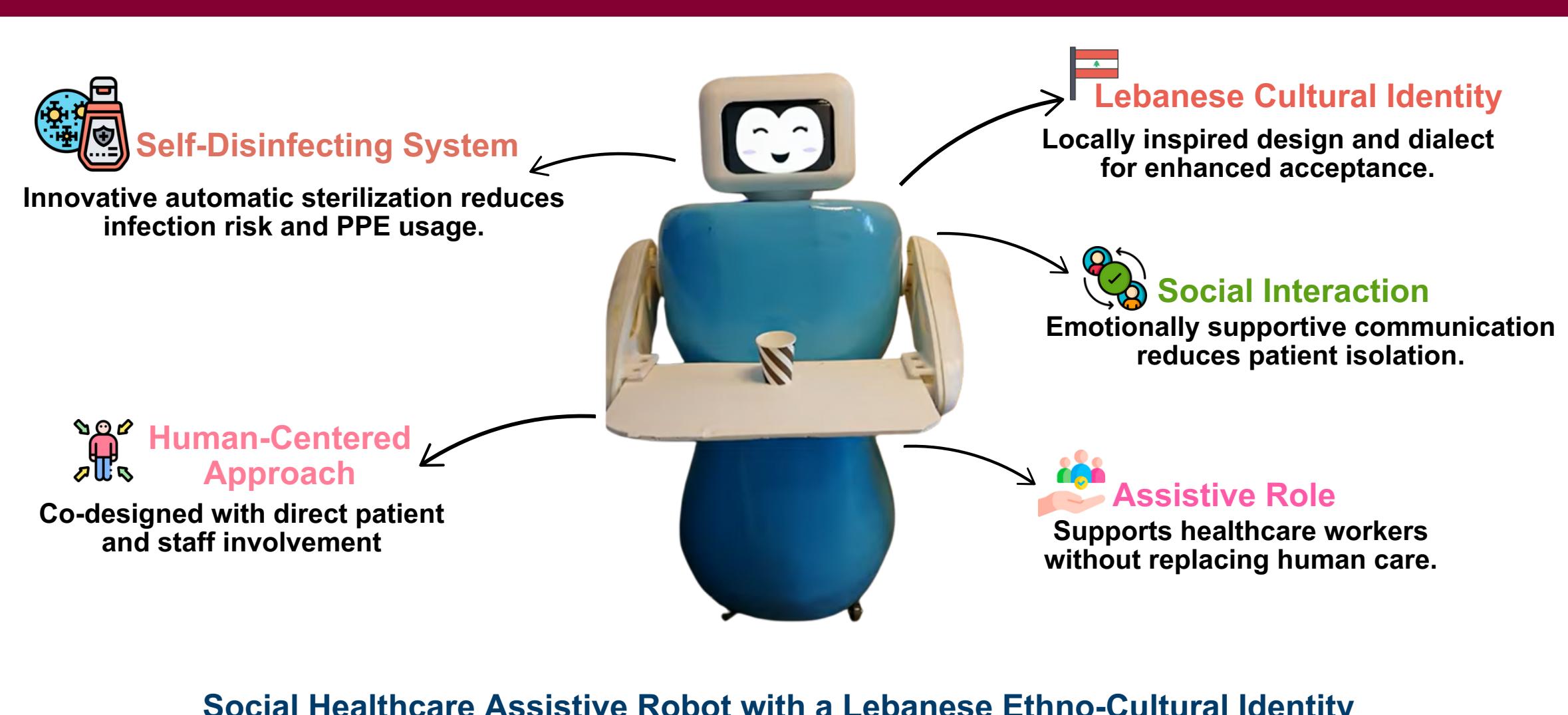


The base consists of a **spring-based suspension** and compact mechanical design for **smooth navigation** over uneven terrain, offering both **stability** and modular **flexibility** for dynamic environments.

A **custom computer vision model** based on **YOLOv3-tiny** is used to detect the handle and its **position** which is then manipulated accordingly by the arm using **PyRobot** and **ROS Kinetic** to rotate it and pull the door.



### What's so CREATIVE about SHARE-C?



**Social Healthcare Assistive Robot with a Lebanese Ethno-Cultural Identity**

## CONCLUSION

This project focused on advancing SHARE-C toward full autonomy in hospital settings by developing key components such as **Graphical User Interface**, **Autonomous Navigation**, a **Differential-Drive Locomotion System**, **Self-Disinfection System** and **Door Opening Mechanism**. Together, these components contribute to minimize the risk of infection and support nurses' jobs at AUBMC.

## ACKNOWLEDGMENTS

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## REFERENCES

M. M. Ismail, Self-disinfecting robots for hospital use, Master's thesis, Dept. of Mechanical Engineering, American University of Beirut, Beirut, Lebanon, Apr. 2022.



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