# **ROCO507Z Advance Robot Design and Prototyping: Project Proposal for an Autonomous Health Care Logistics Robot using NeoSLAM.**

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# **Abstract**

We propose an easily disinfected mobile robot to undertake tasks in a hospital setting, which would otherwise risk human exposure to infectious agents, such as COVID-19. In this work, a multifunction platform is proposed, configurable for logistics and the sanitization of its environment.

### **Introduction**

### **Aims and objectives.**

CAD Design of several modular mechanical units:

* A wheeled base, suitable for locomotion in constrained hospital environments
* A scissor lift and conveyor mechanism, suitable for placing objects on surfaces without human contact
* A UV sanitizing air filtration system
* A sanitizing sprayer, adjustable for targeting particularly contagious areas.

Development of control software, for use in CopelliaSim:

* Direct human control
* Simple ultrasound object avoidance reflexes
* Integration with ROS
* Implementation of NeoSLAM for autonomous navigation

#### **Proposed Design**

**Purpose**

A logistics robot capable of multiple functions is extremely beneficial, although its size must be taken into consideration. In narrow corridors of busy hospitals, it would be unfavorable to have a large bulky autonomous robot. The main purpose of our robot is to transport materials around a hospital where needed. Materials such as paperwork, medical equipment (blood pressure cuffs, Dressings etc...) or even laboratory samples can be transported around a hospital without the supervision of a nurse/doctor. While transportation of materials is the main purpose, other functions such as air purification and sanitation of high traffic areas can also be incorporated. This is extremely beneficial regarding the current climate of COVID-19. A simple air tunnel can be incorporated in the design with the use of air filters and UVC LEDs to clean the air whilst travelling around its environment. The use of melamine resin (Glo Germ) in hand sanitizer provides an indication of which surfaces have been touched under UV light. This can also be incorporated in our design, when the fluorescent property of melamine resin is detected by the UV light, then a nozzle can sanitize the surface.

**Navigation**

The problem of autonomous navigation can be solved using a combination of methods. Path planning should be optimized for determining a collision-free or low traffic path. In the busy environment of a hospital, it is essential to follow a path which copes for a highly dynamic environment. In order to do this, simultaneous localization and mapping (SLAM) along with a neuro-evolution multi-layer perception (MPL) based controller **(ADD REFERENCE HERE)** can be combined, creating a NeoSLAM **(SLAM AND ROS REFERENCE)** method of navigation. The addition of LIDAR sensors, cameras and motor encoders can also be used to improve the accuracy of the localization and mapping process, but all may not be necessary. The use of motion sensors for example, can be place in corridors of hospitals. These will provide data as to how much traffic is in that area, this will contribute to the decision of determining the best possible path for the robot to take.

##### **Appendix**

**References**

Glo Germ reference   
  
**(JAMES- IS THIS THE NEOSLAM IN QUESTION?)**  
Kang, J.G., An, S.Y., Kim, S. and Oh, S.Y., 2009, December. A new approach to simultaneous localization and map building with learning: Neoslam (neuro-evolutionary optimizing). In *2009 IEEE International Symposium on Computational Intelligence in Robotics and Automation-(CIRA)* (pp. 278-284). IEEE.

**Initial design images**