Designing Collaborative Robots for Industrial Environments

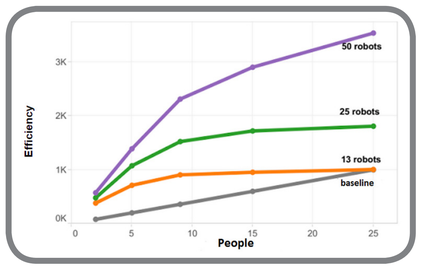
Locus Robotics
SCOPE 2014-2015

Project Goal

Design a flexible, collaborative robot to improve efficiency in industrial environments by assisting human workers in a safe, intuitive, and cost-effective manner.

Simulation

Our 2-D simulation in Python + ROS visualizes how robots and humans interact in the intended environment. This allows us to **investigate the effects of parameters like robot speed and size** on the overall system and **justified our mechanical design decisions**.

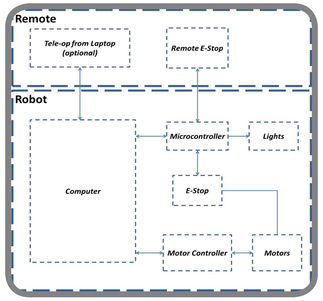


A graphical user interface (GUI) allows non-technical users to control the simulation parameters.

Human-Robot Safety

In addition to a r**obust obstacle navigation with 270° field of view**, the robot has a redundant emergency stop system:

- **Physical E-STOP on the robot** instantly kills power to the motors when pressed
- **Remote E-STOP (operating over radio)** can kill the motors if the physical E-STOP cannot be pressed



Lights & Signaling

A two-section signal light exists on each corner of the robot, allowing movement and status indications to be seen from all angles. Each light section contains an RGB LED strip, independently controlled by an onboard Arduino.

Team

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Advisor

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Liaisons

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Final Prototype: Mobile Base

The mobile base **contains the drivetrain and sensing/computing elements of the robot.** It consists of an aluminum sheet metal base frame covered by a FDM and DiBond (aluminum composite) shell.

Modular mounting design allows mobile base to interface with different upper structures

Hokuyo LIDAR & Point Grey camera allow for 270° obstacle avoidance

Top hatch provides easy access to electronics for maintenance and debugging

Battery compartment slides out for easy battery charging & replacement

Signal lights at all 4 corners provide movement and status indications to workers