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A ROS 2 Package for Dynamic Collision Avoidance Based On On-Board Proximity Sensors for Human-Robot Close Interactions

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Introduction

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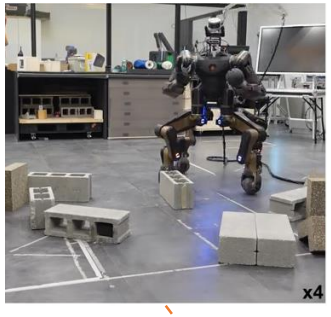
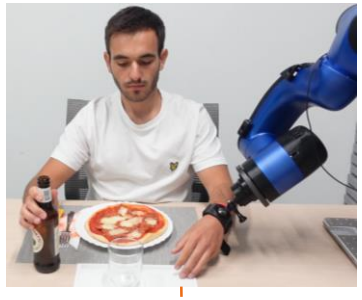
Collaborative Robotics





navigation teleoperation co-workers care givers assistance

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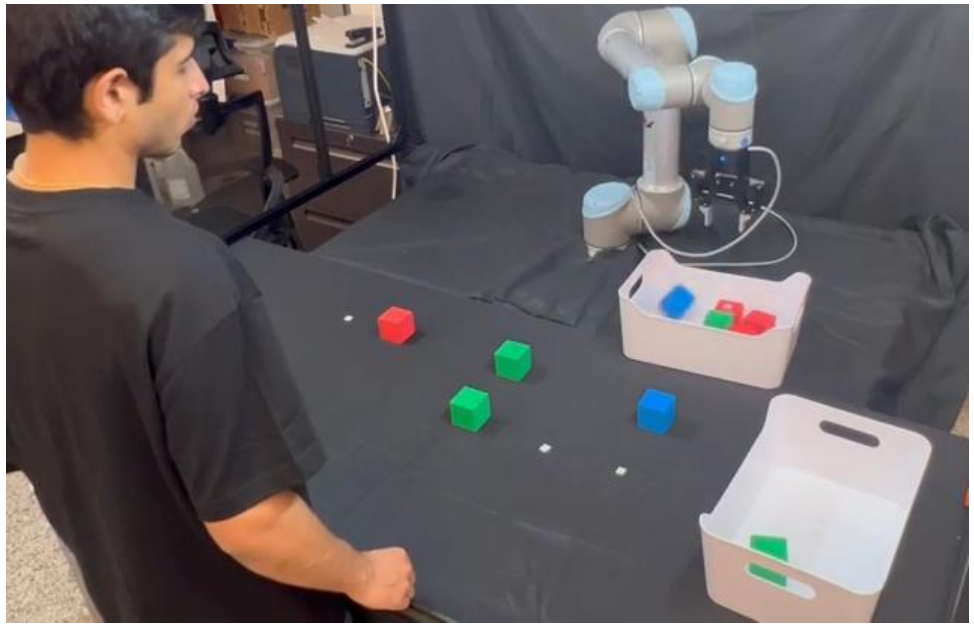
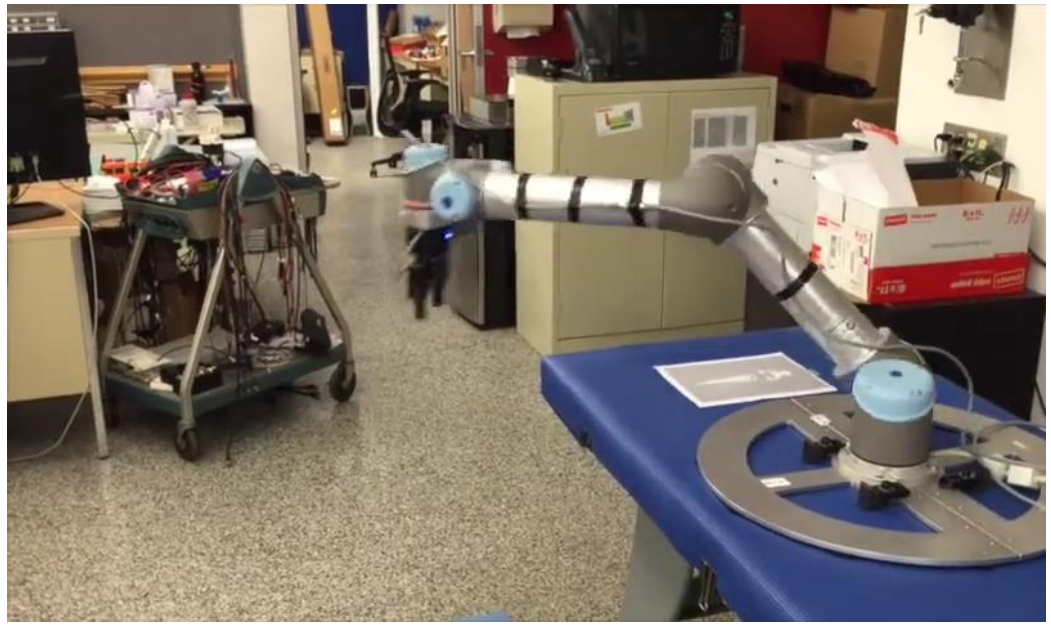
Sharing Workspaces



Dynamic Collision Avoidance!



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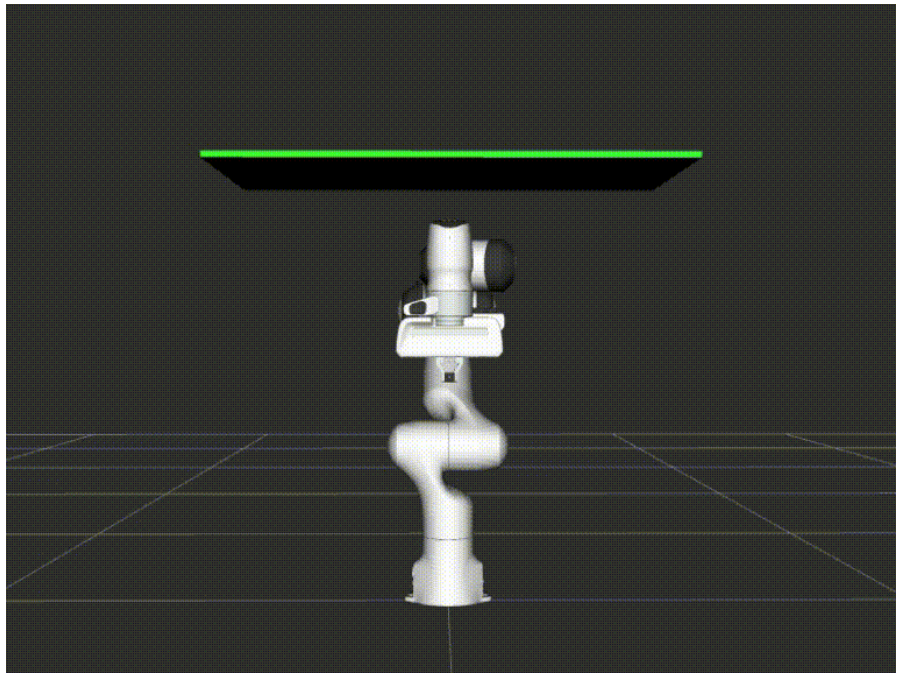
Dynamic Collision Avoidance!



Occlusions!

Full Trajectory Replanning!

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GOAL

Enabling human robot seamless close interactions

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Proposed Approach

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1) LightWeight Robot

2) Equip. On Board Proximity Sensors

On-Board Sensors Body Cells

Proximity Sensors

Free From Occlusions !

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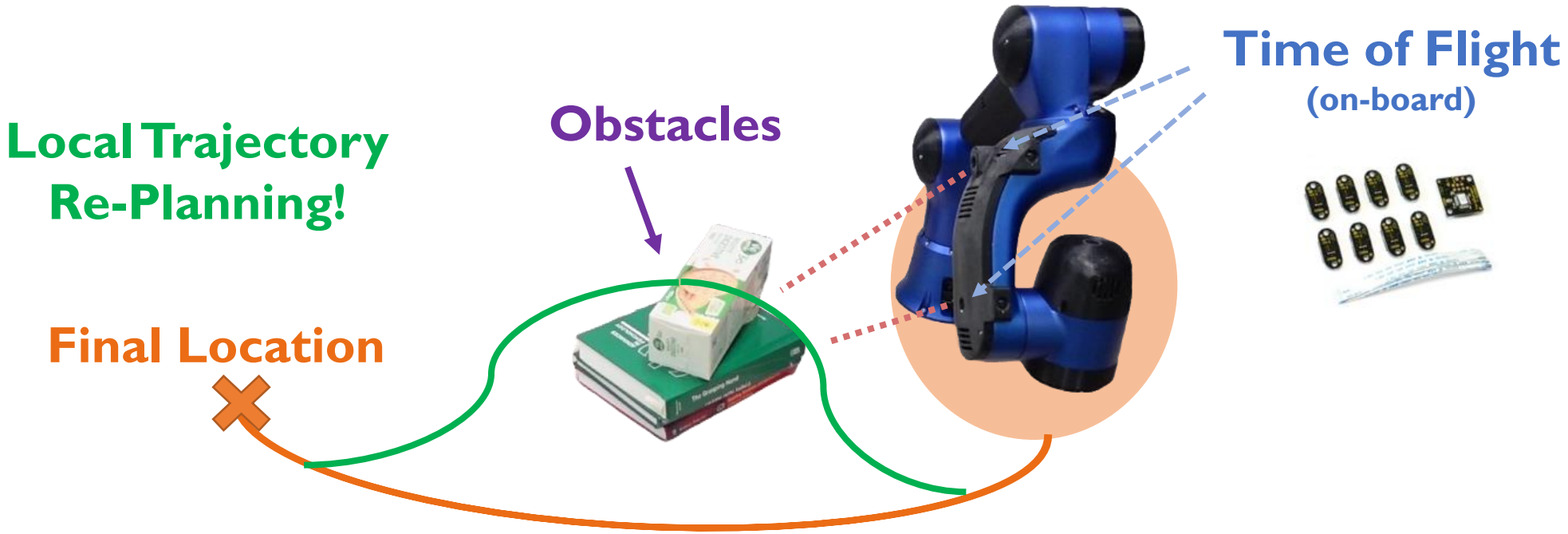
3) Dynamic Collision Avoidance



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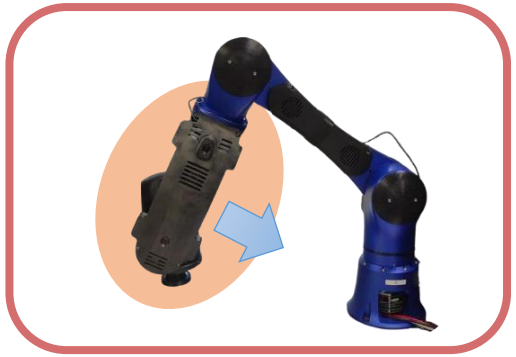
ROS 2 Package!



https://github.com/ADVRHumanoids/ProximityBasedDynamicCollisionAvoidance

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How it works

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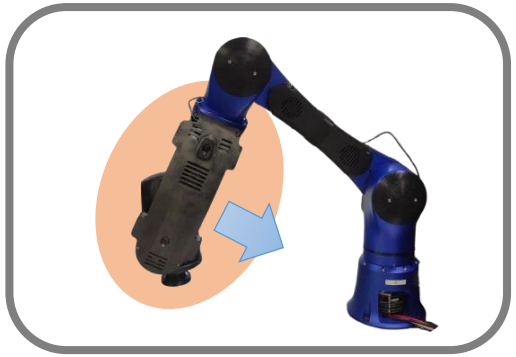
Initialization



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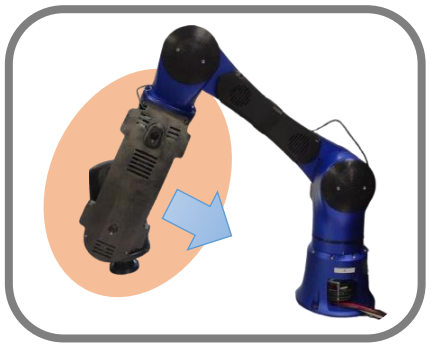
Parameters Settings

```
/robot/dyn_coll_avoid_settings:
  ros__parameters:
    robot_initial_config: [0.0,-1.56,0.9,0.2,-0.5,1.12]
    robot_urdf_model_path: "/home/liana/ros2_ws/src/ROS2UtilityNodes/urdf/inail2arm.urdf"
    robot_base_frame_name: "base_link"
    robot_tip_frame_name: "arm1_6"
    topic_motion_subscriber_name: "/robot/motion_planning"
    topic_sensors_subscriber_name: "/robot/sensors_data"
    topic_robot_publisher_name: "replanning"
    sensors_frame_name: ["teraflex_1_sensor1_link","teraflex_1_sensor2_link","teraflex_1_sensor3_link",
    distance_threshold: 0.20
    correction_time: 0.4
    n_sensors: 6
    rate: 5
    log_path: "/tmp/replanner"
```

Initialization



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Run-Time Package Execution

https://github.com/ADVRHumanoids/ProximityBasedDynamicCollisionAvoidance

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Package Execution

liana@liana-MS-7820: ~/ros2_humble

liana@liana-MS-7820: ~/ros2_humble 101x55

```
liana:~$ cd ros2_humble/src/
liana:~/ros2_humble/src$ git clone https://github.com/lia2790/ROS2PackageForDynamicalCollisionAvoidanceBasedOnProximitySensors.git
Cloning into 'ROS2PackageForDynamicalCollisionAvoidanceBasedOnProximitySensors'...
remote: Enumerating objects: 240, done.
remote: Counting objects: 100% (240/240), done.
remote: Compressing objects: 100% (184/184), done.
remote: Total 240 (delta 124), reused 132 (delta 51), pack-reused 0 (from 0)
Receiving objects: 100% (240/240), 67.10 KiB | 2.68 MiB/s, done.
Resolving deltas: 100% (124/124), done.
liana:~/ros2_humble/src$ cd ..
liana:~/ros2_humble$ colcon build
Starting >>> dyn_collision_avoid
[Processing: dyn_collision_avoid]
Finished <<< dyn_collision_avoid [44.4s]
Starting >>> utility_nodes
Finished <<< utility_nodes [1.20s]

Summary: 2 packages finished [45.8s]
liana:~/ros2_humble$ source install/local_setup.sh
liana:~/ros2_humble$ ros2 launch dyn_collision_avoid dynamic_collision_avoidance.launch.py
```

lia2790/ROS2PackageFor

github.com/lia2790/ROS2PackageForDynamicalCollisionAv...

Relaunch to update

Dizionario Ital... Google Tradut... Google Scholar Accedi Overleaf, Edit... image tool

README

Installation

To Install the dynamic collision avoidance package run

```
git clone https://github.com/lia2790/ROS2PackageForDynamic
```

inside the ***src folder*** of the workspace and then run

```
colcon build
```

in the main folder of the ros2 workspace

Execution

To execute the code, just run:

```
ros2 launch dyn_collision_avoid dynamic_collision_avoidanc
```

Remember to source `install/local_setup.sh`, by simply

```
source install/local_setup.sh
```

You should get a similar output

```
[INFO] [launch]: All log files can be found below /home/li
[INFO] [launch]: Default logging verbosity is set to INFO
[INFO] [DynamicCollisionAvoidance-1]: process started with
[DynamicCollisionAvoidance-1] [INFO] [1717271104.387412824
[DynamicCollisionAvoidance-1]
[DynamicCollisionAvoidance-1] [INFO] [1717271104.390868768
[DynamicCollisionAvoidance-1]
[DynamicCollisionAvoidance-1] frame names : teraflex_1_ser
[DynamicCollisionAvoidance-1] frame names : teraflex_1_ser
```

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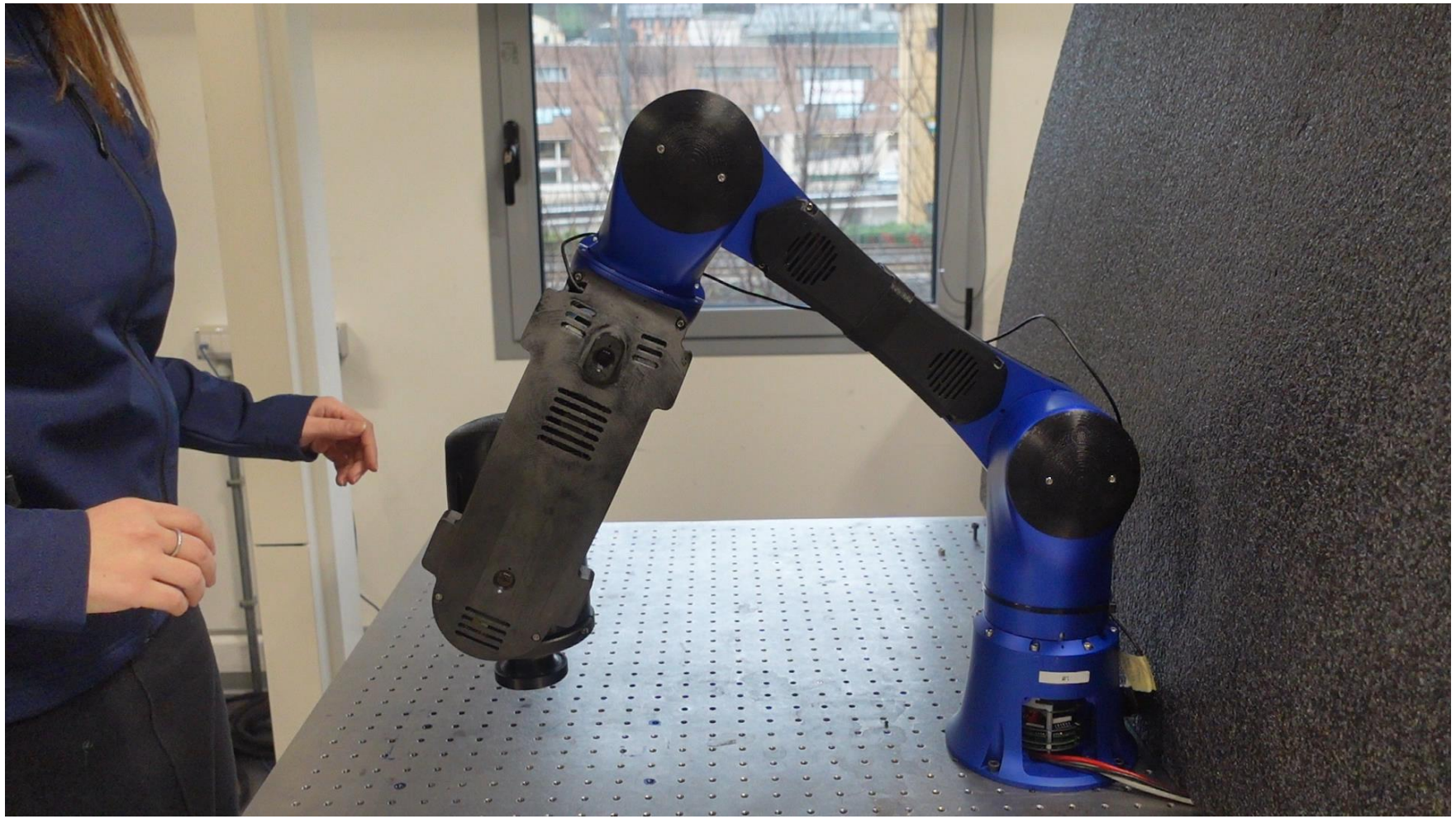
Showcase



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Co-Assembly

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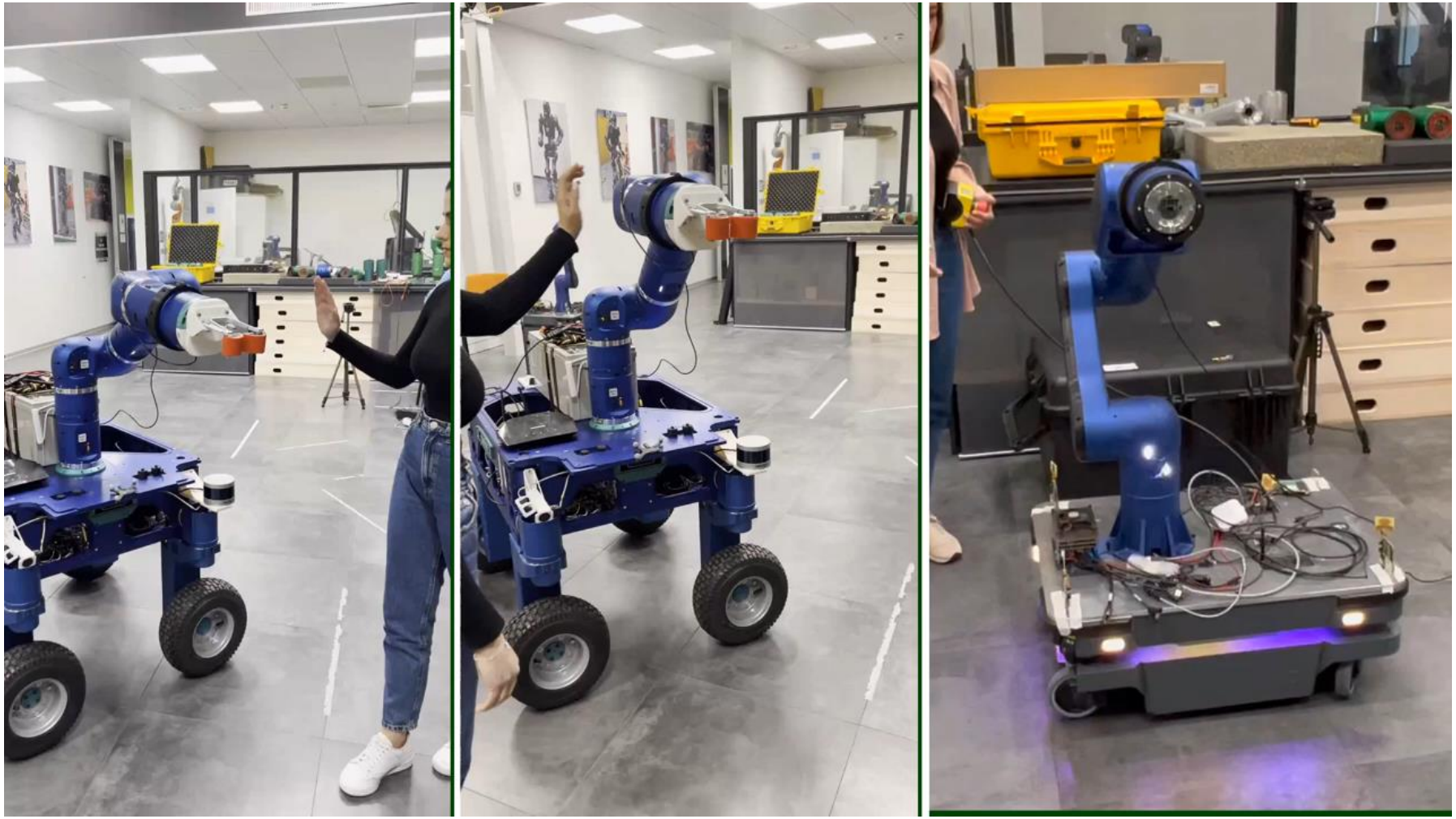
With a Mobile Robots



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- **Source code**
  https://github.com/ADVRHumanoids/ProximityBasedDynamicCollisionAvoidance

- **Documentation/Instructions**
  https://github.com/ADVRHumanoids/ProximityBasedDynamicCollisionAvoidance

- **Projects**
  CONCERT: https://concertproject.eu/
  HARIA: http://haria-project.eu/

- **Publications**
  "Proximity Based Human-Robot Seamlessly Collaborations: A Framework for Close Interactions" (Under submission)

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Thank you !

Questions ?

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