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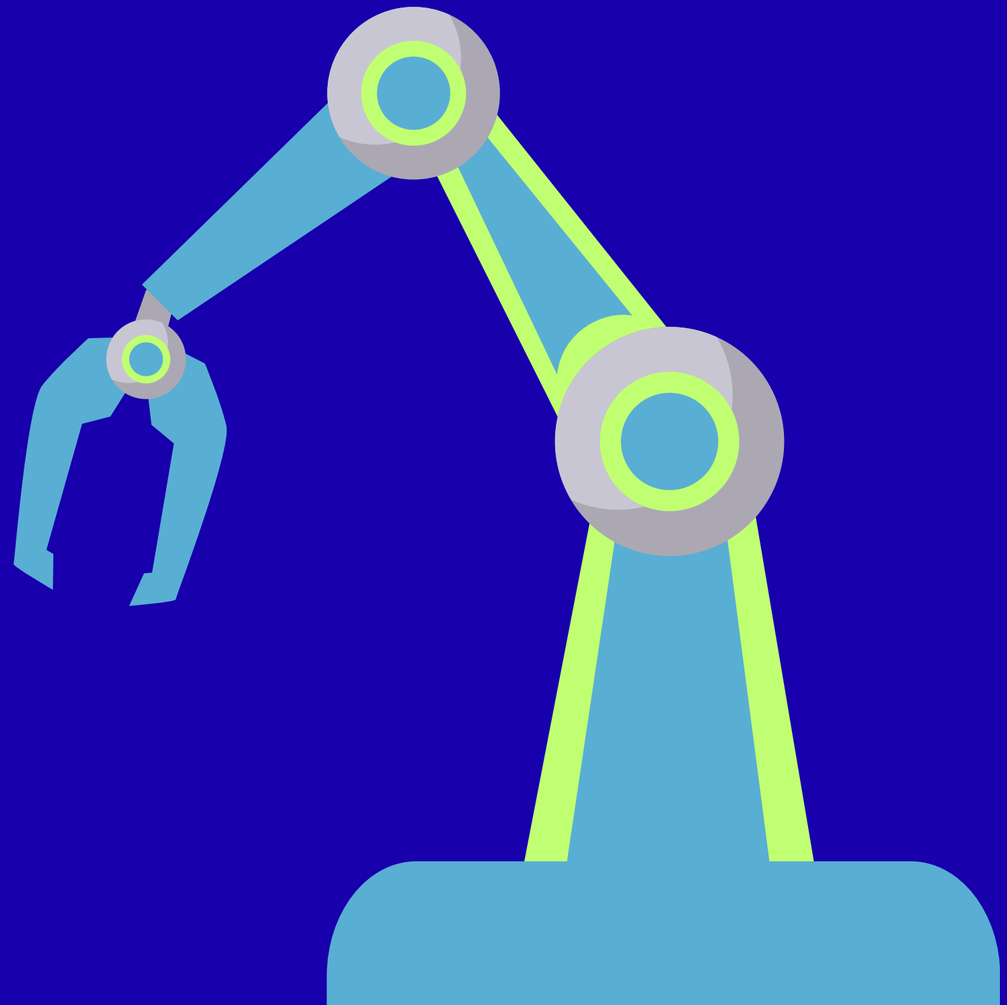
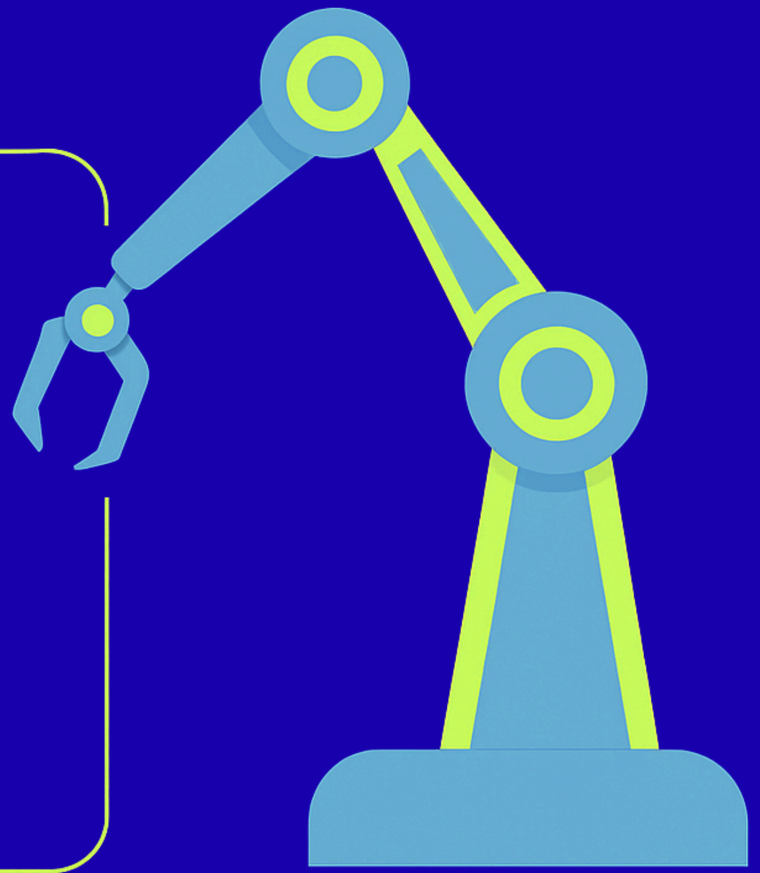
MOVEIT2

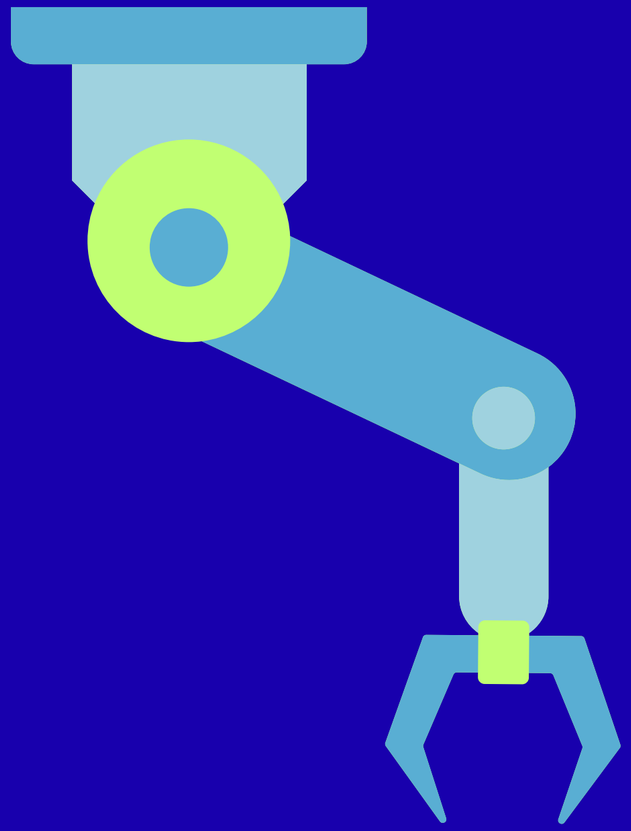


Presented by:
FAKOU Farah
ZAKI Douaa

OUTLINE



INTRODUCTION



MoveIt2 is an integrated development platform in ROS2, consisting of a variety of function packages for manipulating robotic arms, including: motion planning, manipulation, control, inverse kinematics, 3D perception, and collision detection.

The Simple Problem It Solves

Without MoveIt 2:

You'd have to calculate every angle for every joint manually

You'd have to check if the arm hits anything

Very complicated math!

With MoveIt 2:

You just say: "Move the hand to this position"

MoveIt 2 figures out HOW to do it safely

What Can It Do?

1. Plan Safe Paths

Like GPS for your robot arm - finds the best route from A to B without crashing

2. Avoid Obstacles

Sees objects (tables, walls, boxes) and moves around them

3. Pick Up Objects

Special functions to grab things properly

4. Work in Simulation

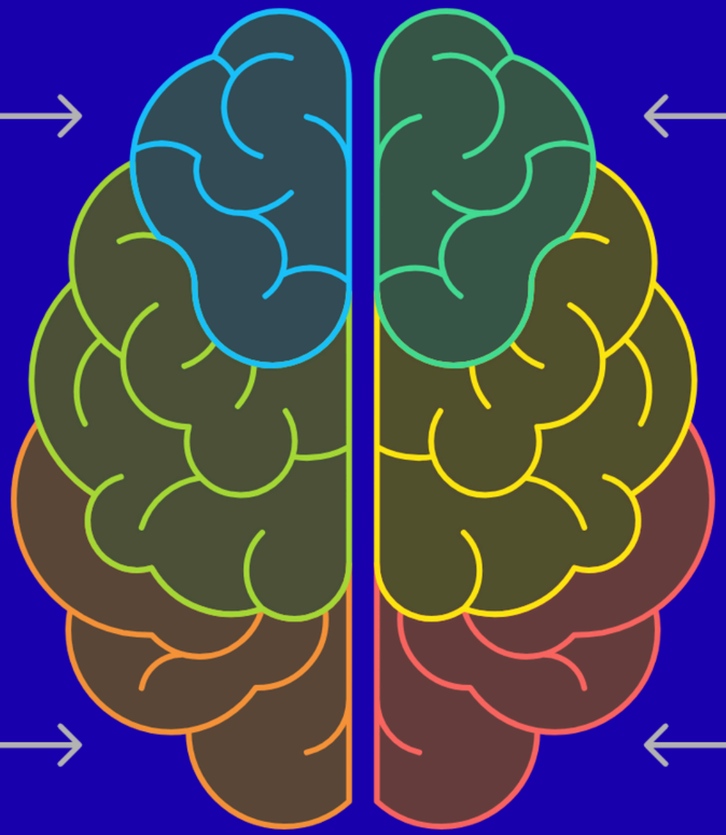
Test everything safely on your computer before using a real robot

CORE FUNCTIONS

Motion Planning

Collision Detection & Avoidance

Control & Execution



Inverse Kinematics

Dynamic Scene Awareness

Visualization Tools

ADVANTAGES OF MOVEIT 2

Real-time support based on ROS 2

The DDS communication architecture of ROS 2 enables MoveIt 2, which has significantly improved real-time performance and reliability.

Modular design

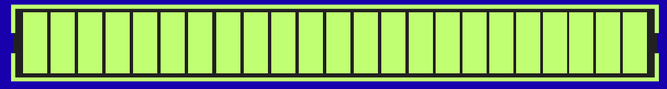
MoveIt 2 adopts a modular architecture, which supports users to load or replace modules as needed, providing great flexibility.

Cross-platform support

MoveIt 2 supports running on multiple operating systems (such as Ubuntu, Windows) and hardware platforms.

Active Community Support

MoveIt 2 has a global developer community that continuously provides updates, feature extensions, and technical support.



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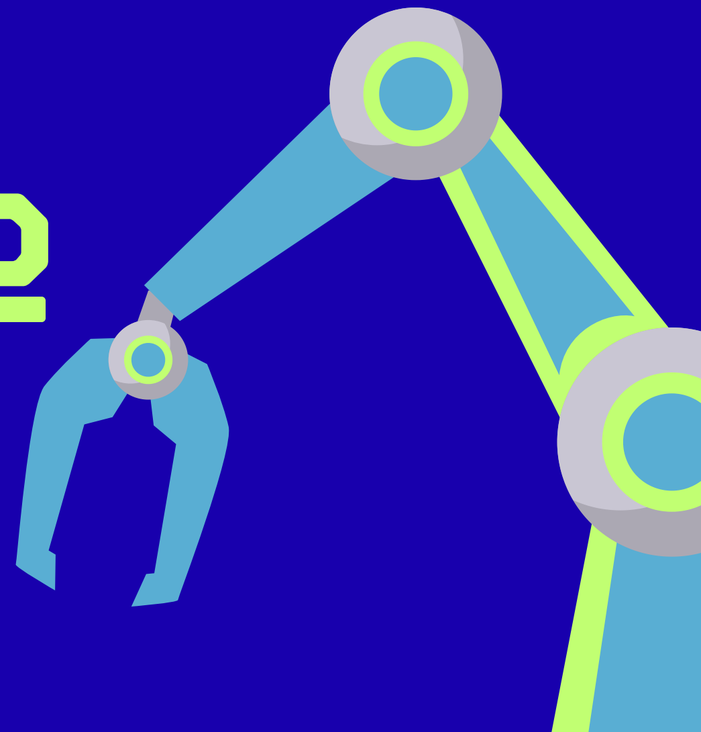
HOW TO INSTALL MOVEIT2



1 Verify & Load ROS Environment

```
cat /etc/os-release                          # check Ubuntu version
cd /opt/ros                                  # enter ROS folder
ls -la                                       # list distributions (see humble)
source /opt/ros/humble/setup.bash            # load ROS env
printenv ROS_DISTRO                          # confirm ROS distro
cd                                           # return home
source /opt/ros/humble/setup.bash            # reload environment
```

2 Prepare System for Dependencies

```
sudo apt install python3-rosdep              # install rosdep tool
sudo rosdep init                             # initialize rosdep
rosdep update                                # download rules

sudo apt update                              # refresh packages
sudo apt dist-upgrade                        # upgrade system
```

3 Install Build Tools (colcon)

```
sudo apt install python3-colcon-common-extensions                                                  # build extensions
sudo apt install python3-colcon-mixin                                                              # mixin support
colcon mixin add default https://raw.githubusercontent.com/colcon/colcon-mixin-repository/master/index.yaml  # add mixins
colcon mixin update default                                                                        # update mixins
```

4 Prepare MoveIt2 Workspace

```
sudo apt install python3-vcstool          # install vcstool
mkdir -p ~/ws_moveit/src                  # create workspace
cd ~/ws_moveit/src                        # go to src
```

5 Download Source & Dependencies

```
git clone --branch humble https://github.com/moveit/moveit2_tutorials   # clone tutorials
vcs import < moveit2_tutorials/moveit2_tutorials.repos                   # import repos
sudo apt update && rosdep install -r --from-paths . --ignore-src --rosdistro $ROS_DISTRO -y   # install dependencies
```

6 Build & Launch Demo

```
cd ~/ws_moveit                                                                  # go to workspace
colcon build --mixin release --executor sequential                              # build packages
source ~/ws_moveit/install/setup.bash                                           # load workspace
ros2 launch moveit2_tutorials demo.launch.py rviz_config:=panda_moveit_config_demo_empty.rviz   # run MoveIt2
```