2.1.1 URDF: Introduction

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URDF?

- robot model storage format?
- simulation format?
- required?

URDF – What is it?

- Domain specific modeling language (DSML)
- XML
- Stores:
  - Kinematics
  - Dynamics parameters and other meta-data
- Human & machine readable/writable

URDF – What is it (2)?

- ROS specific file-format based on XML
- Stores:
  - Robot body layout
  - Appearance
  - Extra information (joint position limits, joint velocity limits,..)
- Names and concepts from robotics domains

URDF – Implementation

- Text file
- XML tags standardized in URDF “standard”
- File references using Uniform Resource Locators (URLs)
- 3D mesh files

Contents

- Mostly `<link>` and `<joint>` elements
- `<link>`s: robot structure
- `<joint>`s: connections and motion constraints

Example

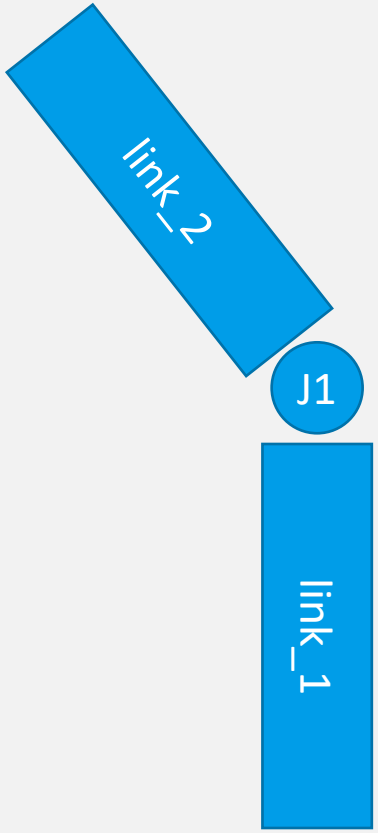
tiny_robot.urdf

```
<robot name="tiny_robot">
  <link name="link_1" />
</robot>
```

Example (2)

tiny_robot.urdf

```
<robot name="tiny_robot">
  <link name="link_1" />
  <link name="link_2" />
  <joint name="joint_1" type="..">
    <parent link="link_1" />
    <child link="link_2" />
  </joint>
</robot>
```



Joint types

1. Fixed: rigid connection
2. Revolute: 1D rotation
3. Continuous: unlimited revolute
4. Prismatic: 1D translation
5. Planar: 2D translation
6. Floating: unlimited 6D

Standardisation

- REP 103 - *Standard Units of Measure and Coordinate Conventions*
- Right-handed coordinate system
- X+ (forward) and Y+ (left) → Z+ (up)
- SI units:
  - Lengths: meters
  - Angles: radians

End of part 1 - recap

- Specialization of XML
- Model robots with links and joints
- Various joint types
- Use 3D mesh files for detailed appearances
- SI units for lengths (meters) and angles (radians)

Try it yourself!