System_Parameters

Corgi Robot System Parameters

> **Source**
>
> Derived from: Corgi_Mechanical Params

This file defines the software symbols for mechanical parameters to ensure consistency across the codebase (ROS 2 / gRPC).

Naming Convention

- **Prefix:** `CORGI_` to avoid global namespace pollution.
- **Units:** All linear dimensions are in **Meters** (standard SI unit for ROS/Simulation) unless specified otherwise.
  - *Note: Original hardware docs use mm.*

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1. Chassis & Body Dimensions

Hardware Param	Value (mm)	Software Symbol	Value (m)	Description
hip2hip dist	240	`CORGI_BODY_WIDTH_HIP_TO_HIP`	0.240	Lateral distance between left and right hip axes
wheel axis dist	510	`CORGI_BODY_LENGTH_WHEEL_BASE`	0.510	Longitudinal distance between front and rear wheel axes
Body Length	694	`CORGI_CHASSIS_LENGTH_TOTAL`	0.694	Total physical length of the main body
Body Width	352	`CORGI_CHASSIS_WIDTH_TOTAL`	0.352	Total physical width of the main body
Body Height	138	`CORGI_CHASSIS_HEIGHT_TOTAL`	0.138	Total physical height of the main body

2. Leg & Wheel Configuration

These parameters are specific to the wheel-leg module.
Note: Verify against `LegDefinitions` to ensure no conflict with internal link lengths (L1, L2).

Hardware Param	Value (mm)	Software Symbol	Value (m)	Description
Axis plane offset	57.166	`CORGI_ABAD_AXIS_OFFSET`	0.057166	Offset from Hip Roll axis to Leg Pitch plane
wheeel distance	91.675	`CORGI_WHEEL_AXIAL_OFFSET`	0.091675	Lateral offset from leg plane to wheel center (?)
pitch radius	100	`CORGI_WHEEL_RADIUS_PITCH`	0.100	Effective radius for kinematics
outer radius	135	`CORGI_WHEEL_RADIUS_OUTER`	0.135	Physical outer radius (collision)

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3. LaTeX Math Symbols

For use in kinematics equations and paper documentation.

Parameter	Symbol	LaTeX Code	Value (m)
Body Width (Hip-to-Hip)	W_{body}	`W_{body}`	0.240
Body Length (Wheel Base)	L_{body}	`L_{body}`	0.510
ABAD Offset	d_{abad}	`d_{abad}`	0.057166
Wheel Axial Offset	d_{wheel}	`d_{wheel}`	0.091675
Wheel Radius (Pitch)	r_w	`r_{w}`	0.100

LaTeX Definition Block

Copy this into your `.tex` preamble or a `math_defs.tex` file.

```
% --- Corgi Robot Physical Parameters ---
% Dimensions in Meters
\newcommand{\Wbody}{0.240}      % Hip-to-Hip Width
\newcommand{\Lbody}{0.510}      % Wheel Base Length

% Offsets
\newcommand{\dAbad}{0.057}      % ABAD Axis Offset
\newcommand{\dWheel}{0.092}     % Wheel Axial Offset

% Wheel
\newcommand{\rWheel}{0.100}     % Wheel Pitch Radius

% Symbol Representations (Variables)
\newcommand{\symWbody}{W_{body}}
\newcommand{\symLbody}{L_{body}}
\newcommand{\symDabad}{d_{abad}}
```

```
\newcommand{\symDwheel}{d_{wheel}}
\newcommand{\symRwheel}{r_{w}}
```

Code Snippets

C++ (Header Style)

```cpp
namespace corgi::params {
    // Coordinate System: Forward: +X, Left: +Y, Up: +Z

    // Body / Chassis
    static constexpr double CORGI_BODY_WIDTH_HIP_TO_HIP = 0.240;
    static constexpr double CORGI_BODY_LENGTH_WHEEL_BASE = 0.510;

    // Offsets
    static constexpr double CORGI_ABAD_AXIS_OFFSET = 0.057166;
    static constexpr double CORGI_WHEEL_AXIAL_OFFSET = 0.091675; // Verify direction
relative to leg

    // Wheel Geometry
    static constexpr double CORGI_WHEEL_RADIUS_PITCH = 0.100;
    static constexpr double CORGI_WHEEL_RADIUS_OUTER = 0.135;
}
```

Python

```python
class CorgiParams:
    # Units: Meters

    # Body
    BODY_WIDTH_HIP_TO_HIP = 0.240
    BODY_LENGTH_WHEEL_BASE = 0.510

    # Leg/Wheel Offsets
    ABAD_AXIS_OFFSET = 0.057166
    WHEEL_AXIAL_OFFSET = 0.091675

    # Wheel Geometry
    WHEEL_RADIUS_PITCH = 0.100
    WHEEL_RADIUS_OUTER = 0.135
```