Go Wherever You Will Go

Unitree
## Physical Characteristics

### Basic information

<table>
<thead>
<tr>
<th>Dimension</th>
<th>LxWxH (Stand)</th>
<th>0.645×0.28×0.4m</th>
</tr>
</thead>
<tbody>
<tr>
<td>LxWxH (Folded)</td>
<td>0.54×0.29×0.13m</td>
<td></td>
</tr>
</tbody>
</table>

**Machine**
- With battery: 12 kg
- Without battery: 5 kg (EDU version), 3 kg (other version)

**Maximum speed**
- 3.7 m/s (Air version 2.5 m/s)

**Operating time**
- 1–2 h

**Maximum angle climb**
- 35°

**DOF**
- Total 12, one leg 3

**Power Outputs**
- 5V, 12V, 24V etc.

**Abundant External Interface**
- HDMI*3; Gigabit Ethernet port*1; USB*3; Integration Interface*1

**Protected Mode**
- Fall protection, overheat, emergency stop protection

**Warning**
- Low voltage, High temperature, Short circuit, overcharge

**Foot Force sensor**
- 4 (only EDU)

**Control**
- Remote/slide-follow/automous

### Brain System

#### Main board

<table>
<thead>
<tr>
<th>Controllers</th>
<th>Basic</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor upgrade</td>
<td>X1</td>
<td><a href="mailto:4-core@1.5GHz">4-core@1.5GHz</a>, memory DDR4L 2GB, flash memory 32GB</td>
</tr>
<tr>
<td>Sensory controller</td>
<td>X1 or X3, Nano</td>
<td></td>
</tr>
</tbody>
</table>

#### software

**Real-time operating systems**
- Motion control: Ubuntu
- Environmental Perception: Ubuntu-ROS

**Framework**
- ARM

**Programming**
- C++ or C, Python, Graphical programming

#### Connect

<table>
<thead>
<tr>
<th>Network</th>
<th>GE/WiFi</th>
<th>4G or 5G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>USB</td>
<td>Integration Interface</td>
</tr>
<tr>
<td>Others</td>
<td>HDMI</td>
<td>Bluetooth transfer image</td>
</tr>
</tbody>
</table>

### Diagrams

- Diagrams showing the robot's physical structure and components.

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**Unitree Robotics**

**Go1**
**Environmental sensor**

**Fish-eye Stereo Depth Cameras**
- Sets: 5
- Totally Units: 10
- Single depth camera lens angle: 150°-170°
- Fish-eye AI Perception: Human Recognition

**Ultrasonic sensory**
- Mileage: 5-200cm, 20-200cm (tail)
- Measurement accuracy: ±(1+3%) ±10cm
- Temperature compensation: Support

**Foot force sensor**
- Dimension: 1
- Quantity: 4
- Resolution ratio: 5g

**High precision laser radar**
- Radar type: 2D lidar, 3D lidar (16line)
- Measuring distance: ≤40m, Reach 100m
- Operating voltage: 5V, 9-18V
- Operating temperature range: -5°C ~ 45°C, -10°C ~ +60°C
- Weight: 165g, 830g
- Equipped functions: Navigation planning, dynamic obstacle avoidance, autonomous positioning, map construction and other functions. Support secondary development

**Inertial measurement unit (IMU)**
- Body IMU quantity: 1
- DOF: 6
- Dynamic accuracy: 1°

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**Remote control handle**
- Type: Unitree Go1
- Detachable rocker: 2
- Charging port: Type C
- LED: Power display and charging status
- Battery life: 4 h

**Smaller controller (UWB)**
- Angular positioning accuracy: ±5°
- Positioning distance: 0.1-3m
- Sampling rate: 50 Hz
- Control mode: rocker*1, button*4, antenna*1
- Battery life: 4h

**Speaker**
- Sound track: left & right
- Rated resistance: 4 Ω
- Diameter: 23.7 mm
- Scope of influence: 380Hz-10KHz
- Power rating: 2 W
- Sensitivity: 82 dB
- Quantity: 1
- secondary development: Support

**Mobile phone APP**
- Virtual joystick buttons: Support
- Image Retransmission: WiFi/4G/5G
- Simulator: Immersive robot dog simulator features
- Function: RGB, depth map switch

**Light**
- Secondary development: Support
- LED: 64-color ambient light

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**HUMEN-MACHINE interaction**

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User-friendly interface

- User PC could use ethernet to connect directly to the robot's built-in motion controller, sensory controller and underlying controller
- The robot base controller, robot on-board controller and user PC can communicate freely with each other to facilitate real-time transfer of visual perception and other data.
- Robot on-board sensors are fully open, available for secondary development
- Develop the underlying control: All motors and sensors of the robot can be read and controlled in real time, facilitating the direct use of open source robot algorithms
- Develop high-level control: could send high-level motion commands such as backward, forward, left, right and left movement directly to the robot

External integrated interface, External power source, External power supply

Break global speed record in same class

![Image of robot running]

2M/0.425S≈4.7M/s
≈17KM/H

Powerful and reliable power system

![Image of robot and power system]

Unitree official Github link: github.com/unitreerobotics 3D model download/Simulation/Abundant Demo/ Forums
Intelligent Side-follow System
Adopt Patented Wireless Vector Positioning and Control Technology
- Robot walks alongside its human master, which is much better than the conventional following mode. Besides, the human-machine interaction is both harmonious and safe.
- No need to worry about the robot since it's right beside you.
- Capable of helping robot choosing better route in complex environment

Super Sensory System
Full View Coverage
- 5 Sets Fish-eye Stereo Depth Cameras + AI Post-processing + 3 Sets Hypersonic Sensors
- 1 set fish-eye stereo Depth deception angle $\approx 150 \times 170^\circ$
- 1 set fish-eye stereo depth perception $\approx 4$ sets intel real sense perception angle
- So: 5 sets fish-eye stereo Depth perception $\approx 20$ sets intel real sense perception angle
- Fish-eye AI perception: body recognition etc.

Go 1 built-in Powerful AI
16 core CPU+ GPU (384Core, 1.5TFLOPS)
- For comparison, the Nvidia TX2 only has CPU (4 cores) + GPU(256Core, 1.3TFlops)
(I) Hardware platform
- weight (with battery) 12kg ± 1.5kg
- L*W*H 0.645*0.28*0.4m
- Load capacity: 5kg
- Sufficient range of motion in all joints:
  - Lateral hip swing joint: -40°~+40°
  - Anterior hip swing joint: -218°~+45°
  - Knee joint: +24°~+132°
- Equip foot force sensor: provide foot force sensor feedback interface
- Equip HDMI*3; Gigabit Ethernet port*1; USB*3; 2 TYPE-C; 1 SIM card slot; 1 back integration Interface
  - 1. Abundant Teaching and research development interface
  - fastest running speed 3.7m/s
  - Built-in super Ai (16 cores CPU+ GPU (384Core, 1.5TFLOPS))
  - Equipped with abdominal power interface, supporting the expansion of wireless or touch autonomy charging function
  - Legs and body connection with omnidirectional flexible cushioning structure, can absorb the impact from all around

(II) Motion control hardware and software
- built-in ARM controller: motion controller 4cores @1.5GHz, memory DDR4L 2GB, flash memory 32GB
- fastest funning speed 4.7m/s (world record)
- With jumping air turn 90° / tap dance / space step / double leg stand and other functions
  - Machine dog with good buffering function, owning the ability that to fall from a height of 1 meter without damage and to continue walking within 2 seconds

(III) Perception module
- Super Dynamic side-follow Autonomous Obstacle Avoidance System
  - Built-in wireless vector positioning system
  - Built-in 3 Nano controller
  - Built-in 4 ultrasonic probe
  - Built 5 Sets Fish-eye Stereo depth camera, Open 5 groups of fisheye binocular depth camera RGB map and point cloud map. Single group camera perception angle about 150°*170°
  - built-in 1 3W loudspeaker
  - built-in 4G module(include GNSS): 4G remote control/image transformation/shout-out, GPS/BeiDou data acquisition
  - God’s eye view, APP immersion robot dog simulator function

Support Events
- RoboCom (national games, A class event)
- World Robot Contest (national games, A class event)
- CHINA ROBOT COMPETITION (national games)
- International Youth AI Competition (national games)
- Various Education Department provincial competitions.