

Humanoids2010

WS3: Humanoids What Next? Applications, Challenges, and Perspectives.

# **Does Cybernetic Human HRP-4C Shoot to Stardom?**

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# Why humanoids?

Humanoid robot

– affords emotional feelings.



# Why humanoids?

## Humanoid robot

- makes its motions easy for human to understand and predict.



# Why humanoids?

## Humanoid robot

- is multipurpose and works in the environment designed for human.



Robonaut 2  
NASA, GM

# Five applications in HRP (2003)



Video



Building and Home Management



Plant Management



Collaborative Outdoor Works

Industrial Vehicle Operation



Care Support Services

# HRP-3 (2007)



<b>Height</b>	<b>1600 mm</b>
<b>Weight</b>	<b>68 kg (Including battery)</b>
<b>DOF</b>	<b>42</b> (arm 7 × 2, leg 6 × 2, waist 2, neck 2, hand 5 × 2)
<b>Sensors</b>	<b>3 CCD cameras for stereo vision</b> <b>2 CCD cameras for remote control</b> <b>Gyro, G-sensors</b> <b>Wrist force/torque sensor x 2</b> <b>Ankle force/torque sensor x 2</b>

- Sponsored by NEDO (2002-2008)
- **Dust-proof , Water resistant (IEC standards IP52)**

Kawada Industries Co. /AIST

# Outdoor Construction



# Assisting in Daily Living





# Reality

- Hobby
- Education
- Entertainment

# Hobby



Takara Tomy  
i-SOBOT



WowWee  
Robosapien  
Taiwan



Hina  
Japan

# Education (Research Platform)



KAIST  
HUBO  
Korea



Aldebaran Robotics  
Nao  
France



ROBOTIS  
DARwin-OP  
USA



Kondo  
KHR-3V  
Japan

# Education (Research Platform)

## Trials of IS/AIIST



HRP-2



HRP-2m



HRP-4

# HRP-2 (2002)



## SPECIFICATIONS

- Height: 1540 mm, Weight: 58kg
- Degrees of Freedom: 30 axes  
(Arm 6DOF + Hand 1DOF, Leg 6DOF, Waist 2DOF, Neck 2DOF)
- Hand grip: 2kgf (per hand)
- Vision: 3-eyes CCD stereo cameras
- Sensors: Attitude sensor, Force sensors

# HRP-2m Choromet (2006)



## SPECIFICATIONS

- Height: 350 mm, Weight: 1.5kg
- Degrees of Freedom: 20 axes (Arm 4DOF each, Leg 6DOF each)
- Sensors: Attitude sensor, Force sensors

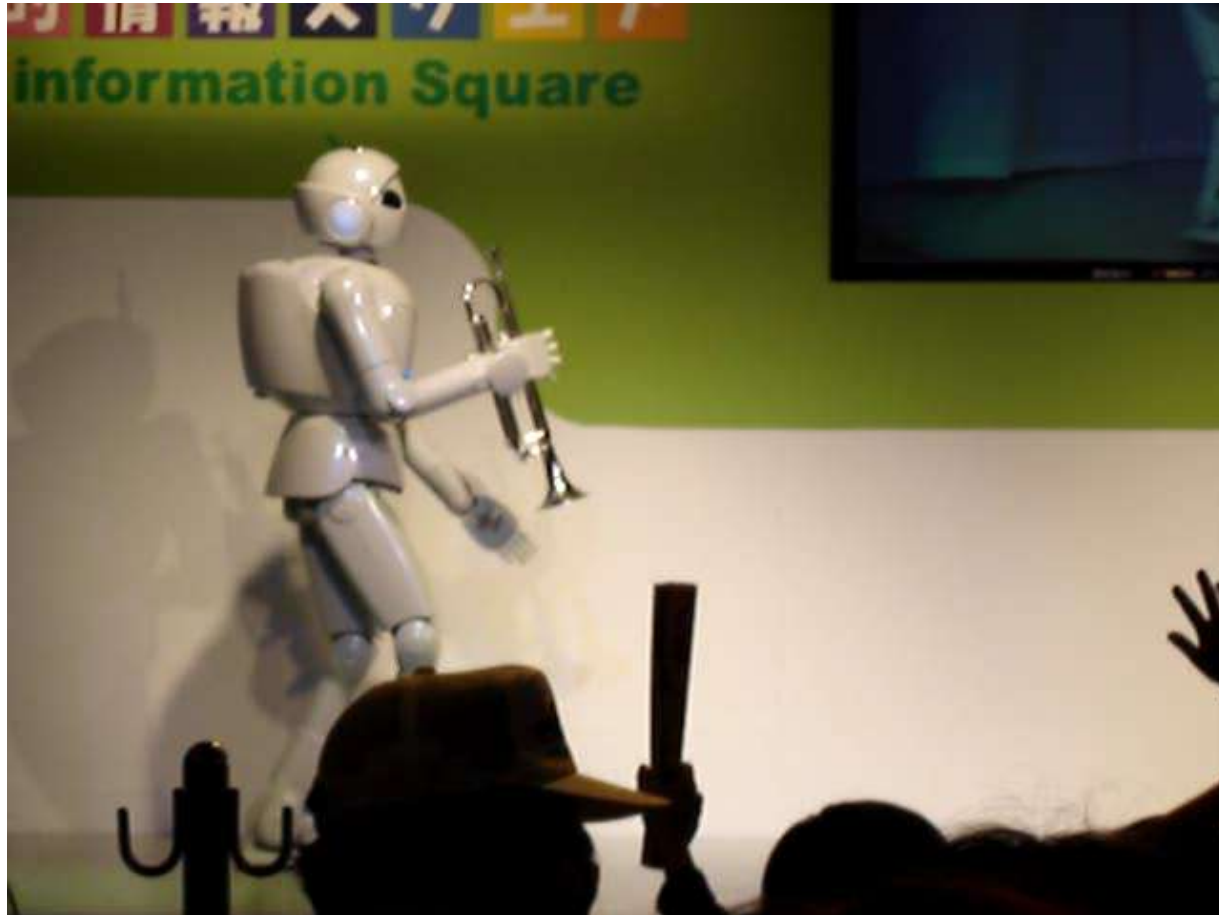
# HRP-4 (2010)



## SPECIFICATIONS

- Height: 1510 mm, Weight: 39kg
- Degrees of Freedom: 34 axes (Arm 7DOF + Hand 2DOF, Leg 6DOF, Waist 2DOF, Neck 2DOF)
- Hand grip: 0.5 kgf (per hand)
- Sensors: Attitude sensor, Force sensors
- All actuators: 80W and under
- Optional PC can be mounted on the back

# Entertainment



Partner Robot  
TOYOTA  
Japan



# Entertainment

## Trials of IS/AIST



HRP-4C

# Cybernetic Human HRP-4C (2009)



<b>HRP-4C Specifications</b>	
<b>Height</b>	158 cm
<b>Weight</b>	43 kg
<b>Joints (Number of Motor)</b>	42 (Face: 8, Neck: 3, Arm: 6x2, Hand: 2x2, Waist: 3, Leg: 6x2)
<b>Battery</b>	NiMH
<b>CPU</b>	Motion Control: Intel Pentium M 1.6GHz Speech Recognition: VIA C7 1.0GHz
<b>Sensors</b>	Attitude Sensor: 1 Force Sensor: 2

Dimensions set to average values for young Japanese females. <http://riodb.ibase.aist.go.jp/dhbodydb/>

# *Applications*



Opening Address  
SHINMAI Creator's Collection  
SHINMAI Creator's Project  
(JFW in Tokyo) (2009.3.23)



Fashion model  
2009 YUMI KATSURA Grand  
Correction in Osaka (2009.7.22)

# *Applications*



Singer  
CEATEC JAPAN 2009  
with YAMAHA VOCALOID  
(2009.10.6-10)



Actress  
DIGITAL CONTENT EXPO 2009  
by SAM  
(2009.10.22-25)

# Applications



MC (Master of ceremonies)  
JISSO PROTEC 2010  
with YAMAHA VOCALOID  
(2010.6.2-4)



Singer  
CEATEC JAPAN 2010  
with VocaListener and VocaWatcher  
(2009.10.5-9)

# *Applications*



Dancer  
DIGITAL CONTENT EXPO 2010  
with Miim Friends  
(2010.10.16-17)

# Does Cybernetic Human HRP-4C Shoot to Stardom?

Somehow... still on the way.

But to be famous is not the goal of Miim.

We believe **Humanoids** significantly contribute to the **XXI Century Society** not only in Hobby, Education, and Entertainment but **in a lot of application areas.**

What we should do:

- 1. Sufficient verification tests of technology under the actual environment** necessary for practical application.
- 2. Separating Hardware, Software and Contents creators**
- 3. Development of a social system** (safety standards, insurance, etc.).
- Promotion of **better public understanding of humanoids** in order to facilitate the acceptance of humanoids.



# Thank you!

