Implementation of OPRoS to a human-friendly guide robot,
FURO

Ph.D. Se-Kyong Song
CEO of FUTURE ROBOT

Dec. 11, 2012
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FUTURE ROBOT is making a ‘future robot’.

Established Venture Company in August, 2009

Located in Pangyo Techno-Valley (Silicon Valley of Korea)

Robot Design, Manufacturing & Robot Solution Provider

Service Robot Global Leader in Future
FUTURE ROBOT is in the spotlight with ‘FURO’.

CeBit 2012 in German

Hong Kong Electronics Fair 2012
FUTURE ROBOT is in the spotlight with ‘FURO’.

Roadshow in Singapore

KOMAF Fair 2012 in China
FUTURE ROBOT is a service robot leader.
FUTURE ROBOT has appeared on Worldwide Media with ‘FURO’.
2. CEO Song
Ph.D. Se-Kyong Song

Graduated from KAIST, Specialized in Robotics & Control

2002~2008 Worked in Samsung Electronics

2008~2009 Worked in Philips Electronics

2009.8 Established FUTURE ROBOT

2012 Awarded several notable awards from the government
A ‘First Mover’ to open service robot global market

The Korean company has sold 100 FURO-K robots to Brazil.

By Robotics Trends News Sources - Filed Oct 02, 2012
Future Robot has unveiled a new service robot called FURO-K that will function as a friendly kiosk. The company claims that people often prefer to order in line to speak with a human employee rather than using an intimidating kiosk, so it has been designed to look cute and inviting. Furthermore, instead of sitting in a corner, the robot scoots around greeting customers in a synthesized voice to explain its features.

The robot comes with an integrated circuit card (ICC) reader, and near field communication (NFC) for non-contact data transactions. If you're still hesitant it will also accept credit card payments and can print you a receipt. The company has already sold the robot to major hospitals in Korea and will begin providing services this month.

From right: FURO, Future Robot’s CEO Se-Il-Young Song, and FURO-K, a robot kiosk.

However, the real story is a recent purchase order from Brazil for one hundred FURO robots. That version of the robot has an anime-inspired female face and can function as a waitress. The plan is to deploy the robots as mobile advertisement and information kiosks at various Brazilian venues, such as airports and malls. The company has also sold units to Japan, China, and France.

“the key strength of Future Robot, in my opinion, is its human-robot interaction technology which is compatible with all other robots.”

The company made a public presentation of its service robot at the Discovery Channel show on robotics called "A Hybrid Between a Smartphone and a Smart Machine." And the new Future Robots, or FUROs, from Korean robotics startup Future Robot are an interesting hybrid instead of, robotic and interactive kiosk and digital signage technologies – one mix with potential for service digital signage or self-service kiosk applications in retail, hospitality or maybe even food service. (Imagine a mobile robot that can sit up to a restaurant table, let customers order via a touchscreen interface and then let them pay via their smartphone or a card Readers...)

According to Korea IT Times, the FURO-interactive robot can provide a variety of services "by reading users' intentions in different situations" by observing users' movement, face and voice, and then conveying the "most appropriate, facial expressions, movement, and necessary information." The robots can move around freely on wheels hidden beneath their slats, and they have on-screen displays on smaller screens "boards" that will show changing facial expressions in response to different stimuli, such as smiling to new people or looking up when someone talks to them.

The robots were chosen at this year’s show at the Discovery Channel show in March, and Future Robot CEO Se-Il-Young Song told the Times that the show was "very exciting for us to show our technologies and also gain more innovative ideas from them." One former US worker who offered over 100,000 FURO robots for sale in new business model - mobile (moving) advertisements. As FURO moves around in airports or exhibitions, they said, the back screen which is remotely operated can be utilized for advertisements while the front screen provides ordinary information service.

The company loaded this segment of a Discovery Channel show focusing on its robots onto its YouTube channel.

Global robotics news sites
B2B Sites
IFA 2012 TechWatch
FURO on Media
3. Service Robot
Human-Robot Coexisting World is Coming Soon!

Car ➔ PC ➔ Smart Phone ➔ Service Robot

Expansion
Saturation
Growth
Emerging

New Business Opportunity
(IT, Automotive, Medical, Military, Education)

Convergence

1886 Start
1946 Start
1956 Start
2000 Start

Time
Service robots may be totally different from industrial robots.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Industrial Robot</th>
<th>Service Robot</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High-Tech. Device</strong></td>
<td>![Industrial Robot Image]</td>
<td>![Service Robot Image]</td>
</tr>
<tr>
<td><strong>Key Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Performance/time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Accuracy↑</td>
<td>- Emotion, Vividness</td>
<td></td>
</tr>
<tr>
<td>- Repeatability↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Speed↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Payload↑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Reliability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key Component Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Actuator, Sensor, Controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Circumstance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Known Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Factory / Automatic Machines</td>
<td>- Public place / From child to Elderly</td>
<td></td>
</tr>
<tr>
<td>Only Operator (Closed)</td>
<td>User Friendly (Open)</td>
<td></td>
</tr>
</tbody>
</table>
Service Robots have been developed from human dream.

- Atom (1963)
- Mazinga (1972)
- Robot V (1976)
- RoboCop (1987)
- Bicentennial Man (1999)
- Transformer (2007)
- Real Steal (2011)
- Da Vinci
- irobi-Q
- Zenibo
- Dawin

Technology < Expectation
Technology > Expectation
Market Open
Service Robot

Expectation
Dissatisfaction

Global Leader of Smart Service Robot
www.futurerobot.com
Service Robots have different kinds of types according to application.

Service Robots can:
1. **cognize & perceive** external environment
2. **recognize** situations
3. **independently and autonomously** operate

Three Parts
- **Perception**: Input
- **Decision**: Processing
- **Expression**: Output

Embedded images include:
- **Military Robot**: USA
- **Medical Robot**
- **Professional Service**
- **Personal Service**
- **IT + Robot**: Korea
- **Humanoid Robot**: Japan
4. OPRoS

OPRoS (Open Platform for Robotic Services)

http://www.opros.or.kr/
OPRoS is an Open Platform for RObotic Services.

Component: HW independent API

Application SW (components)

Multimedia contents player
Script interpreter

OPRoS Framework (Interface)

Robotization

Application SW (contents)

OPRoS IDE

H/W with DLL/So
Algorithm

Ideas

H/W

Vision

SLAM

Ultrasonic

SLAM

LRF

SLAM

Navigation

Robotization

Robots

Global Leader of Smart Service Robot

www.futurerobot.com
OPRoS will provide new services as an integrated M/W.

- Realtime scheduling service for the component performance (0.1ms)
- Monitoring service for the components & core engine
- High performance distributed communication middleware service
- Cloud service components
- Support other robot middlewares like ROS, OROCOS
- Development toolkits for the Android app. components
OPRoS will be evolved as a global robot middleware.
5. FURO

FURO (Future Robot)
FURO is a smart service robot like smart phone.
Service Application

- COEX_Shopping Mall
- Seoul Nat’l Univ. Hospital
- Severance Hospital
- ETLAND_Tax Free Shop, Cinema
Service Application

HYUNDAI ASAN Museum

Gwancheon Nat’l Science Museum

Restaurant, SBS TV

Robot Event
Robotics (Technology) shall be intersected with Liberal Arts (Humanism).
FURO is made as a ‘Convergence’ product based on ‘Liberal Art’.

Service + Information

Information Device

Dynamic Interaction

Emotional Avatar

Neutral 
Surprise

Pitch 
Move

Approach
FURO has an Open Platform with OPRoS (Middleware) & FUROware (HRI Engine).

Expresses interactive emotions through multi-channel perception and AI.
FUROware is Robotic solution made of OPRoS components.

<table>
<thead>
<tr>
<th>Part</th>
<th>Solution (OPRoS Component)</th>
<th>Basic Module</th>
<th>Advanced Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perception &amp; Cognition</td>
<td>FURO-Sense</td>
<td>Face Detection</td>
<td>Face/Sex/Age Recognition, Face Servoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human Intention Detection</td>
<td>Human Intention Identification, Human Motion Servoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keyword Recognition</td>
<td>Voice command</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Touch Sense</td>
<td>Emotion Expression according to Touch Pattern</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>FURO-Brain</td>
<td>Emotion Engine</td>
<td>Emotion Controller according to service scenario</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dialogue Engine</td>
<td>Dialogue Engine according to service scenario and emotion status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service Robot Platform</td>
<td>Robot Personalization, Task Manager for multi-service events</td>
</tr>
<tr>
<td>Action &amp; Expression</td>
<td>FURO-Expression</td>
<td>TTS (Text-to-Speech)</td>
<td>Natural TTS and Lip Sync</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sound Effect</td>
<td>Emotional Sound Effect according to service scenario</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language (Korean)</td>
<td>English, Japan, Chinese, France, German (30 countries)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Character Emotion</td>
<td>Facial Avatar Emotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emotional Gesture</td>
<td>Head, Monitor, Waist, Mobile, LED</td>
</tr>
<tr>
<td>Mobility</td>
<td>FURO-Mobile</td>
<td>Navigation</td>
<td>Map Building, Obstacle Avoidance, Object Chaser</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Charging Station</td>
<td>Automatic Recharging</td>
</tr>
<tr>
<td>Robot Management</td>
<td>FURO-Manager</td>
<td>Joystick</td>
<td>Voice Command</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote Monitoring</td>
<td>Teleoperation / Scheduling / Statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scenario Editor</td>
<td>User creative robot service editor</td>
</tr>
<tr>
<td>Others</td>
<td>FURO-Pay</td>
<td>Card &amp; RFID Reader, Printing</td>
<td>Human Identification / Credit card reader / Printing service</td>
</tr>
</tbody>
</table>
RoIS S/W Framework is a interface with HRI Components suitable for variety of robot service applications.

Referring to Figure 4, this specification defines the RoIS Framework as one that manages the interface not in units of functional implementations incorporated in the robot but rather in abstract functional units applicable to a service application. Such an abstract functional unit is called an “HRI Component.” Here, HRI Components (e.g. person detection, person identification) are logical functional elements making up the description of a human-robot interaction scenario.
FURO S/W Framework is a middleware with OPRoS + FUROware (HRI Engine) suitable for variety of robot service applications.
6. Future
will be more sustainable with ‘FURO (Product)’ and ‘OPRoS (HRI Component)’.
‘FURO-i’ will live together with humans.

**FURO-i Services**

**Service 1 Health Care Service**
- Checking health with U-Health Device
- Health treatment information / Emergency call

**Service 2 Mental Care Service**
- Pet Design / Avatar / Lip-sync / Interaction
- Delivering emotion with variety of facial expression
- Conversation Service - Caring for lonely

**Service 3 Entertainment Service**
- Family SNS Service
- Music, Movie, etc / Weather news

**Service 4 Education Service**
- Interesting smart education service with interaction between robot and kid

**FURO-i System**

**Intelligent Avatar**
- Expression of various emotions / Lip sync expressions

- OS: Android 3.x or Windows 7
- *Battery life - 3 hour(s) / Charging time - 1.5 hour(s)*

- Camera, microphone
- Emotion display LED Motion
- Speaker
- 10.1(7") touch screen Avatar (1280x800)
- Mobile
- PSD Sensor
Personal Robot: FURO-i

u-Health Care Service

FURO-i (Android Tap 10.1“) (Patented)
Service Robots shall be contributed to Worldwide Risks as well as to Humankind Wellbeing.

- Aging, Welling-being, Safety
- Society
- Energy
- Economy
- Solo, Manpower Shortage, New Emerging Countries
- Climatic Change, Declining Resources

FUTURE ROBOT make best effort to build ‘better ecosystem’.

Let’s build a ‘cooperative ecosystem’ for human and world.

Open mind ~ Open robot platform

Contact to us always be welcome!
Thank You