

ROBOTIC TELEPRESENCE – A PRIMER

Telepresence robotics technology uses mobile robots equipped with two-way visual collaboration tools. Most robots have a screen that displays the operator's face. They can be driven around remote facilities by an operator who interacts with colleagues from afar. The first batch of commercial robots to hit the street range in price from \$3,500 to \$15,000. On the do-it-yourself side, Wiimote hacker Johnny Chung Lee has open-sourced his plans for a \$500 version using a \$250 netbook and a \$250 iRobot Create kit on YouTube. The video has over 55,000 views. In addition to players featured in the line-up, robotics powerhouses iRobot and Willow Garage have both demonstrated telepresence robots and are expected to enter the market.

The technology combines the collaborative and humanizing nature of video with the mobility of robotics. Some applications include:

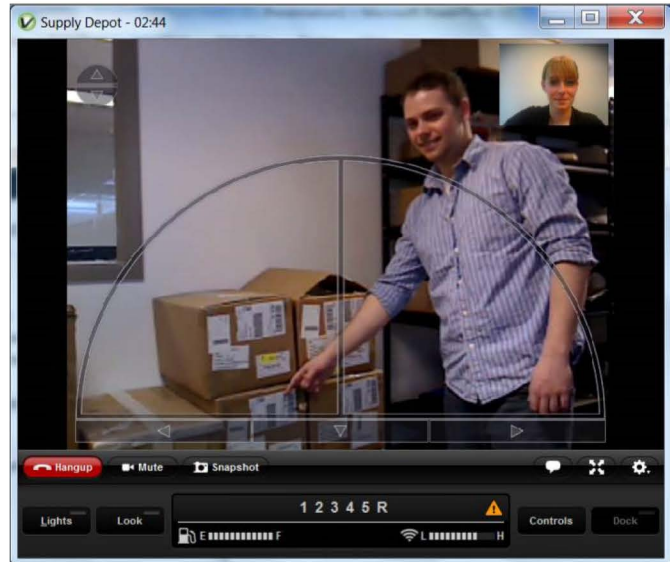
- Remote employees interacting with colleagues at traditional company campuses and locations
- Subject matter experts working remotely in a variety of locations
- Owners and managers monitoring their businesses from afar
- Mobile pill dispensers roving hospitals
- Remote students studying at a variety of universities
- Roving security systems (when not in use by a remote operator)

Early adopters have reported a number of unique social dynamics arising from the technology. Fred Nikgozar, the CEO and founder of RoboDynamics, has said that two thirds of the time colleagues will seek out the robot to talk with a remote employee instead of simply calling him or her. After five days, co-workers begin referring to the robot by the employee's name.

So, how many robots can we expect to see roaming the halls in the coming years? Trevor Blackwell, the founder and CEO of AnyBots, believes that one robot for every 100 employees in a company is the right ratio to use the machines effectively.

Like any new technology, a number of legal and security issues need to be worked out. These include the following.

- **Liability:** Whose insurance pays when a remote employee's robot runs into someone while picking up a scone at the coffee shop?
- **Security:** What if a hacker or competitor hijacked a robot and used the camera's high-resolution zoom to capture pass-



The view from the driver's seat – The dashboard of the VGo telepresence robot

words, white board material, or an image of the boss in the can.

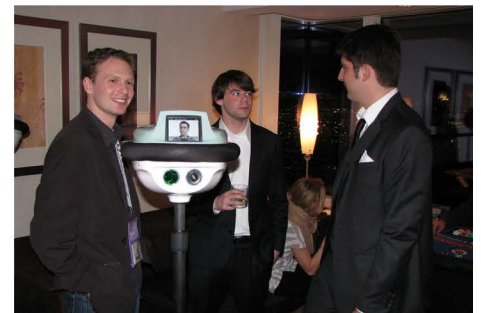
The Future of Robotic Telepresence

More Autonomy: Telepresence robots must be driven somewhat laboriously around an office or campus. This requires attention and wastes time. Expect future robots to automatically pilot themselves to a specific location while detecting obstacles and avoiding collisions along the way.

Better Human Factors: What's the biggest disappointment with the initial crop of telepresence robots? The small displays aren't placed at the right height for talking to a standing human. Screens will get bigger — the bare minimum should be a life-size human head — for more humanistic interaction.

Life-like representations of the owner/operators: Companies at the forefront of this technology have made great improvements to the small servo-mechanical motors that can

mimic human gesture and emotion. Soon, robotics will be able to faithfully replicate a human face. In the long term, the industry will likely move toward a future like the one depicted in the film *Surrogates*, in which operators are jacked into life-like, fully-mobile versions of themselves from afar.



QB from AnyBots likes to Party



Professor Henrik Sharpe of Aalborg University in Denmark examines a non-mobile Geminoid – DK robot that has been designed to look exactly like him.



Robotic Telepresence: Tale of the Tape



From Left: AnyBots QB, RoboDynamics TiLR, Gostai Jazz Connect, Mantaro's Mantaro Bot, and VGo

Bot:	QB	TiLR	Jazz Connect	Mantaro Bot	VGo
Manufacturer:	AnyBots	RoboDynamics	Gostai	Mantaro	VGo
Availability Date:	March 2011	Summer 2008	January 2011	March 2011	November 2010
Price Tag & Per Month Charges if any:	\$15,000 / \$0	\$10,000 /\$0-\$100/mo/user	\$11,000 / \$0	\$3,500 / \$0	\$5,995 / \$100
Height & Weight:	Height Adjusts: 30-74" 35 lbs	42" and 48" 60lbs	40" / 18lbs	63" / 40 lbs 15.5" x 15.5" footprint	48" tall, 13"x15" footprint / 18 lbs
Top Speed:	5.13 feet/sec	3.5 feet/sec	3.65 feet/sec	2.05 feet/sec	2.5 feet/sec
Video Resolution:		640 x 480, 30fps full-duplex	Up to 640x480p at 25fps	Up to 720p	640 x 480
Bandwidth Required:	600 kbps (SD) to 3 Mbps (HD)	85kbps (min) 500kbps (rec)	480Kbps up & down recommended	1Mbps	768K up and down (connections are typically about 400K, still functions as low as 100K)

Bot:	QB	TiLR	Jazz Connect	Mantaro Bot	VGo
Manufacturer:	AnyBots	RoboDynamics	Gostai	Mantaro	VGo
Runtime:	6-8 hours	6-8 hours	5 hours	4 hours	6 hours or 12 hours
Unique Features:	<ul style="list-style-type: none"> - High definition zoom - Seamless roaming on wireless - Two way streaming video - Touch screen enabled WiFi configuration - High quality audio - clear visual - Collision avoidance technology -Professional and friendly appearance 	<ul style="list-style-type: none"> - Ability to run your own video/audio solution (eg Skype, MSN Messenger, etc) - Independent Pan/Tilt/Zoom camera - 26x Optical Zoom - Platform independent (run any OS) 	<ul style="list-style-type: none"> -Articulated head -Detects & avoids obstacles -5" LCD touch screen -Automatic Wifi roaming -Gostai 3D pointer technology -Speech synthesis -Optional laser navigation and mapping <p>Security options:</p> <ul style="list-style-type: none"> -automatic patrolling -movement detection -infrared LED for night vision 	<ul style="list-style-type: none"> - Capable of expansion and customization via 4 USB ports, 16 digital I/O, and 4 A/D inputs -Custom design services available for modifications and feature requests. -Infrared obstacle detection to aid in navigation. 	<ul style="list-style-type: none"> -Hi Res Snapshot w Flash, -WiFi Roaming, -802.1X enterprise security, -802.11e WMM packet prioritization, -Obstacle and cliff avoidance, -USB ports -H.264 codec -8khz audio -2 speakers, 4 Mics -Speech processor -Auto-camera down when not in use -Local view PIP -Auxiliary lights -Connectivity diagnostics -Camera Zoom (Q2-2011)
Docking Station:	Yes	Yes	Yes w/ Auto-Dock	Yes	Yes w/ Auto-Dock
Network Connectivity	802.11n Wi-Fi	Wi-fi, 4G	Wi-fi, 3G optional	Wi-fi	Wi-fi, 4G