



Ifs and bots

They have started trickling into the industrial space, and from the looks of it the day is not far when there will be a robot in every home, says **Varuna Verma**

Walk into Santosh Hulawale's Mumbai home and you will be greeted by a tallish, black-and-white, Stormtrooper-like humanoid straight out of *Star Wars*. The mean machine rolls across the living room on wheels, shakes hands, introduces itself as Indro — short for India's Robot — and spouts specifics about its height and weight.

Indro is 6.5-foot tall, has 10 functional fingers, can move on flat surfaces, shake hands, hold objects, see with its HD micro camera, listen and communicate in English.

It wasn't built in some high-end science laboratory, but in Hulawale's bedroom — which looks like a carpenter's workshop, lined with spanners, saws, scales, screwdrivers and drilling machines. It took the 35-year-old hardware engineer nine years and three failed attempts to build Indro. He says, "I sold off my motorcycle and computer services business to raise money."

Hulawale's dabble with building humanoid robots seems to be paying off, finally. Indro goes public next month. Hulawale will present it at the IIT Mumbai Techfest, followed by an unveiling at Shastra, the tech fest at IIT Madras, next January. If time permits, Indro will fly to Bangkok to participate in a technology event.

Hulawale is looking for investors to manufacture Indro on a large scale, as an armoured security robot for India's growing security sector.

Service industries across the world are being stormed by a humanoid workforce. They serve food in restaurants, do household chores, room service in hotels, work as receptionists and even cheer soccer teams from stadium stands. This revolution is now making its way into India.

In April, this year, Tokyo's Mitsuboshi department store hired a new receptionist, Aiko Chihira. Chihira is a young woman with fair skin and red hair and wears a kimono. She wel-

comes visitors to the store, displaying human-like facial expressions. Chihira is actually a humanoid robot developed by Toshiba Corporation.

Abhirami may not be as charming as Chihira, but this humanoid is a hit with autistic children and young cancer patients in Mumbai.

The two-foot-tall, blue-eyed bot (short for robot), whose brain is an Intel Atom CPU running on a Linux kernel, is programmed to carry out 100 operations — dancing, story-



INDROID: Indro, the mean machine created by Santosh Hulawale; (top) Diwakar Vaish, Manav's human parent

telling, solving puzzles, displaying emotions and doing the surya namaskar, to name a few.

The robot can even flail its limbs and bawl like a baby, says Sasi Kiran Gade, CEO of the Mumbai-based Gade Autonomous Systems that got the French-built robot to India in 2014, and wrote the software applications that make her tick. "She's programmed to stop crying when picked up," says Gade.

Abhirami is a part of Robolution.Me, a crowd-sourced platform Gade created last year to use robotics to solve real-world problems. "She's a companion for children with autism and cancer," he explains.

Last year, on a visit to Mumbai's St. Jude India ChildCare Centre, a recovery home for children undergoing chemotherapy, Abhirami slipped and fell while dancing. She was unable to bounce back on her feet immediately, like a human. "A girl wanted to know if Abhirami was hurt, tired or asleep. Humanoids can generate as much empathy and attachment among children as humans," Gade says.

Gade Systems' humanoid catalogue also includes AdverTron, a robot receptionist that speaks English, interacts with people and acts as a tour guide and mobile information desk. "When a client walks into an office, AdverTron can talk to him about the company's products," says Gade, adding that he is in talks with several multinationals interested in hiring the mechanical front desk manager.

About 7,000 robots sell in India every year. Most of this mechanical workforce is employed in the industrial sector — as robotic arms or pick-and-place robots doing assembly line jobs. But as these rookie machines get smarter by the day, they will invade Indian homes and offices over the next decade, predicts Gade. "They'll be folding your clothes, polishing your shoes and chopping vegetables at home and fetching your coffee and manning front desks in office."

Manav could soon be doing many of these things. All of two feet, this humanoid looks like an oversized toy. But that's where the similarity ends. Made up of 21 sensors, two cameras in each of its eye sockets and two microphones, Manav is a 3D-printed humanoid that walks, talks, does push-ups and headstands, plays football and moon-walks like Michael Jackson — all in response to voice commands. "We're also working on adding a grabber to its arms, so it can lift objects," says Diwakar Vaish, head of robotics and research at the Delhi-based A-SET Training and Research Institute, and Manav's human parent.

Vaish says robots have played a restricted, behind-the-scenes role in India's manufacturing industry so far. "We want to bring them into the limelight, making them a part of everyday life." Priced at Rs 1.5 lakh, over a hundred Manav bots have been sold to technical universities and robotic enthusiasts.

HDFC Bank will soon be giving its services a robotic touch. It is in the process of rolling out, at a branch in Mumbai, a robot receptionist who will greet walk-in customers and assist them with tasks like withdrawing or transferring money. "We will be announcing the launch of our humanoid receptionist this month," says a company spokesperson.

Body doubles won't just be for the movie stars — busy corporate honchos can now be at two places at one time, via a digital double. Delhi-based robotic start-up Milagrow HumanTech will roll out its telepresence robot next year, which will allow high-flying executives to attend a morning meeting in Mumbai followed by a luncheon in London — without any jet lag.

The robot works like Skype on wheels. "It has a screen to enable face-to-face interaction and it can move around and mingle. The humanoid ensures your presence won't be missed," says Rajeev Karwal, founder, Milagrow, which also markets a range of home-cleaning robotic appliances, including a robot that vacuums, mows lawns and cleans the swimming pool.

A digital celebrity walked the red carpet at the Star Screen film awards in Mumbai this January. Goofy, the social bot, co-hosted the show with Karan Johar and Kapil Sharma, greeted guests and connected Bollywood actors with fans. Built as a brand mascot for Airtel, the humanoid's communication and movement were controlled via GPS and the Internet, says Aakash Sinha, CEO of Omnipresent Technologies, the company that built the robot. Queries for Goofy clones have been pouring in it seems.

Want to also wonder how that will impact jobs? Someone should.

celebrity circus



BHARATHI S. PRADHAN

The man who knows infinity

On November 8, Shatrughan Sinha (SS), who was a celebrity guest at the Sharjah International Book Fair (SIBF), sat in his suite at the Sheraton there and watched America cast its vote.

While the channel continued with its predictions and exit polls, Shatrughan repeated what he had been tweeting for two days: Donald Trump could well be heading towards creating history.

Shatrughan is no tarot card reader. But I had been with him during the Delhi Assembly elections two years ago when, even as he campaigned for his party, he privately told all of us that there was an unmistakable AAP wave which would see Kejriwal in the chief minister's chair once again. Since I was putting the finishing touches to my biography on him, I was with SS once again when Bihar went to polls last year. By then, his party had completely sidelined him and he was openly predicting a landslide victory for the Nitish Kumar-Lalu Prasad combo.

SS was proved right in both Delhi and Bihar. With the triumph of Trump over Clinton, Shatrughan couldn't help but crow about it on Twitter. He cheekily followed it up with a tweet asking if people now wanted his forecast for UP, Punjab and Goa too, and to "watch this space".

Was it just Sinha's tendency to go against the tide that made his predictions come true or was there some shrewd calculation under his famous bluster? It could be a bit of the former but long before Hillary called Donald to concede defeat, Shatrughan ticked off a few points on his fingers. He kept track of the roster of names who had vociferously endorsed Clinton and run down Trump. From Salman Rushdie's ex-wife Padma Lakshmi (now considered famous in her own right as author, television host and celebrity cook) to Beyonce, Madonna, Spielberg, Clooney, DeNiro, Sean Penn, Ellen DeGeneres, Lady Gaga, 50 Cent, Anne Hathaway, Eva Longoria and Reese Witherspoon, there was an impressive mix of whites and people of various origins rooting for Clinton. Bryan Cranston (of *Breaking Bad* fame), Miley Cyrus and others had even threatened to leave America if Trump made it to the Oval Office with Cher saying she'd go to planet Jupiter.

Instead of being impressed, SS calculated that winning without the support of celebrity arsenal or the media would turn it into a bigger triumph for Trump. SS also factored in the "FBI turn-about" on Clinton's dodgy emails and

saw it as another item that would leave the voting Americans in doubt over her credibility.

All this was discussed in SS's suite the night before the results came in. Not once did he discuss the possibility of a Clinton win. So when Trump finally gave his acceptance speech, Hillary supporters in India like Salman Khan and hundreds in America may have wept, but SS had reason to gloat. Since he had no personal stakes in the US presidential elections, Sinha's "I told you so" could be well justified this time around because, unlike Delhi or Bihar, predicting victory for Trump could not be dismissed as the rantings of a disgruntled Indian politician.

One is tempted to make a prediction of one's own at this juncture but it's got nothing to do with Trump or politics. The time when Karan Johar will opt for fatherhood à la Tusshar Kapoor or through adoption, is not too far away.

Remember how Karan used to muse aloud that maybe he should first get himself a puppy and take care of it to see if he was ready for the responsibility of raising a child? Well, he took the first step a little while ago and brought home a pup. Guess what the globe-trotting Johar has named his new "responsibility"? It's the same name as the famous chain of high-end Japanese (and fusion) restaurants in Dubai, London, Los Angeles and other places — Nobu.

Karan, incidentally, will probably be one of the celeb guests at the SIBF next year after his biography is out because the fest is fast becoming one of the five biggest lit fests of the world. With the Sheikh of Sharjah personally taking an interest in promoting "a passion for words" and encouraging the reading habit in school children, SIBF has been playing host to big names like Chetan Bhagat all through the week. Shilpa Shetty (who has her own luxury house in the UAE and turned up at the venue in a Rolls Royce) flew in to promote her book on fitness.

Maria Goretti was there for her cookbook and to give a live demo of her cooking. Shashi Tharoor and Mammootty got an enthusiastic response from the huge Malayali population in the Gulf. And Shatrughan Sinha was there to promote his biography.

Fortunately, at the SIBF, the Sheikh ensures that the core motive of promoting books and inculcating the reading habit in the young, does not get overshadowed by star attendance.

Bharathi S. Pradhan is a senior journalist and author



Shatrughan cheekily asked if people now wanted his forecast for Uttar Pradesh, Punjab and Goa too

Civil engineer-turned-ecologist Dhrubajyoti Ghosh stumbled upon what is now known as the East Kolkata Wetlands (EKW) — located along the eastern fringes of the city — in the early 1980s.

He had been tasked by Ashok Mitra, the then finance minister of West Bengal, to find out how wastewater management could be implemented in Calcutta.

Ghosh, who had just completed his doctorate from Calcutta University, was clueless about where to begin. He finally chose an outfall canal (outlet of a body of water) in the heart of the city and followed it until he arrived at a massive network of 250 *bheris*, or fishponds.

Astounded by the discovery, Ghosh began to research how wetlands work, and shortly after, created the first participatory map of the 12,500 hectares of wetland area. He studied it to understand the impact of wetlands on urban and rural areas.

That map is relevant even today. Some years later, he invited the then chief minister Jyoti Basu to the site for a demonstration. "I drank water directly from the *bheri* to show him how clean it was," says Ghosh.

Today, the EKW is the world's only fully organic sewage treat-

ment system. Ghosh, who is now in his seventies, was the one who kept real estate sharks at bay, and also fought and secured for EKW a Ramsar Site status in 2002.

A Ramsar Site status is a marker of international importance under the Ramsar Convention, an international treaty for the conservation and sustainable use of wetlands. The treaty is so named after a city in Iran, where the convention was signed in 1971.

"West Bengal is not known for its sense of agency or emancipation," says Ghosh. "The public and the government are indifferent to the EKW. There is so much to talk about in terms of climate change, but no one says or does anything."

EKW treats Calcutta's wastewater for free. It is also a thriving aquatic farm that annually produces 10,000 tonnes of fish and up to 50 per cent of the vegetables

So fish can feed on lilacs

The East Kolkata Wetlands has a global reputation for good reason. **Tania Bhattacharya** meets the man behind it



COLOUR OF KIDNEY: Dhrubajyoti Ghosh (left) believes the EKW is a victory of the people's knowledge

that are sold in the city markets. It provides employment to nearly one lakh people.

Ghosh, however, conscientiously emphasises that he did not invent the technology, merely ran into it. "The EKW is a victory of the knowledge of the people."

Ghosh's career as an ecologist spanning 30 years has been spent

advocating a more open approach towards the achievements of the common man in ecological conservation.

"That the common man can think is something we just cannot adapt to," says Ghosh. "His scientific knowledge is never accepted, but we must include in our thought paradigm the fact that

ecology doesn't have a robust basis, and that we may not know it all. Learned ecologists must unlearn in order for science to develop and grow."

In his 1998 paper titled "The Calcutta Wetlands: Turning Bad Water Into Good", Ghosh likens the functioning of the EKW to the kidneys in the human body. He

writes, "The retention of wastewater in the ponds, before the initial stocking of fish, allows bacteria to act upon the organic matter in the sewage and decompose the organic waste. The growth of these beneficial bacteria is supported by the algae that thrive in these shallow ponds under the ample sunshine. The algae also provide food for the fish. This ecosystem provides a natural kidney for the city's organic wastewater."

Ghosh is humble, soft-spoken and a humorous conversationalist, with an inspiring passion for ecology and grassroots movements for preserving the environment. It is not surprising that a man possessed of all these qualities, despite being a stalwart in the field of ecology, should remain largely unknown.

He worked at the Institute of Wetland Management in Dakshineswar. Later, he was the chief environment officer of West Bengal. But his professional life, by his own admission, was somewhat

rocky: "I was never a diplomat," he says. "After so many decades, people are finally listening to me," adds Ghosh.

His efforts to preserve the EKW as well as the livelihoods of lakhs of fisherfolk and farmers have been recognised internationally. This year he was conferred the Luc Hoffmann Award, considered the Nobel Prize of ecology by the International Union of Conservation of Nature.

Ghosh teaches wetland management to panchayat officers and engineers as well as district magistrates so they can continue to look after the EKW. Fortunately for him, the present government has reacted positively to these steps. "I tell them, if it's your village, you craft your own wetland policy and then discuss with other officers of other villages to come to a mutual understanding and legislation."

So what lies ahead? At the International Wetland Convention in Taiwan in September, Ghosh outlined a plan to develop the potential of the EKW as a green business hub with a projected turnover of \$10 million (Rs 66.5 crore) annually. This includes advancing pisciculture to produce 36,000 tonnes of fish, attracting birds to the habitation and promoting agriculture. "We can save the EKW and profit from it," he says. "I prefer to offer hope."

Now that's what we call a virtuous cycle.