AI will give teeth to our existing technology and make them more potent

Defence Research and Development Organisation's Director General (missiles and strategic systems) and Scientific Adviser to the Defence Minister, G Satheesh Reddy has played a key role in the design and development of missile systems, guided weapons, and avionics technologies. In an interaction with Outlook Business, Reddy speaks on the need for R&D institutes, industry and academia to come together and create an ecosystem for defence and civilian technologies.

What is the likely impact of artificial intelligence (AI) on future battlefield technologies?

As the theatre of war shifts from information-specific warfare to an intelligence-specific one, it is predicted that intelligence and the synergy between its human and machine aspects will be the key factor to dictate the eventual outcome. AI will give teeth to our existing technologies by augmenting them with autonomy and embedded intelligence, thereby making them more potent and destructive. AI will help extract logical conclusions from the ocean of data and enable enhanced battlefield situation awareness, leading to quick and logical decision-making in real time.

DRDO set up a lab for AI and robotics in the '90s. Why haven't we seen any technology breakthroughs yet?

We have been carrying out studies on AI and robotics for nearly three decades. Currently, DRDO is working on various technologies ranging from microrobots for surveillance and disaster relief to large-scale autonomous systems for combat roles. One should understand that this is a rapidly evolving technology which needs a supporting ecosystem for fruition of ideas and that different technologies attain maturity in different time frames. Rapid advances in information and communication technology (ICT) have unbelievably changed the way we interact. Similarly, on a global scale, you can see that the past decade has witnessed a perceptible change owing to the application of AI and machine learning to existing systems. I am confident that in the next five years, we will see appreciable results.

What is the present state of work on AI in DRDO labs? The Center for Artificial Intelligence & Robotics (CAIR) claims to have developed eight different robots. Have they been deployed?

The systems developed by CAIR are undergoing trials and will be deployed after completing field trials over the next two to three years. CAIR has also been working on a multi agent robotics framework (MARF) to equip the Indian Armed Forces with an array of robots that can function as a team similar to what our soldiers do. CAIR's research includes Robot Sentry — a mobile robot system targeted at patrolling, reconnaissance, surveillance, autonomous navigation in semi-structured environments with obstacle avoidance capability and continuous video feedback.

Apart from CAIR, Research & Development Establishment (Engineers), Pune and Combat Vehicles Research & Development Establishment, Chennai, are working on autonomous vehicles and autonomous tanks respectively. Aeronautical Development Establishment, Bengaluru, is developing unmanned aerial vehicles (UAV). Naval Science & Technological Laboratory, Visakhapatnam is developing autonomous underwater vehicles for naval application. A dedicated group at Research Center Imarat is also engaged in the development of AI systems. We have tie-ups with IITs and other universities on robotics and AI-related projects and also encourage start-ups working in the UAV space.

China and Russia have already taken the lead in terms of AI in defence, but we are still figuring out our ecosystem. Aren't we too late?

China has taken off in this area, but we are not much behind. In two years, we will be able to catch up, but the momentum should not go down. For that, the most important thing is to have a market and then address the issue of funding. If these two variables are addressed, the industry will eventually find a way out. India has contributed tremendously in the area of ICT and it will be the same with AI and robotics. Even as we speak, the AI industry is clocking an annual revenue of $180 million in India, which is home to around 29,000 AI professionals. The average work experience of AI professionals in India is 6.6 years. University of Mumbai, BITS (Pilani), IITs (Kharagpur, Delhi, Bombay, Kanpur, Roorkee), University of Pune and University of Delhi are undertaking professional AI graduate and post-graduate courses. This augurs well for the future.

What's needed for the industry to move up the curve in terms of defence technology?

No industry can survive by catering to the domestic market alone. It needs to create state of the art products that can be sold globally. Make in India should not stop at build-to-print, instead, it should involve indigenous design, development and manufacturing. This means roles have to be redefined.

We have generally been technology followers. The industry must shorten the lead time — often close to a decade — to two to three years. Schemes such as Atal Innovation Mission, Technology Development Fund and Small Business Innovation Research Initiative will aid the industry to shorten the lead time, thereby ensuring a ready market both within and outside the country.

The need of the hour is a synergistic effort of research institutes, academia and industry. Once we do this, the journey from 'technology followers' to 'technology leaders' will be relatively navigable.

Can you elaborate on how you plan to handhold the industry?

As development partners, the industry will have access to new and novel technologies and innovations. The DRDO test facilities, too, are available for use.

The government is striving to facilitate closer public-private partnerships with working groups involving military and technical experts, defence laboratories and academia to explore potential military application of AI. As a nation, we should formulate a mission-oriented long-term policy for strategic AI technologies.

Is the government making any specific effort towards ushering AI?

The government has put across a seven-point strategy as a prelude to India's plan for using AI. This covers aspects such as human-machine interaction; security of AI systems; competent workforce; ethical, legal and societal implications of AI; and measuring and evaluating AI technologies. An expert committee has also been set up in the Ministry of Electronics and Information Technology to advise the government on a policy for AI. Similarly, a task force has been set up to look into the applications of AI in defence. In the 2018 Union Budget, the government has allocated ₹30.7 billion for research, training and skill development in areas such as AI, digital manufacturing, robotics, quantum communication, big data intelligence, 3D printing, machine learning and internet of things. NITI Aayog also plans to establish a national programme to conduct research and development in AI and related areas.

A comprehensive long-term vision of the strategic and military role of AI is the backbone of sustained AI research as well as innovation. The vision must cover the various facets of AI, including autonomous weapons, cyber-defence, and formulate policies for each of them. This will help optimise the allocation towards the development of AI capabilities beneficial for the country.

DRDO looks to engage firms for border surveillance system

By Vijay Mohan

The Defence Research and Development Organisation (DRDO) is looking towards the industry for the commercial production and marketing of a border surveillance system (BOSS) developed by it. Two prototypes of the system, developed by DRDO's Dehradun-based Instruments Research and Development Establishment, were deployed in Ladakh for trials for over a year, sources said.

Following requisite modifications and upgrading, the DRDO now wants it perationalised. "Since DRDO is not a production agency, we are looking at transferring the technology to interested parties, both in private and public sector that can manufacture the system," a senior DRDO scientist said. "We are willing to engage up to three firms for the project," he added.

BOSS can be deployed at unmanned observation posts for remote controlled all-weather day-and-night monitoring of designated areas. It consists of a battle field surveillance radar along with electro-optical sensors like camera, infrared, thermal imager, laser ranger and GPS mounted on a pan-tilt unit.

It can detect a light vehicle at a distance of 10-12 km and a group of persons at 8-10 km while operating in temperatures from minus 30 to 55°C. Real time data and video can be transmitted over a distance of 20 km to a command post through wireless optic fiber link for up to 14 days.

The Army as well as border-guarding forces like the Border Security Force and the Indo-Tibetan Border Police Force could have a requirement for hundreds of such systems that can be deployed at vulnerable areas along the border in different types of terrain. Besides being a force multiplier and mitigating human stress in harsh terrain and inclement weather, the multitude of technologies involved in the system like radars, optics, hybrid power sources, electronics and communication, mechanical sub-systems and image processing also has spin-offs for the local industry.

The BOSS

The border surveillance system (BOSS) consists of a battlefield surveillance radar along with electro-optical sensors such as:

- camera , infrared sensors, thermal imager, laser ranger, Global Positioning System
- **10-12 km** is the distance up to which it can detect a light vehicle
- **8-10 km** is the distance up to which it can detect group of people