R&D Cell, CTC T & IT





CTCT & IT, Ranchi, Jharkhand



Shri Amit Taneja, DIGP Patron Shri Rajesh Sahay, Comdt. Chief Editor

Shri Sanjay Belwal, DC. Editor & Publisher

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"Every act of communication is a miracle of translation."

SI/T R N Singh

DEFINITION:-

The "Tongue Drive system" is a tongue-operated assistive technology developed for people with severe disability to control their environment. The tongue is considered an excellent appendage in severely disabled people for operating an assistive device.



OVERVIEW:-

The TDS provides people with minimal or no movement ability in their upper limbs with an efficacious tool for computer access and environmental control. Tongue Drive consists of A small permanent magnet secured on the tongue by implantation, piercing, or tissue adhesives is used as a tracer, the movement of which is detected by an array of magnetic field sensors mounted on a headset outside the mouth or on an orthodontic brace inside. The sensor outputs signals are wirelessly transmitted to an ultraportable computer carried on the user's clothing or wheelchair and are processed to extract the user's commands. The user can then use these commands to access a desktop computer, control a power wheelchair, or interact with his or her environment.

Working of Tongue Drive and its Block Diagram: -

In Tongue Drive system, the motion of the tongue is traced by an array of Hall-effect magnetic sensors, which measure the magnetic field generated by a small permanent magmagnet that is contained within a nonmagnetic fixture and pierced on the tongue. The magnetic sensors are mounted on a dental retainer and attached on the outside of the teeth to measure the magnetic field from different angles and provide continuous real-time analog outputs. Fig. 1



shows the Tongue Drive System block diagram with two major units: one inside the mouth, the mouthpiece, and the other outside, a portable body worn controller. Small batteries such as hearing aid button-sized cells are intended to power the mouthpiece for extended durations up to a mouth. The power management circuitry

scans through the sensors and turns them on one at a time to save power. The time division multiplexes (TDM) analog outputs are then digitized, modulated, and transmitted to the external controller unit a wireless link. The across magnetic field generated by the tracer inside and around the mouth varies as a result of the



tongue movements. These variations are detected by an array of sensitive magnetic sensors mounted on a headset outside the mouth, similar to a head-worn microphone, or mounted on a dental retainer inside the mouth, similar to an orthodontic brace. The sensor outputs are wirelessly transmitted to a personal digital assistant (PDA) also worn by the user. A sensor signal processing (SSP) algorithm running on the PDA classifies the sensor signals and converts them into user control commands that are then wirelessly communicated to the targeted devices in the user's environment. The principal advantage of the TDS is that a few magnetic sensors and a small magnetic tracer can potentially capture a large number of tongue movements, each of which can represent a particular user command. A set of specific tongue movements can be tailored for each individual user and mapped onto a set of customized functions based on his or her abilities, oral anatomy, personal preferences and lifestyle. The user can also define a command to switch the TDS to standby mode when he or she wants to sleep, engage in a conversation, or eat. The signals received by the external controller unit are demodulated and demultiplexed to extract the individual sensor outputs. By processing these outputs, the motion of the permanent magnet and consequently the tongue within the oral cavity is determined. Assigning a certain control function to each particular tongue movement is done in software

and can be easily customized control functions may then individual user. These customized control functions may then be used to operate a variety of devices and equipment including computers, phones, and powered wheelchairs.

One prototype for human trials, shown in Figure 3, was built on a face shield to facilitate positioning of the sensors for different subjects.



Conclusion: -

A tongue operated magnetic sensor based wireless assistive technology has been developed for people with severe disabilities to lead a self-supportive independent life enabling them to control their environment using their tongue. This technology works by tracking movements of permanent magnet, secured on the tongue, utilizing an array of linear Hall-effect sensors. The sensor outputs are a function of the position-dependent magnetic field generated by the permanent magnet. This allows a small array of sensors to capture a large number of tongue movements. Thus, providing quicker, smoother, and more convenient proportional control compared to many existing assistive technologies. Other advantages of the Tongue Drive system are being unobtrusive, low cost, minimally invasive, flexible, and easy to operate. A more advanced version with custom designed low-power electronics that entirely fit within the mouthpiece is currently under development.

A recent advance in lead-acid battery technology developed by the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) is

the Ultra Battery, а hybrid energy storage device that integrates supercapacitor with a lead-acid battery in one-unit cell. The Ultra Battery incorporates carbon plates at the negative electrode to act as supercapacitor hybrid electrodes, allowing fast charge acceptance compared with the conventional technology. This feature makes the lead-acid battery more suitable in hybrid vehicle applications, but could also be important for short-term wind turbine output power stabilisation.



What the function of carbon electrode is like?

It enables the carbon electrode on the negative plate to pull in the electrons.

It achieved the speedy recovering charge and thereby longer life span



Why create an ultrabattery ?

One problem with lead acid batteries and their sealed counterparts is that battery performance is tied to the charge state of the battery, as well as other outside factors. In applications like solar energy storage, where the charge state of the battery may be unpredictable, but the battery needs to be ready to take a charge at any time, this type of technology could be very useful. In fact, the UltraBattery is able to stay at a partial state of charge for extended periods of time without sulfation or separation of the electrolyte. In the past, remote energy storage grids have suffered when batteries begin to degrade, but this new technology could potentially prolong the life of these batteries beyond the range of all the other batteries currently on the market.

where will ultrabattery be used?

Currently, most of the research and applications of UltraBattery are centered around energy grid projects, but this technology is finding its way into the hands of electric vehicle manufacturers, another industry that is coming head to head with the challenges of battery degradation and the need for long-lived batteries that can handle partial state of charge operations.

Paper Printer- Erase Printed Text to Reuse Paper as Almost New

ASI/RO M Venkata Rao

The printer from Toshiba is able to "scrub clean" pages that have been printed using Pilot's FriXion ink already used in the stationery company's erasable pens, changing the blue toner into white so that paper looks almost new. Noting that "80 percent of everything printed is discarded within half an hour", Toshiba applied the FriXion blue ink to a laser printer so that users can save money whilst also helping the environment by reusing resources.

In addition, pages are scanned by the printer before they are erased so that users are able to recover a copy from the hard drive should they find that they need it again; and scans the page again once text has been erased to check for any marks that have been missed, with pages that are deemed too messy being diverted to a different paper bin to prevent it from being used again by mistake.

Toshiba : The first eco-friendly multifunction printer that can erase printed text

Toshibas the world's first eco-friendly MULTIFUNCTION PRINTER system that can erase images and text on the prints with integrated scan-to-network function, available in Japan from February 2013 to be followed by a worldwide roll out.

The e-STUDIO 306LP multifunction printer combines with the e-STUDIO RD30 for removing the toner colour from the printed documents. The instantly erasable toner is a special toner whose colour is removed by passing the paper through the RD30 at high temperature.



If the same paper is used five times, this constitutes some 57% reduction in the system's total CO2 emissions.

The key features of the RD30 are its ability to sort paper

into reusable and un-reusable sheets at the same time as removing the toner colour, and to digitize the documents prior to erasing. Normally, documents that have been used, for example, at a meeting, are either filed away or scrapped, but with this system, there is no filing or destroying of paper documents, and the contents of the documents can be converted into data and saved for future use.

Differentiation in eco-printing

Based on the Toshiba strategy of 'Differentiation in ECO-printing' the company has always provided multifunction printers with enhanced environmental technology by reducing the multifunction printer's size and weight and smart energy efficiency improvements. Yet a key cost-saving issue with a positive 'green' effect in every office today is "saving paper". The e-STUDIO 306LP/RD30 re-usable paper solution opens a window to a new work style in the office environment by encouraging users to re-use paper through the new system.

Toshiba TEC new e-STUDIO 306LP/RD30 helps enterprises to adopt business strategies that contribute to sustainable development.

Environmental Technologies: Customer Benefits

- 1. The e-STUDIO 306LP/RD30 houses Intelligent Green multifunction printer Technology with the built-in erasing system, allowing users to refill their paper tray five times with the same paper! This has a double advantage for the enterprise:
 - ✓ paper cost is reduced to one-fifth of the current cost structure
 - ✓ lower ecological footprint of every e-STUDIO 306LP/RD30 multifunction printer improves the standing of the enterprise in CSR (Corporate social responsibility) campaigns and is part of a sustainable future for all
- Toshiba's award-winning design team incorporated bio-based plastics into this innovative re-usable paper multifunction printer. Bio-based plastics are made from raw materials extracted from plants, Bio-based plastics are environmentally friendly, producing approximately 20% less CO2 during its production when compared with petroleum-based plastics.
- 3. It is the world's first product in the category of mass-produced multifunctional printers to use electrographic.
- 4. The erasable toner was jointly developed with Pilot Corporation. The erasing speed is 30 A4size sheets per minute using only the erasing function, or 15 A4-size sheets per minute using the erasing-scanning-sorting function.
- 5. The number of times sheets can be reused varies depending on the usage environment.
- 6. Eco-friendly multifunction printer system has verified the calculation method used to determine the amount of reduction in CO2 Life Cycle Assessment by British Standards Institution Group Japan. Life Cycle Assessment is a method of assessing the environmental impact of a product or service from the time of production until disposal. BSI (British Standards Institution) is a global organization that equips businesses with the necessary solutions to turn standards of best practice into habits of excellence. Formed in 1901, British Standards Institution was the world's first National Standards Body and a founding member of the International Organization for Standardization (ISO).

While Toshiba has only used the technology on large business printers, it hopes that if the idea takes off it could become "an option for home printing as a separate toner cartridge".

Cost : Approximately 6,50,000/-

Augmented Reality (AR) and Virtual Reality (VR)

HC/RO S K Mishra

Pay Attention: Augmented Reality (AR) and Virtual Reality (VR) Will Change Our Daily Lives and How We Do Business

Augmented reality (AR) and virtual reality VR) are on the verge of emerging as mainstream technologies that will impact our society and economy. As hardware costs decrease and software availability increases, both technologies will start to make their way into everyday life and business. Work will change thanks to AR and VR, and the technologies will integrate into our personal lives as well. It requires some imagination and vision to understand how it will impact the workplace, jobs, and daily life. But we know one thing for sure: change is undoubtedly coming for some industries...

Shopping, ecommerce, and retail

Today, shopping is 3D if we can be bothered to go into an actual store, or it's 2D if we like to shop online, swiping through hundreds of products and images. Soon, there will be new ways of shopping and trying out products. Instead of traditional retail shops, there will be virtual showrooms. Much to the delight of designers and store owners, virtual showrooms have no limit to their square footage, so virtual showrooms can have space for you to browse. These virtual experiences could be customized, shared by communities or similar shoppers, or change every so often as do shop windows.

One thing to look forward to is being able to virtually try on clothes which will allow us to experience the clothing and how they would fit our body type before purchasing them online. Returning items due to size or appeal is a hassle, and while the customer will be happy for the greater convenience, big online retailers will be happy that their shipping expenses and backwards supply chain costs will decrease. Along similar lines, you'll soon be able to try out new personal styles – new tattoos, haircuts, makeup looks – without the permanent commitment factor. Who wouldn't be excited by that?

Medicine

Believe it or not, AR and VR are already helping patients with certain diseases such as Alzheimer's, PTSD, and autism. A UC Davis startup <u>Cognivive</u> is creating mixed-reality digital therapeutics to treat cognitive impairments. Meanwhile UCSF founded <u>Neuroscape</u>, a translational neuroscience center to use technology, such as AR/VR, to improve mind quality and tackle neurodegenerative diseases. They have released multiple academic papers and are developing diagnostic tools and intervention solutions aimed at tackling autism, dyslexia, ADHD, multiple sclerosis, depression, mild cognitive impairment and dementia, and more. Neuroscape has multiple trademarks but has also filled multiple patents such as a patent for methods on enhancing performance on a cognitive task by improved self-regulation of internal distraction.

Another interesting application of VR to medicine relates to the development of new drugs through virtual and 3D biological analysis. Scientists and researchers can "stand next" to a 3D molecular structure that's the same size as them, walk around it, and essentially play with it. Seeing and experiencing the 3D

structure of a compound, for instance, could highlight areas for chemical changes. <u>Nanome</u>, a startup out of UC San Diego, is doing something along those lines and has created a VR platform, a virtual world, where people can experiment, design, and learn at nanoscale. I've tried it and it's impressive!

Construction and Real Estate

Perhaps one of the most obvious applications of a 3D world is changing 2D designs for large 3D objects: buildings. Imagine being able to walk through a building before it has been built, even before the foundation has begun. Experienced construction professionals, electricians, plumbers, anyone involved in small to large scale construction projects can walk through a building in VR and immediately identify problems: time and money drains, design flaws, etc. Clearly this has potential to positively impact project management, save time, and reduce construction costs. As construction begins, project managers aren't necessarily required to be onsite anymore if they can tour and walk through construction in AR or VR and still manage the project from afar.

Interestingly, the application of construction goes a step further to once a building has been built. Those in the real estate business trying to sell or lease can now offer VR tours to potential occupants or buyers. They can experience the building without being present.

Education and Training

VR/AR can also be applied to training those in construction, plumbing, engineering, and any work that's truly hands-on. Imagine being able to practice cutting, building, or plumbing before doing it on real materials: you can fail as often as you like, learn what not to do, and the cost of resources lost is \$0. Going a step further, trainee surgeons can practice surgery before they operate on a live patient! Other industries that are high risk such as oil, gas, and utilities, can benefit from being able to train workers in VR before they take to high cost resources. Caterpillar and BP are already using AR/VR to train workers with success thus far.

For K12, classrooms will shift to curiosity-based learning. Students could tour the galaxy in VR, explore history by watching battles, visiting historic locations, or taking virtual field trips. In short, the distance will be close, the inaccessible accessible, and the boring will come alive!

Manufacturing

Already, some manufacturing workers are receiving assistance from AR gadgets to reduce human error, save time, and increase efficiency. GE and Boeing have both deployed tests and found that worker efficiency increase by 16%.

Customer Service

A related part to manufacturing is repairs and maintenance. When things break, or don't work, they need to be repaired and quickly. The faster you can identify problems, order parts, and execute the repair, the less the cost of down-time. AR/VR can enable experts to identify problems remotely: you get access to experts through virtual consultation without the time and cost of bringing them on-site. The same concept

applies to non-physical customer service and support. AR/VR can enable customer support representative to literally see what the customer sees, identify problems, and solve them.

Law Enforcement

Another AR technology on the edge of going mainstream is the use of AR glasses in law enforcement. The glasses can detect lies in real-time using analysis of facial expressions and body movements. They can also help to identify weapons or contraband. Perhaps slightly more disturbing is that the same technology can be applied to jury selection and even jury monitoring: picking your jurors and playing to their reactions based on social and emotional data.

For the detective and crime scene fans, a new entertainment is undoubtedly on the horizon. While VR and AR can allow the virtual re-creation of an accident or a crime scene, they can also be applied to cool mystery-solving VR games. Undoubtedly crime scene re-creation will help detectives and courtrooms in real life, but I'm sure many of us would jump at the chance to play detective and solve imaginary VR crimes.

The Workplace

Clearly, if you're in a profession that's hands-on, change is coming. Job training will change and AR will serve as a technology to help us do our jobs better with less error and greater safety. Those in desk jobs won't escape the sweeping changes: anticipate virtual meetings in VR, team collaborations, and a new way to work remotely yet work together. Imagine that going to an office meeting with colleagues across the country meant putting on a VR headset and "walking" into a VR conference room. VR meetings aren't for the distant future either: a startup at the Qualcomm Institute at UC San Diego, <u>VirBELA</u>, has already created an MVP and are expanding their customer case.

HR teams will likely push for empathy and EQ training using VR – you could literally walk a mile in someone else's shoes in VR, helping build empathy. Ideally, greater empathy helps with dispute resolution or better yet, avoiding disputes in the first place and improving workplace and team dynamics!

Applications to Business

Given what's to come, there is clearly a huge opportunity for startups in the AR and VR space. It's a trend we're already seeing, but many of the avenues we're discussing are yet to be explored or implemented. With that, there's a need for cross-trained talent: if you're going to develop a VR surgery platform, you need expertise in surgery. Similarly, if you're going to build a VR construction platform, you need to know about construction. I wouldn't be surprised if we see a structural engineer who also knows computer programming or a molecular biologist who is also a software engineer.

Work will change and VR and AR will become part of our workday. In some cases, such as mechanics or manufacturing assemblers, AR will perhaps dominate most of their day but in a way that aids job performance. The question as a manager becomes, how do you get buy-in from your average construction worker or mechanic that AR or VR will help them perform and enjoy their job more?

If you're in an industry that will be more heavily disrupted by AR/VR, questions arise around value propositions and business models. How do you change your value proposition if you're in retail? It's cheaper, faster, and easier to buy from a virtual showroom following a virtual fitting. With that said, what value will

brick-and-mortar stores provide to customers? How will business models adjust when capital expenditures for showrooms decrease significantly? Evidently, there will be shifts in resources, capital, and also labor as industries shift their talent needs: retail will need fewer retail associates and far more software engineers and virtual designers. It's time to prepare for change as AR and VR become more and more mainstream and businesses in industries facing greater disruption will have to start changing now or be left in the dust.

How AI, Data Science and Technology is Used to Fight The Pandemic

HC/RO S K Mishra

Since the first report of <u>coronavirus (COVID-19)</u> in Wuhan, China, it has spread to at least 200 other countries. As China initiated its response to the virus, it leaned on its strong technology sector and specifically artificial intelligence (AI), data science, and technology to track and fight the pandemic while tech leaders, including Alibaba, Baidu, Huawei and more accelerated their company's healthcare



initiatives. As a result, tech startups are integrally involved with clinicians, academics, and government entities around the world to activate technology as the virus continues to spread to many other countries. Here are 10 ways artificial intelligence, data science, and technology are being used to manage and fight COVID-19.

1. AI to identify, track and forecast outbreaks

The better we can track the virus, the better we can fight it. By analyzing news reports, social media platforms, and government documents, AI can learn to detect an outbreak. Tracking infectious disease risks by using AI is exactly the service Canadian startup<u>BlueDot</u> provides. In fact, the BlueDot's AI warned of the threat several days before the Centers for Disease Control and Prevention or the World Health Organization issued their public warnings.

2. AI to help diagnose the virus

Artificial intelligence company Infervision launched a coronavirus AI solution that helps front-line healthcare workers detect and monitor the disease efficiently. Imaging departments in healthcare facilities are being taxed with the increased workload created by the virus. This solution improves CT diagnosis speed. Chinese e-commerce giant Alibaba also built an AI-powered diagnosis system they claim is 96% accurate at diagnosing the virus in seconds.

3. Process healthcare claims

It's not only the clinical operations of healthcare systems that are being taxed but also the business and administrative divisions as they deal with the surge of patients. A block-chain platform offered by Ant Financial helps speed up claims processing and reduces the amount of face-to-face interaction between patients and hospital staff.

4. Drones deliver medical supplies

One of the safest and fastest ways to get medical supplies where they need to go during a disease outbreak is with drone delivery. Terra Drone is using its unmanned aerial vehicles to transport medical samples and quarantine material with minimal risk between Xinchang County's disease control centre and the People's Hospital. Drones also are used to

patrol public spaces, track non-compliance to quarantine mandates, and for thermal imaging.

6. Robots sterilize, deliver food and supplies and perform other tasks

Robots aren't susceptible to the virus, so they are being deployed to complete many tasks such as cleaning and sterilizing and delivering food and medicine to reduce the amount of human-to-human contact. UVD robots from Blue Ocean Robotics use ultraviolet light to autonomously kill bacteria and viruses. In China, Pudu Technology deployed its robots that are typically used in the catering industry to more than 40 hospitals around the country.

6. Develop drugs

Google's DeepMind division used its latest AI algorithms and its computing power to understand the proteins that might make up the virus, and published the findings to help others develop treatments. BenevolentAI uses AI systems to build drugs that can fight the world's toughest diseases and is now helping support the efforts to treat coronavirus, the first time the company focused its product on infectious diseases. Within weeks of the outbreak, it used its predictive capabilities to propose existing drugs that might be useful.

7. Advanced fabrics offer protection

Companies such as Israeli startup Sonovia hope to arm healthcare systems and others with face masks made from their anti-pathogen, anti-bacterial fabric that relies on metal-oxide nanoparticles.

8. AI to identify non-compliance or infected individuals

While certainly a controversial use of technology and AI, China's sophisticated surveillance system used facial recognition technology and temperature detection software from SenseTime to identify people who might have a fever and be more likely to have the virus. Similar technology powers "smart helmets" used by officials in Sichuan province to identify people with fevers. The Chinese government has also developed a monitoring system called Health Code that uses big data to identify and assesses the risk of each individual based on their travel history, how much time they have spent in virus hotspots, and potential exposure to people carrying the virus. Citizens are assigned a color code (red, yellow, or green), which they can access via the popular apps WeChat or Alipay to indicate if they should be quarantined or allowed in public.

9. Supercomputers working on a coronavirus vaccine

The cloud computing resources and supercomputers of several major tech companies such as Tencent, DiDi, and Huawei are being used by researchers to fast-track the development of a cure or vaccine for the virus. The speed these systems can run calculations and model solutions is much faster than standard computer processing.

In a global pandemic such as COVID-19, technology, artificial intelligence, and data science have become critical to helping societies effectively deal with the outbreak

- 1. The Government of India has constituted a Science and Technology Em powered Committee to make speedy decisions on research and development of COVID19.Who is Chairman of this committee?
 - A. T. S. Thakur
 - B. Vinod Paul
 - C. Harsimrat Kaur Badal
 - D. Prakash Javadekar
- 2. Which of the following has partnered will UNESCO to adopt technology in class rooms?
 - A. Samsung
 - B. Lenovo
 - C. Toshiba
 - D. DELL
- 3. Which of the following launched India's First Service Audio Service 'Suno'?
 - A. Netflix
 - B. Audible
 - C. Google
 - D. Facebook
- 4. FSSAI to develop app to prevent food wastage in partnership with which company?
 - A. Google
 - B. Nasscom Foundation
 - C. Infosys
 - D. TCS
- 5. Government launched 'indianculture.gov.in' portal is developed by which of the following institutes?
 - A. IIT Kharagpur
 - B. IIT Kanpur
 - C. IIT Bombay
 - D. IIT Delhi

- 6. Researchers of which institute has designed a paper-based sensor to detect the quality of milk?
 - A. IIT Hyderabad
 - B. IIT Bombay
 - C. IIT Guwahati
 - D. IIT Delhi
- 7. Which hospital has set Guinness World Record for the largest gathering of cardiac surgery patients at one place?
 - A. Ramesh Hospitals, Vijayawada
 - B. Star Hospitals, Hyderabad
 - C. Max Healthcare, Gurgaon
 - D. Fortis Escorts Hospital, Jaipur
- 8. ISRO has plans to set up India's own space station by _____.
 - A. 2025
 - B. 2026
 - C. 2030
 - D. 2032
- 9. What is the name of audio guide facility app launched by Ministry of Tourism?
 - A. Audio Odigos
 - B. Radio Guide
 - C. Mobile Guide
 - D. Guide to Ride
- 10. What is the name of the space docking experiment that ISRO has planned to carry out in 2020?
 - A. Vikram
 - B. Spadex
 - C. Dock-Tech
 - D. Unix

Technical Terms

Smart monitoring:

A variety of channels can be monitored while the radio is muted, and calls can be received on any of the channels being scanned.

Voice Encryption:

The optional Voice Encryptor provides communication security (COMSEC) and enables users to communicate sensitive information in confidence, without complicated setup procedures. It also provides visual confirmation that the conversation is secure.

Antenna Tuner:

A device used to match the output impedance of a transmitter to that of an antenna.

Anti-VOX:

Transceiver circuitry used in voice-operated (VOX) stations to prevent audio from the receiver's speaker from actuating the voice-operated transmitter.

Balun:

A passive electronic device that converts between balanced and unbalanced electrical signals using some form of electromagnetic coupling.

Beacon:

A station that transmits signals either continuously or on a timed basis, for location and propagation purposes.

BNC:

A push-and-turn locking coaxial connector commonly used with VHF/UHF transceivers, as well as oscilloscopes and test equipment.

DAC:

Also known as D/A and D-to-A. Digital to Analogue converter. A device that converts digital signals into analogue signals.

DF:

Direction finding. Also known as ARDF and "fox hunting", the use of triangulation and directional antennas to find a hidden transmitter. May be done recreationally or as a means of locating the source of problematic radio frequency interference. We are highly thankful for reading out this compilation and hope it will be useful for you in our day to day professional and personal life. We would like to hear your interest areas, suggestions from you to make this newsletter more informative and interesting. Your views will definitely help us to create this newsletter as an effective medium to reach you with latest development in the fields of communication and technology.



R&D Team CTC T&IT CRPF, Ranchi, Jharkhand ⊠ ctcit@crpf.gov.in

Answers to the Quiz

1	2	3	4	5	6	7	8	9	10
B	D	B	B	С	С	A	С	A	В