INFOLINE

Volume XIII Issue 4 April 2023

DEPARTMENT OF COMPUTER TECHNOLOGY AND INFORMATION TECHNOLOGY

KONGU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)

Affiliated to Bharathiar University,
Coimbatore
Approved by UGC and AICTE,New Delhi
Re-accredited by NAAC,DBT STAR College Scheme
An ISO 9001 : 2015 Certified Institution
Nanjanapuram,Erode - 638 107

INFOLINE

EDITORIAL BOARD

CONTENTS

ADAPTATIVE ROBOTICS

Adaptive robotics is a field that goes one step further than collaborative robotics. It involves the development and manufacturing of robots capable of adapting to and learning from their environment, interacting with humans. In other words, adaptive robots are those with cognitive, sensing and decision-making capabilities to modify their behaviour and function in response to contextual changes.

Hierarchical intelligence is the term used in the industry, referring to the different – and independent layers of intelligence in the machine that would simulate a human brain (receiving visual information, planning trajectories, recognition, position calculation etc..,). In short, it is about robots that can constantly 'learn' new things without needing to be reprogrammed: new routes, new sequences and new task.

This area of robotics has been under investigation for several decades and the evolution has been driven mainly by recent advances in technologies such as artificial intelligence, computer vision (also known as machine vision), the IoT and electronics. These robots can use machine learning techniques to analyse and understand their environment as well as learn from human interactions, adapt their behaviour and function accordingly, making them a key tool for use in collaborative environments.

Uses of Adaptive Robotics

Following are 3 examples of different industrial sectors where adaptive robotics is used:

Manufacturing: adaptive robots can be used in a wide range of manufacturing applications such as assembly, welding or quality inspection tasks. They can work collaboratively with human operators, performing repetitive or physically demanding tasks while human workers perform more complex jobs.

Healthcare: robots are increasingly being used in healthcare-related tasks, for example to assist patients with reduced mobility, providing support to healthcare staff.

Logistics and warehousing: in warehouses and distribution centres performing tasks related to order picking, inventory management or shipping.

The ability to adapt to the environment's challenges, the use of adaptive robotics has also spread to other sectors such as construction, hospitality, entertainment and

agriculture, but it is particularly interesting how it is improving the automation of industrial processes.

Adaptive Robotics And Industrial Automation

Industry 4.0 is a concept that refers to the transformation of all industrial sectors, as a result of the impulse of new technologies. This transformation mainly affects manufacturing and production processes which have experienced a significant boost in cost-effectiveness, production capacity and cost reduction, among other benefits. Production environments are highly dynamic and changing. In this context, adaptive robotics has the potential to perform its assigned function continuously and intelligently, adjusting its routes and functions in the most effective way.

For example, an assembly robot can adjust its speed and accuracy in response to changing production conditions which can improve the efficiency and quality of the production process. Finally, adaptive robotics brings new horizons of industrial flexibility by simplifying production lines (since a single machine can do multiple tasks) and improves the safety of human equipment, enhancing the automation of hazardous tasks.

M. HARINII

B.Sc. (Computer Technology)

THE RISE OF INTELLIGENCE AUTOMATION

Another key trend to watch out for in 2023 is the integration of AI and RPA to create intelligent automation solutions. By combining the strengths of AI such as machine learning, natural language processing and image recognition with the automation capabilities of RPA, organizations can unlock new possibilities for improving their operations.

RPA can serve as a foundation for companies looking to accelerate their integration of AI into critical activities and decisions. It allows robots to automate decision-making processes and perform complex analyses, simplifying everyday operations and improving productivity and accuracy. Companies can leverage the latest AI trends to improve their RPA systems. They can use machine learning to enhance decision-making accuracy, NLP to understand customer

needs better and image recognition to automate data extraction from various sources.

PHARITHIVEL A B

III B.Sc. (Computer Technology)

DATA PRIVACY

Data privacy, sometimes also referred to as information privacy, is an area of data protection that concerns the proper handling of sensitive data such as certain financial data and intellectual property data, to meet regulatory requirements as well as protecting the confidentiality and immutability of the data.

Roughly speaking, data protection spans three broad categories, namely, traditional data protection (such as backup and restore copies), data security and data privacy. Ensuring the privacy of sensitive and personal data can be considered an outcome of best practice in data protection and security with the overall goal of achieving the continual availability and immutability of critical business data.

Encryption is a way to conceal information by scrambling it so that it appears to be random data. Only parties with the encryption key can unscramble the information.

With the increase in dependency on electronic devices, it becomes important to teach people the proper ‘netiquettes’. Parents have an important role to play in monitoring their child’s behaviour and activity on the internet. It is also important for Access control ensures that only authorized parties access systems and data. Access control can be combined with Data Loss Prevention (DLP) to stop sensitive data from leaving the network. Two-factor authentication is one of the most important technologies for regular users, as it makes it far harder for attackers to gain unauthorized access to personal accounts. These are just some of the technologies available today that can protect user privacy and keep data more secure. However, technology alone is not sufficient to protect data privacy.

As technological advances have improved data collection and surveillance capabilities, governments around the world have started passing laws regulating what kind of data can be collected about users, how that data can be used and how data should be stored and protected. Some of the most important regulatory privacy frameworks to know include:

General Data Protection Regulation (GDPR): Regulates how the personal data of European Union (EU) data subjects, meaning individuals can be collected, stored and processed and gives data subjects rights to control their personal data (including a right to be forgotten).

National Data Protection laws: Many countries such as Canada, Japan, Australia, Singapore and others have comprehensive data protection laws in some form. Some, like Brazil's General Law for the Protection of Personal Data and the UK's Data Protection Act, are quite similar to the GDPR.

California Consumer Privacy Act (CCPA): Requires that consumers be made aware of what personal data is collected and gives consumers control over their personal data, including a right to tell organizations not to sell their personal data. There are also industry-specific privacy guidelines in some countries: for instance, in the United States, the Health Insurance Portability and Accountability Act (HIPAA) governs how personal healthcare data should be handled. However, many privacy advocates argue that individuals still do not have sufficient control over what happens to their personal data. Governments around the world may pass additional data privacy laws in the future.

Online tracking: User behavior is regularly tracked online. Cookies often record a user's activities and while most countries require websites to alert users of cookie usage, users may not be aware of to what degree cookies are recording their activities. Losing control of data: With so many online services in common use, individuals may not be aware of how their data is being shared beyond the websites with which they interact online and they may not have a say over what happens to their data. Lack of transparency: To use web applications, users often have to provide personal data like their name, email, phone number, or location; meanwhile, the privacy policies associated with those applications may be dense and difficult to understand.

Social media: Social media posts may reveal more personal information than users realize Cybercrime: Many attackers try to steal user data in order to commit fraud, compromise secure systems, or sell it on underground markets to parties who will use the data for malicious purposes. Some attackers use phishing attacks.

S. JAGADESH

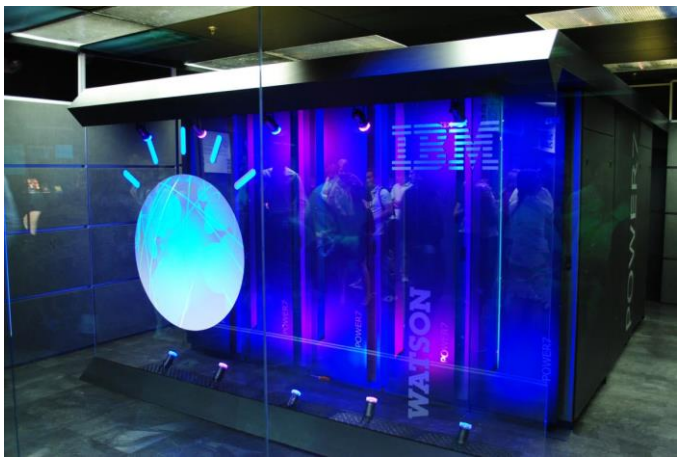
III B.Sc. (Information Technology)

IBM TAKES ON AWS, GOOGLE AND MICROSOFT WITH WATSONX

IBM is taking on the likes of Microsoft, AWS and Google by introducing Watsonx, a new generative AI platform which will help enterprises design and tune large language

models (LLMs) for their operational and business requirements. Watsonx comes with a suite of tools for tuning LLMs, a data store built on lakehouse architecture and an AI governance toolkit, the company said.

Watson AI is IBM's artificial intelligence engine that the company had trained on different machine learning algorithms along with question analysis, natural language processing, feature engineering and ontology analysis. Watsonx can be seen as the evolution of Watson AI. With the Watsonx platform, the company said it is trying to meet enterprises' requirements in five areas, including interacting and conversing with customers and employees, automating business workflows and internal processes, automating IT processes, protecting against threats and tackling sustainability goals.



As part of the generative AI platform, IBM will offer a development studio for AI builders to train, test, tune and deploy traditional machine learning and new generative AI capabilities with the help of built-in foundation models, the company said. The AI studio, dubbed Watsonx.ai, will come with a foundation model library and necessary tools for data preparation, model development, and model monitoring, it added. Examples of some components of Watsonx.ai include a Tuning Studio, a Prompt Lab, the foundational model library, developer libraries and APIs.

The current foundation models included in the library have been trained to understand not only natural language but also code, time-series data, tabular data, geospatial data and IT event data, IBM said, adding that the initial set of foundation models will be made available in beta tech preview to select clients. Some of the foundation models in Watsonx.ai's library are fm.code, fm.NLP, and fm.geospatial. While fm.code can be used to train models to generate code for developers via natural language processing, fm.geospatial can be used to predict weather or climate conditions as it is a model built on climate and remote sensing data. The fm.geospatial model was built by IBM Research in collaboration with NASA, the company said. The AI studio's components such as the Prompt Lab currently only support tuning of text and code foundation models.

Under fm.NLP, the company is offering a collection of LLMs that can be customized using client data for better natural language understanding as language or expressions can vary from one industry to the other. IBM has

also partnered with Hugging Face to provide datasets and models built on Hugging Face's open source libraries within Watsonx.ai. Watsonx.ai which will be available as a SaaS offering initially is expected to be made available in July this year, the company said.

IBM Watsonx.data to act as a data store along with Watsonx.ai, IBM is introducing a data store which is built on an open lakehouse architecture, for AI workloads. The data store, dubbed Watsonx.data, will support open data formats and help enterprises with additional capabilities such as data querying and data governance among others. It can reduce data warehousing costs by 50%, IBM said, adding that the data store offers integrations with an enterprise's existing databases.

K. DURAIMURUGAMI

I B.Sc. (Computer Technology)

HETEROGENEOUS SWARM ROBOTICS

Biological systems such as ant colonies, flocks of birds and herds of sheep display emergent behaviors that are of great interest to swarm robotics research. Recent research in scalable and efficient self-organized robot swarms and collaborative behaviors demonstrates the vital role that biological swarms play in inspiring robotics research. This has numerous real-world applications, such as humanitarian de-mining, search and rescue (SAR) operations, agricultural harvesting, infrastructure inspection, and planetary exploration. While many robotics works focus on single type robot systems for their simplicity and homogeneity, heterogeneous robot systems are emerging as effective solutions for multi-robot tasks. For instance, unmanned aerial vehicles (UAVs) with better sensing and extended vision can complement robot swarms consisting of unmanned ground vehicles (UGVs) or unmanned underwater vehicles (UUVs) and collaboration with UAVs can improve the performance of robot swarms significantly. However, such systems present new challenges, including the need for a more sophisticated architecture for coordinating heterogeneous robots, an efficient communication network for a large swarm, a more resilient robot learning for different robots and the ability to scale the swarm to a large group while maintaining efficient performance.

Heterogeneity in robot swarms can arise from physical or behavioural differences such as (i) robots with different designs and roles; (ii) robots with different designs but the same roles, or (iii) robots with the same design but different roles in a cooperating team. This topic focuses on the implementation of heterogeneous multi-robot systems and robot swarms. We welcome articles that describe mature research demonstrated on physical

systems or theoretical work that has a clear and direct application to robots.

Some potential topics for this area of research include, but are not limited to:

* Heterogeneous robot swarms are applied to tasks such as foraging, search and rescue, assembly, construction, agriculture, inspection, monitoring, or space exploration.
* Heterogeneity in learning for multi-robot systems.
* Heterogeneous cooperative dexterous manipulators.
* Heterogeneous cooperative sensing for robots.
* Heterogeneous cooperative localization and mapping.
* Coordination and collaboration of multiple heterogeneous robots.
* Heterogeneous strategies for multi-robot communication networks.
* Heterogeneous robot swarms in adversarial domains.
* Heterogeneous robot swarms in centralized or decentralized learning.
* Heterogeneous bio-inspired robot swarms.
* Heterogeneous self-organizing robot swarms.

B.THARNIKA

III B.Sc. (Information Technology)

GROWTH OF CONVERSATIONAL AI

Conversational AI systems are expected to become more widespread in 2023 with experts predicting an increase in their usage across various industries.

While current chatbot technology may not yet be able to handle complex queries, advancements in AI trends have the potential to make them more advanced and efficient. Organizations are increasingly looking to implement conversational AI assistants in their processes, but to ensure desired results, they must stay updated with the latest AI trends. These trends include integrations to personalize interactions, using a no-code approach to reduce IT workload and incorporating natural language processing, machine learning and sentiment analysis to understand user intent and provide personalized responses.

M. HARINII

II B.Sc. (Computer Technology)

DIGITAL TWIN TECHNOLOGY BENEFITS AND CHALLENGES

As with any new and evolving technology, IT and IAM professionals must be aware of the potential digital twin technology benefits, challenges and security risks so that their companies can benefit from the technology without placing systems, products or end users at risk.

The growing adoption of smart technology in the industrial sector has given rise to the widespread availability and mainstream use of digital twins. About 48 percent of companies already using smart manufacturing plan to embrace digital twin technology in an effort to improve operations and provide better service to customers.

The Digital Twin: Like the Real Think but Virtual

Industry 4.0 is bringing sweeping changes to industrial operations. Defined by i-Scoop as "the evolution to cyber-physical systems, representing the fourth industrial revolution on the road to an end-to-end value chain with Industrial IoT and decentralized intelligence," this widespread digital transformation is bringing a multitude of new technologies to the mainstream, including digital twins.

The concept of the digital twin originated with NASA as the organization sought effective ways to handle the difficulties associated with the Apollo 13 mission. Using data collected from sensors, a "virtual model of a process, product or service" is created. This digital representation, the twin, can then be used to visualize something physical in detail, glean critical data and apply the information in practical ways.

With digital twins established as a reality in many manufacturing businesses, the

market for the technology is set to hit $15.66 billion by 2023. By 2021, half of large industrial companies will be using digital twins to transform the way they approach manufacturing and customer service.

Practical Applications for Digital Twins

Because it's possible to make digital twins of individual components, complete assets, full systems and entire processes, the technology has broad application in a variety of areas.

Testing New Systems Prior to Manufacture

Companies can use digital twins to create and test systems, equipment ideas and service models before investing in building or implementation. If a model proves effective, its digital twin could theoretically be linked to the physical creation for real-time monitoring.

Improving Efficiency and Productivity

In a 2017 prediction regarding the benefits of digital twins, Forbes suggested using the technology could improve the speed of critical processes by 30 percent. According to Gartner, industrial companies could see a 10 percent improvement in effectiveness. The widespread availability of and diverse use cases for digital twins gives businesses in nearly all industries a better understanding of where processes can be streamlined and improved, thus helping to minimize downtime through the practice of predictive maintenance.

Managing Assets in Real Time

Using digital twins to monitor daily operations and streamline manufacturing reduces unnecessary wear and tear on machinery and alerts business owners to potential money-saving changes such as making adjustments in fuel use. Faster maintenance and repair allows companies to maintain a competitive edge by improving overall output.

Understanding Data to Provide Better Service

Digital twins also have customer-facing applications, including remote troubleshooting. Using virtual models, technicians can conduct diagnostic testing from anywhere and walk consumers through the proper steps for repair instead of blindly relying on default protocols. Information gathered from these sessions provides valuable insights for future product planning and development.

Facing New Security Challenges

The faster a new type of technology spreads, the less attention tends to be paid to security at the outset. This forces companies to scramble to put out metaphorical fires when vulnerabilities are exploited, leading to the loss of time and profits.

Because digital twins are based in the cloud and don't require physical infrastructure, the associated security risks are somewhat

lower than with other types of systems. However, the massive amounts of data being collected and utilized is drawn from numerous endpoints, each of which represents a potential area of weakness. It's estimated 75 percent of digital twins will be integrated with at least five endpoints by 2023, and a time is coming when visualizing complex systems may require the linking of multiple digital twins.

Every time a new connection is made and more data flows between devices and the cloud, the potential risk for compromise increases. Therefore, businesses considering digital twin technology must be careful not to rush into adoption without assessing and updating current security protocols. Areas of greatest importance include:

- Data encryption
- Access privileges, including clear definition of user roles
- Principle of least privilege
- Addressing known device vulnerabilities
- Routine security audits

The businesses make improvements in processes and gain more control over operations, the introduction of any new system creates new vulnerabilities requiring the attention of IT security professionals. Businesses seeking to implement digital twin technology must consider the potential weaknesses and take appropriate measures to guard against malicious activity so that the full benefits may be realized with a minimal amount of risk.

G.AAKASH

II B.Sc. (Information Technology)

EMAIL MARKETING TRENDS

Emails are an essential part of any business's marketing campaign. Every company wants its audience to open its emails, respond and initiate a positive next step, but we all know such a sequence takes work. Many emails are lost in the receiver's mailbox. Some are ignored or deleted and some are responded to with a curt unsubscribe.

Keeping It Minimal

The second of the email marketing trends for 2023 is keeping your emails short and sweet. People need more time to browse through 400 words of content, so keep it

between 50-125 words. Within your email, empower your call to action and make it stand out, along with your main topic and subtopics. If someone is glazing through your email, you want them to see these things. On the other hand, lists can attract the eye so that you can substitute words with a clickable picture, gif or informational video.

Improving User-Generated Content

User-generated content is an established way to make emails more personal and engaging, and it's the third on this list of email marketing trends for 2023. Customers want to know that others endorse a product or service, so adding customer reviews to an email can be effective. As its potential continues to advance in 2023, user-generated content applications are on track to make customer connections even more accessible.

Utilizing Artificial Intelligence

The amount of data about emails surges daily and marketers can use this wealth of information to gain insight into consumer behaviours, desires and more. However, people need help to sort through and understand millions of data points. Still, artificial intelligence (AI) software can make it the fourth of the email marketing trends for 2023 on this list. Analysing big data, AI identifies correlations, determines the best dispatch times, predicts subscriber actions, and forecasts trends. AI's possibilities seem endless which is why using AI with email campaigns is steadily increasing.

Enhancing Copy

Concise, high-quality copy is the lifeblood of email marketing, now and especially in the future. Like some of the previous email marketing trends for 2023, expect this one to remain potent well beyond next year. Consumers have become much better at distinguishing insincerity online and many consumers exhibit short attention spans which is why uninteresting and unengaging copy is quickly overlooked.

Customer Appreciation Emails

Showing your customers appreciation for their loyalty to your brand is an important way of connecting with them. One of the best things you can do to express your thanks is to use appreciation emails. The pandemic of 2020 reshaped the way we look at marketing. As more and more quarantined people flocked to the internet for their daily shopping needs, many consumers began to favour e-commerce shopping over brick-and-mortar. As you know, shopping online is far different from shopping in a store in person because you interact entirely with machines.

Because of this, there needs to be a more authentic connection between the

customer and the seller. A well-designed and even personalized appreciation email can bridge this gap. As a token of appreciation, you can send your customers gifts or discounts for your products/services. Making them feel special in this way will leave a positive impression and may help build and strengthen your connection.

You can send an appreciation email whenever you want, but here are some valuable opportunities you can use to thank your customers:

- When a customer makes a purchase
- When a customer subscribes to your email list
- When a customer has a birthday
- When a company has a significant accomplishment
- When a company celebrates an anniversary
- When a customer attends a company event

Increasing Interactivity

Interactive emails generate a 73% increase in click-to-open rates. Whether it's an image carousel, integrated tabs within the email, or anything clickable, interactive components do wonders for an email campaign's success. The goal of increasing interactivity is to engage customers better. In the future, more and more emails will contain videos and other interactive content and this trend among the other email marketing trends for 2023, will continue to gain steam.

Generating AMP-ed Up Emails

Tied into interactive components is using Accelerated Mobile Pages (or AMP). This technology, introduced by Google in 2016, makes it possible to add purchase buttons, accordions (a feature that shortens the length of the email layout) and other interactive elements directly into emails.

AMP continues to add more in-email capabilities each year and it is one of the email marketing trends for 2023 that you will not want to miss out on. Incorporating AMP will be key to giving your audience the interactive experience they expect.

Expanding Automation

The ninth on this list of email marketing trends for 2023 is automation. While not new, automation is growing and becoming progressively more critical. This is especially true when designed to react to user behaviours. A prime example of this is the automatically generated newsletter. Companies can use customer actions such as purchases or registration to follow users along their customer journeys.

Boosting Privacy

The tenth on this list of email marketing trends for 2023 is boosting privacy. More than ever, as cybercrime increases and email accounts are flooded by unwanted spam, protecting consumers' personal information is

vital. Only some consumers trust that a brand will keep their data safe. To reassure them, companies must improve their customer data usage practices. This goes beyond complying with the standards set in the 2018 General Data Protection Regulation. Augmenting consent layers and remaining transparent is crucial for companies to gain and keep consumers' trust.

Focusing on the Consumer and the Future

Email marketing is an essential component of a successful marketing mix and it will continue to be so for many years to come. Optimizing content and staying abreast of the developing trends for 2023 is essential for creating a cohesive, trustworthy and effective customer-centered experience. Next year, you must consider implementing AI, employing emerging tech capabilities and standardizing practices to keep a competitive edge and get those clicks.

P.S. MOHANKUMAR

II B.Sc. (Computer Technology)

COMPARISION OF GI-FI AND LI-FI

Gigabit Fidelity (GI-FI)

It is the absolute first transmitter cum beneficiary installed on a chip. It is manufactured using the CMOS (Complementary metal-oxide-semiconductor) procedure which works at 60 GHz. It will permit video transfer at the pace of 5 gigabits per second which is higher than the present Maximum transfer rate of wireless fidelity, at 10% Of the expense. It was developed at **NICTA (National ICT Australia Ltd)** in Melbourne, Australia. This innovation was decided to be built in the frequency range of 57-64 GHz by the NICTA researchers. In a closed environment, the Accessible 7 GHz of range resulted in a data rate of 5 GHz per second, typically within 10 meters Range. It works with the IEEE 802.15.3C band.

Light Fidelity (LI-FI)

It is a wireless optical networking technology that uses visible light from LED's for data transmission. Li-Fi has created a new revolution in wireless communication. A German Physicist Herald Hass keeps on wowing the world with the revelation of data transfer using light. Li-Fi allows an electronic device for connecting to the internet with no wire. It is more secure than wireless fidelity based on the spread of the signal. Li-Fi uses visible light and communication and it is faster compared to radio-waves which is 250 times faster compared to any other broadband.

Specifications

GI-FI

Specification Authority: NICTA (National ICT Australia Ltd)

Operation: GI-Fi technology transmits the data over the air using the millimeter waves.

Data Transfer Rate: Provides the speed upto 5 Gbps, and more.

Frequency of Operation: Li-Fi can achieve the frequency of operation around 60 GHz.

Coverage Range or Distance: GI-Fi ranges up to 10 meters in particular.

Data Density: GI-Fi works within the very high dense environment.

Security: Data transfer is less secured compared to Li-Fi.

Power Consumption: Power Consumption is less than 2MW (milli watts).

Primary Devices: Mobile phones, home devices, electronics etc..,

LI-FI

Specification Authority: IEEE (Institute of Electrical and Electronics Engineers)

Operation: Li-Fi transmits data using light intensity modulation.

Data Transfer Rate: Provides the speed upto 1 Gbps.

Frequency of Operation: Li-Fi can achieve the frequency of operation upto 50 THz.

Coverage Range or Distance: Li-Fi systems can maximum range up to 100 meters depending upon the light intensity and range of that LED.

Data Density: Li-Fi works with the high density environment.

Security: Li-Fi provides secure data transfer due to the light blocked by the walls.

Power Consumption: Power Consumption is upto 1 MW (milli watts).

Primary Devices: Hospital, vehicle and transportation, aviation etc..,

R.V. POOJA

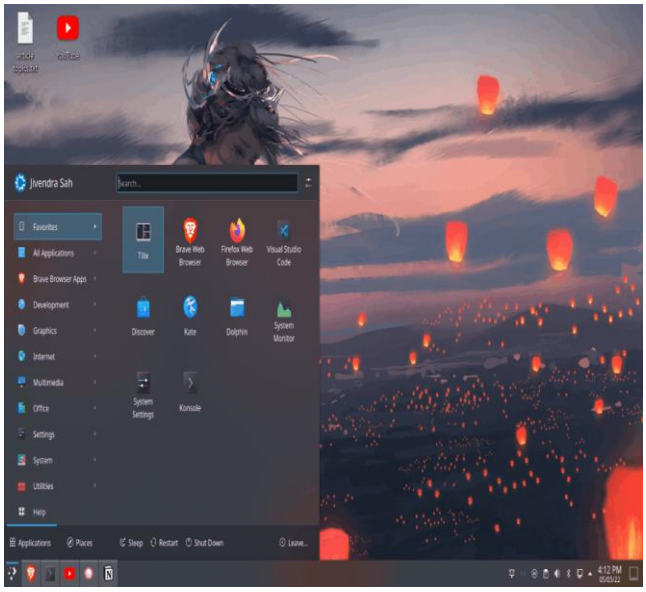
II B.Sc. (Information Technology)

DESKTOP ENVIRONMENT AND WINDOW MANAGER IN LINUX

What is a Desktop Environment?

Desktop Environment is a suite of applications and programs that make a Linux distribution graphically usable. It packs in different components like the taskbar, start menu, widgets, file manager, screen locker, theme manager, terminal emulator and a lot more. Different desktop environments have different sets of these components and all those components and programs have a similar look and feel which collectively build the unique look of a desktop environment. For example, KDE comes with (the Konsole Terminal emulator and Dolphin File manager) whereas xfce comes with (xfce Terminal emulator and Thunar file manager). Different desktop environments are built for different purposes like xfce is meant to be a lightweight Desktop environment and thus comes with

lightweight programs and utilities, KDE is developed to be highly customizable whereas CInnamon is meant to look modern and have a good user experience, thus having modern-looking programs.



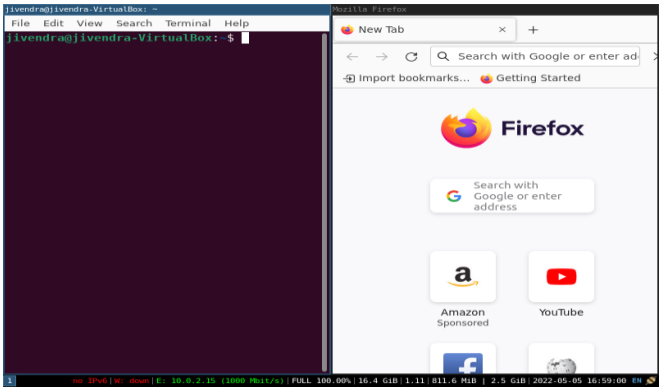
The desktop environment also comes with its own Window Manager. So window manager is a part of a Desktop Environment. Now, let's understand what a window manager is.

What is a window manager?

A window manager is software that is responsible for the creation and placement of windows applications. It controls how different windows stack along with each other on a single screen. It gives every application window a title bar and border by which a user can resize and reposition the window. As we have seen, it comes bundled with a desktop environment. But if it is a part of the desktop environment, how can it possibly be a replacement for the desktop environment? The thing is, you can install a window manager without a desktop environment, but then, you will have to install other essential components yourself, like a file manager, terminal emulator, menu bar etc.., Essentially you would be building up your own unique environment if you were to use a standalone window manager. If you decide to go down that road, you have a lot of options to choose from. They are categorized into two parts.

Tiling Window manager: They tile the windows around each other on a screen, like tiles on a floor or pieces of a puzzle. Each new window that is created, gets its own rectangular share of the screen and does not overlap with other windows. Some famous tiling window managers are i3, bspwm, dwm, and awesome.

Stacking Window manager: They allow windows to overlap. They are most commonly used and are used by all major desktop environments. They are also called floating window managers. Some famous stacking managers are Fluxbox, Openbox, and KWin.



Why would you use a window manager?

Using a standalone window manager has some use-cases and advantages over using a Desktop environment such as

Saving Resources: Using a window manager uses fewer resources than a Desktop environment. Even lightweight desktop environments like xfce use more resources than a standalone window manager.

Customization: Unlike the desktop environment, window manager does not come with essential software like a menu bar, file manager etc.., So you can install whatever option you like for basic utilities such as a file manager. You can do the same with a desktop environment, but the difference here is that you can choose not to have a component altogether. For example, you can decide not to have a calendar app at all. This saves up space and during the process of installing all the required components, you automatically do not install all the stuff that you do not require. This makes it minimal as well.

Faster workflow: Setting up a window manager along with installing and configuring all the required utilities and components require time. But once done, the setup can prove to be more efficient than a traditional desktop environment. Also, a lot of window managers offers the user a lot of keyboard shortcut. Learning them can save a lot of time.

Advantages of using a Desktop Environment

Desktop environments are there for a reason, depending upon your use case and priorities, you can choose one for yourself.

- They are user friendly.
- Require less time to set up.
- Are easy to customize as they give the option to tweak the settings within the desktop environment itself.
- Come in different options and with different distributions, ready to install.

DINISH S

I B.Sc. (Computer Technology)

INTERNET OF BEHAVIOR (IoB)

Internet of things is playing a vital role in today's growing world. The data collected by the IoT devices provide valuable information about users behaviour, interests and preference. This has brought a new way for technology that is called as Internet of Behaviour in short IoB. The shift to mobile devices has changed the whole way of interaction of world. Now a day if we will see an individual's day start with some IoT enabled digital devices and also ends with those IoT devices. Not only IoT devices provides services but also each moment IoT tries to make human's life easier and more comfort by improving it's service. So, the data these IoT devices collect and later on analysing it extracts valuable information about users behaviour, interests and preferences. So, this was the point from where and when this IoB came into the picture. Seeing the current scenario of the country the pandemic is the temporary reason that IoB is in the list of latest trends. So, let's

take a deep look at the Internet of Behaviours, its features and finally the advantage and disadvantages of IoB.

Internet of Behavior (IoB) :

Basically IoB is a process where a user data is analysed in terms of behavioural psychology. With the result of the analysis it informs new approaches to designing a new service or product and how to market the end product in companies. So, the important point is collecting each digital activity data of user and finally to use this information to influence behavior.

Features of IoB :

As companies are for customers and customers are the point to whom the company's focus and plans it's mission and vision. So, IoB can become a powerful new marketing and sales tool for business and organization all around in upcoming times. It helps in gaining a deep understanding for the customers which add a growth to the business.

Moreover, implementing the emerging technologies innovations such as machine learning algorithm, IoB can capture, analyse, understand and respond accordingly to all the behaviour in a way that allows tracking and interpreting the behaviour of people.

Advantage of IoB:

- Analyses customer buying habits across the platform.
- Studies the previously unobtainable data about how customers interact with devices and products.
- Gains deeper insights into customer's interests and their buying experience.
- Quickly resolves issues to close sales and keep customers satisfied.
- Also helps in enhancing the security of public places and other internet things

Disadvantages of IoB:

- Data abundance and insight will be challenging to manage and secure and it will lead to great cybercrime. IoB is currently in its growing stage and may turn out as a life changing thing for people. IoB has come with tons of excitement to bring innovation and will bring a lot of change to the technological world. As the pyramid the IoT surely converts data to information but the IoB translates knowledge into real wisdom.

S. MIRUNALINI

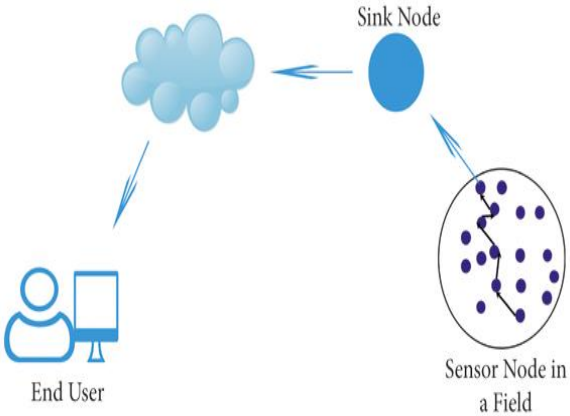
III B.Sc. (Computer Technology)

S-MAC PROTOCOL IN WSN's

S-MAC (Sensor MAC) is a low-power, duty-cycled MAC (medium access control) protocol designed for wireless sensor networks. It tries to save energy by reducing the time a node spends in the active (transmitting) state and lengthening the time it spends in the low-power sleep state. S-MAC

achieves this by implementing a schedule-based duty cycling mechanism. In this system, nodes coordinate their sleeping and waking times with their neighbours and send the data only at predetermined time slots. As a result of this mechanism, there are fewer collisions and idle listening events, which leads to low energy usage.

The term "S-MAC" refers to the entire S-MAC protocol which contains every component of our new system. A unique MAC protocol specifically created for wireless sensor networks is called sensor-MAC (S-MAC). This protocol has good scaling and collision avoidance capabilities, even if reducing energy consumption is the main objective. By applying a hybrid scheduling and contention-based approach, it achieves good scalability and collision avoidance. We must determine the main causes of inefficient energy usage, as well as the trade-offs that can be made to lower the usage of energy, in order to achieve the primary goal of energy efficiency.



S-MAC saves energy mostly by preventing overhearing and effectively sending a lengthy message. Periodic sleep is crucial for energy conservation when inactive listening accounts for the majority of total energy usage. S-MAC's energy usage is mostly unaffected by the volume of traffic. To reduce the capacity of transmissions and data transmitted in the network, S-MAC also has capabilities like packet aggregation and route discovery. This improves the network's scalability and also helps to reduce overhead. Due to its abundance to offer low-power and energy-efficient communication in wireless sensor networks, S-MAC is widely employed in a variety of applications, including environmental monitoring, industrial automation, and military sensing.

Design and Implementation of S-MAC

To save energy, this protocol's ability to modify sleep duration based on traffic patterns is intriguing. The node sleeps for longer periods when there is less traffic; also the node is limited by the duty cycle protocol. Nodes spend more time in transmissions as a result of fewer opportunities for periodic sleep as traffic volume increases. Since the traffic load does alter over time, sensor network applications can benefit from this feature. The amount of traffic is relatively lower when there is no sensing event. A large sensor, such as a camera, may be activated when some nodes detect an event, creating a

lot of traffic. The S-MAC protocol can adjust to changes in traffic. In contrast, the message-passing module with overhearing avoidance lacks periodic sleep and when traffic demand reduces, nodes spend an increasing amount of time idle listening.

Although to minimize the frequency of transmissions and the amount of data transmitted in the network, S-MAC uses the packet aggregation technique, which involves combining multiple data packets into a single bigger packet. This improves the network's scalability and also helps to decrease overhead. In addition, it also has a route discovery mechanism that enables nodes to select the fastest and most efficient overall, path for data transmission. By doing so, the network becomes more efficient overall and the need for energy for data transmission is reduced.

The implementation of this protocol generally involves the use of a network protocol stack with the MAC layer acting as the implementation layer of the protocol and the lower levels acting as its supporting infrastructure for data transmission and reception. The low-power constraints of wireless sensor networks as well as the need for security, scalability and robustness must be taken into account in the design and implementation of S-MAC.

After implementation, it also showed a fascinating property: according to the condition of the traffic, they made their trade-off between latency and energy. S-MAC has been widely integrated into many different systems and devices and is commonly used in wireless sensor networks because of its flexibility, adaptability and versatility as a solution for low-power and energy-constrained wireless networks because its design can fit the needs of applications.

Design Goals of S-MAC

- Reduce energy consumption
- Support good scalability
- Self-configurable

Features of the S-MAC

S-MAC (Sensor MAC) is designed specifically for wireless sensor networks and has several key features including:

- **Synchronized sleep schedule:** To minimize the overhead and power usage related to MAC protocols, it adopts a synchronized sleep schedule. To save energy, nodes alternately take turns sleeping and waking up which reduces idle listening and maximizes battery life.
- **Packet aggregation:** Packet aggregation is a feature of this protocol that combines multiple data packets into a single larger packet to reduce the quantity and frequency of transmissions in the network. This improves the network's scalability and hence decreases overhead.
- **Route discovery:** The S-MAC protocol has a route discovery mechanism that enables nodes to select the fastest and

most efficient path for data transmission. This improves the network's overall efficiency and lowers the energy use associated with data transmission.

- **Low overhead:** It is because S-MAC limits the amount of data carried through the network and lowers the number of transmissions, it has a low overhead. This increases the network's effectiveness and helps to conserve energy.
- **Robustness:** S-MAC is designed to be resilient and robust in the face of failures and changes to the network. It has tools and mechanisms for handling failures, identifying them and adjusting to network changes like node mobility and changes in network topology.
- **Security:** To protect against unauthorized access and malicious attacks. This makes it easier to guarantee the security and privacy of data sent across the network.

Performance Evaluation

The performance evaluation of S-MAC (Sensor MAC) is a crucial part of its development and implementation since it enables researchers and practitioners to evaluate the protocol's efficacy and efficiency. There are several metrics that are commonly used to evaluate the performance of S-MAC including:

- **Energy efficiency:** Energy efficiency is a crucial indicator for wireless sensor networks because the node's battery life is constrained and they must run for extended periods without maintenance. The average energy use per node per unit of time and the network's overall energy use is frequently used to measure energy efficiency.
- **Latency:** The amount of time it takes for data to be transmitted from a source node to a destination node is known as latency. For real-time applications where data must be delivered quickly to be usable, low latency is crucial.
- **Throughput:** The amount of data that can be transferred in a given amount of time is known as throughput. If some of the applications need more throughput and a sudden requirement of larger data, then it might be crucial.
- **Scalability:** A protocol's scalability refers to how well it can manage an expanding network of nodes and a growing amount of traffic. Sometimes scalability may be crucial according to the higher needs and demands.
- **Reliability:** It is reliable for the crucial data to be sent without getting any errors or leakage of data. It should have a reliable and confidential mechanism to provide data.

Application of S-MAC

1. **Environmental monitoring:** Environmental monitoring systems can be used for animal tracking, flood detection, forest surveillance and

weather forecasting where a large number of wireless sensor nodes are deployed to collect data about the environment by operating for longer periods of time without maintenance which makes it energy efficient.

Industrial control: Senosrs working under S-MAC protocol makes it economically feasible to monitor the status of machines and ensures safety by installing sensor nodes into machines.

Health monitoring: Sensors are effectively and widely used in health monitoring systems by getting embedded into a hospital building to track and monitor patients and medical resources. There are different kinds of sensors that can measure blood pressure, body temperature, and ECG. BSN (Body sensor network) where wireless sensors are worn or implanted for healthcare purposes and are used to collect data about a person's health and well-being.

Disaster response: Sensors can effectively act to prevent the consequences of natural disasters like floods, landslides, forest fires etc.., Its response mechanism in disaster management systems plays a key role in the collection of data in the field and also in the incoming impact of the disaster.

Military surveillance and safety: Wireless sensors can be immediately deployed for surveillance and used to provide battlefield intelligence regarding location, moments & motions, the identity of troops & vehicles and also the detection of weapons.

Agricultural monitoring: Wireless sensor nodes are deployed to collect data about crop conditions and soil moisture. With the use of many wireless distributed networks, we can easily track down the usage of water and other resources.

Benefits of S-MAC

Sensor MACs are simply developed to overcome the challenges faces by sensors while their working period. These networks consist of small, battery-powered devices that are planted in remote areas, that is they are difficult to reach. These nodes are designed to sense, collect, and transmit data to a central server location where the data is analyzed and processed.

- It cuts down the main challenge of wireless sensor networks of conservation of the energy, as the nodes are limited by their battery power so it concentrated on creating low-power MAC protocols that may decrease power usage and increase the battery life of the nodes and must operate for long periods without maintenance.
- Installation and adaptation of these protocols in wireless networks are beneficial and make it the only viable option where hard wiring and construction limitations couldn't limit its usage.

- To address these issues and increase the energy effectiveness of wireless sensor networks, S-MAC was developed. It was created to use a synchronized sleep schedule and other energy-saving methods to reduce the overhead and power consumption associated with MAC protocols.
- Nowadays it is widely used for many useful and valuable purposes such as environmental monitoring, military surveillance, and the health sector etc.., Minimal disruptions to the workforce and a system that gets up and runs much sooner.

Limitation of S-MAC

Despite its many advantages, there are some limitations to S-MAC that should be considered when evaluating its suitability for a particular application:

Complexity: It seems complex because it requires better understanding and a higher level of technical knowledge for its implementation and working, which also makes it costly for its fulfilment.

Scalability: When embedded in large-scale networks, its performance gets reduced for high-speed communication, and hence it is expensive to build and not affordable by all.

Latency: It focuses more on the duty-cycling mechanism for energy consumption due to which there is a reduction in both latency and per-hop fairness, so some of the real-time applications get affected which require low latency.

Interference: Although it has the mechanism to avoid interference, it fails to do so due to high levels of interference coming from the outside surrounding the sensing nodes.

Overhead: Due to its communication mechanism, it has an increased overhead in comparison with other MAC protocols.

Overhearing: Here nodes receive a packet that is destined for another node and it is kept silent until it meets its requirement.

Security: It doesn't have its own in-built security mechanism, so it is prone to hacking by hackers.

Challenges in S-MAC

- There is no single controlling authority, so global synchronization is difficult.
- Power efficiency issue.
- Frequent topology changes are due to mobility and failure.

MAC protocol for sensor network

It establishes an infrastructure for communication among sensor nodes. There are three types of MAC protocols used in sensor networks:

Fixed-allocation: It shares a common medium through a predetermined assignment. It is suitable for sensor networks that continuously monitor and generate

deterministic data traffic. Each node is given a bounded delay. The channel requirements of each node may vary over time and in the case of burst traffic, it may lead to inefficient usage of the channel.

Demand-based: This is useful in cases where the channel is allocated according to node demand. It is suitable for variable-rate traffic, as it can be efficiently transmitted. It requires the additional overhead of a reservation process.

Contention-based: Random access-based contention is used for the channel when packets need to be transmitted. It has no guarantees for delays and has possibility of colliding. It is not suitable for delay-sensitive and real-time traffic. Overall, S-MAC is a useful protocol for wireless sensor networks where energy conservation is a critical requirement.

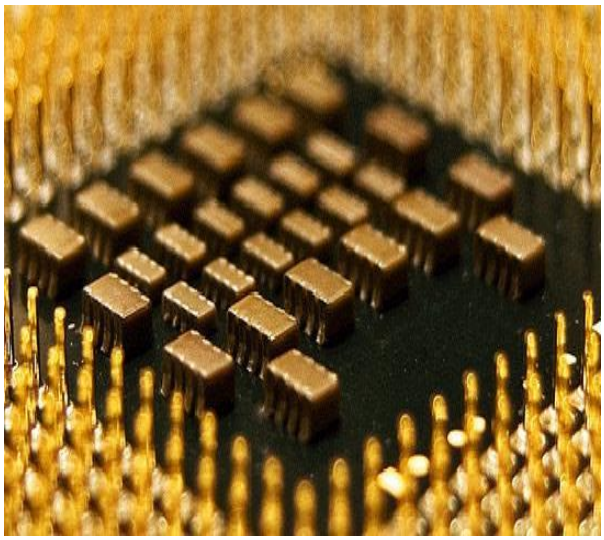
SELVAKUMAR K

II B.Sc. (Computer Technology)

PHASE-CHANGE MATERIALS INCREASE THE SPEED LIMIT FOR COMPUTERS

By replacing silicon with phase-change materials, new research shows that computers could be capable of processing information up to 1,000 times faster than currently models. The present size and speed limitations of computer processors and memory could be overcome by replacing silicon with 'phase-change materials' (PCMs) which are capable of reversibly switching between two structural phases with different electrical states one crystalline and conducting and the other glassy and insulating in billionths of a second.

Modeling and tests of PCM-based devices have shown that logic-processing operations can be performed in non-volatile memory cells using particular combinations of ultra-short voltage pulses which is not possible with silicon-based devices. In these new devices, logic operations and memory are co-located, rather than separated, as they are in silicon-based computers. These materials could eventually enable processing speeds between 500 and 1,000 times faster than the current average laptop computer, while using less energy.



The processors, designed by researchers from the University of Cambridge, the Singapore A*STAR Data-Storage Institute and

the Singapore University of Technology and Design, use a type of PCM based on a chalcogenide glass, which can be melted and recrystallized in as little as half a nanosecond (billionth of a second) using appropriate voltage pulses. The calculations performed by most computers, mobile phones and tablets are carried out by silicon-based logic devices. The solid-state memory used to store the results of such calculations is also silicon-based. "However, as demand for faster computers continues to increase, we are rapidly reaching the limits of silicon's capabilities," said Professor Stephen Elliott of Cambridge's Department of Chemistry, who led the research.

The primary method of increasing the power of computers has previously been to increase the number of logic devices which they contain by progressively reducing the size of the devices but physical limitations for current device architectures mean that this is quickly becoming nearly impossible to continue. Currently, the smallest logic and memory devices based on silicon are about 20 nanometers in size approximately 4000 times thinner than a human hair – and are constructed in layers. As the devices are made ever smaller in order to increase their numbers on a chip, eventually the gaps between the layers will get so small that electrons which are stored in certain regions of flash non-volatile memory devices will be able to tunnel out of the device, resulting in data loss. PCM devices can overcome this size-scaling limit since they have been shown to function down to about two nanometers.

An alternative for increasing processing speed without increasing the number of logic devices is to increase the number of calculations which each device can perform, which is not possible using silicon but the researchers have demonstrated that multiple calculations are possible for PCM logic/memory devices. First developed in the 1960s, PCMs were originally used in optical-memory devices, such as re-writable DVDs. Now, they are starting to be used for electronic-memory applications and are beginning to replace silicon-based flash memory in some makes of smartphones.

The PCM devices recently demonstrated to perform in-memory logic do have shortcomings: currently, they do not perform calculations at the same speeds as silicon and they exhibit a lack of stability in the starting amorphous phase. However, the Cambridge and Singapore researchers found that, by performing the logic-operation process in reverse starting from the crystalline phase and then melting the PCMs in the cells to perform the logic operations – the materials are both much more stable and capable of performing operations much faster.

The intrinsic switching or crystallization, speed of existing PCMs is about

ten nanoseconds, making them suitable for replacing flash memory. By increasing speeds even further, to less than one nanosecond (as demonstrated by the Cambridge and Singapore researchers in 2012), they could one day replace computer dynamic random-access memory (DRAM) which needs to be continually refreshed, by a non-volatile PCM replacement.

"Eventually, what we really want to do is to replace both DRAM and logic processors in computers by new PCM-based non-volatile devices," said Professor Elliott. "But for that to need switching speeds approaching one nanosecond. Currently, refreshing of DRAM leaks a huge amount of energy globally, which is costly, both financially and environmentally. Faster PCM switching times would greatly reduce this, resulting in computers which are not just faster, but also much 'greener'."

S. MIRUNALINI

III B.Sc. (Computer Technology)

MCQs FOR PLACEMENT PREPARATION

1. Look at this series: 7, 10, 8, 11, 9, 12, ...
What number should come next?
A.7

B.10

C.12

D.13

ANS: B.10

2. Which word does NOT belong with the others?

A. inch

B. ounce

C. centimeter

D. yard

ANS: B.ounce

3. Odometer is to mileage as compass is to

A.speed

B.hiking

C.needle

D.direction

ANS: D.direction

4. A sum of money at simple interest amounts to Rs.815 in 3 years and to Rs.854 in 4 years. The sum is:

Rs. 650

Rs. 690

Rs. 698

Rs. 700

ANS: C

5. What least number must be added to 1056, so that the sum is completely divisible by 23?
A.2

B.3

C.18

D.21

ANS: A

6. When he

P : did not know
Q : he was nervous and
R : heard the hue and cry at midnight
S : what to do
The Proper sequence should be:
A.RQPS

B.QSPR
C.SQPR
D.PQRS

ANS: A

7. SCD, TEF, UGH, ____, WKL

A.CMN
B.UJI
C.VIJ
D.IJT

ANS:C

8. CMM, EOO, GQQ, _____, KUU

A.GRR
B.GSS
C.ISS
D.ITT

ANS:C

9. The small child does whatever his father **was done**.

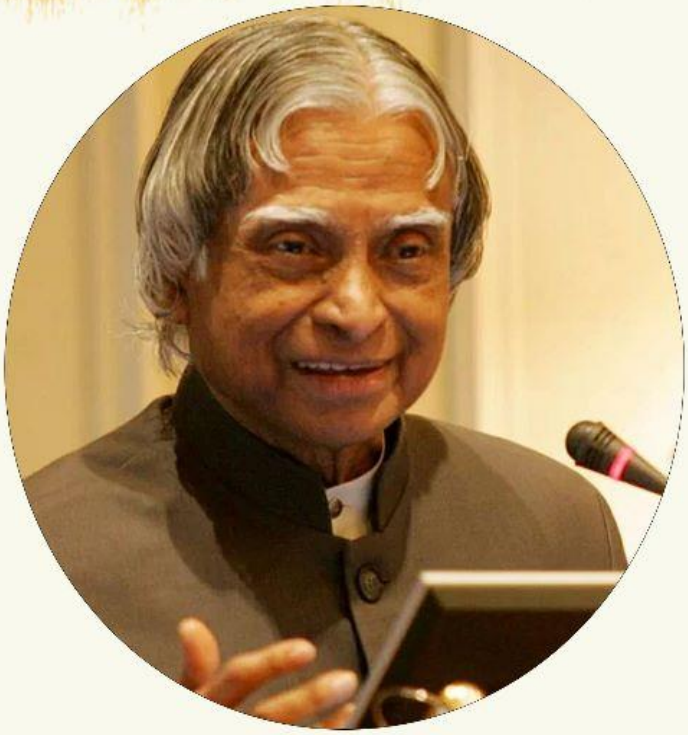
A.has done
B.did
C.does
D.had done

ANS: B

10. Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. The marks obtained by them are:

A.39, 30
B.41, 32
C.42, 33
D.43, 34

ANS: C



As A Young Citizen of India,
Armed with Technology And Love
For My Nation.

-ABJ ABDUL KALAM-