DGITechChronicle

DGI TECH CHRONICLE

CSE EDITION

Volume III, Issue II (Jan-Jun) 2023

DGITechChronicle

EDITORIAL MESSAGE

Dr. Bipin Pandey
(HOD CSE)

Dear Readers,

It is with immense pleasure that we bring to you the latest edition of DGI Tech Chronicle—a platform where ideas converge, creativity thrives, and knowledge transcends boundaries. In this issue, we celebrate innovation, perseverance, and the incredible stories that connect us all.

As the world evolves rapidly, so does our role in shaping it. This magazine reflects not only the aspirations of our contributors but also the collective ambition of our vibrant community to lead, inspire, and excel. From thought-provoking articles and groundbreaking research to artistic expressions and inspiring success stories, this edition is a testament to our unwavering commitment to excellence and creativity.

A special thank you goes out to our contributors, whose dedication and talent have added color and depth to this edition. We also extend our gratitude to the editorial team for their tireless efforts in curating this masterpiece.

As you flip through the pages, we invite you to explore the diverse perspectives that unite us as a community, celebrate the milestones achieved, and find inspiration for your own journeys. Remember, every idea shared is a step toward building a brighter future.

Warm regards,
Dr. Bipin Pandey
Editor-in-Chief, DGI Tech Chronicle

EDITORIAL BOARD

Editor in Chief

In this issue, we delve into a captivating array of topics and developments, all tailored to the inquisitive minds of the future engineers. As an engineering college community, we stand at the forefront of technological breakthroughs, and it is our mission to empower you with the knowledge and insights to not only keep pace but to lead in this ever-accelerating race of innovation.

DGITechChronicle

CSE EDITION

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VISION

Empowering the future with innovative advancements in computer science technology, fostering human values and principles, through technical education.

MISSION

Advancing computer science technology through cutting-edge research and education, driving innovation and excellence.

Promoting a culture of ethical responsibility and human-centered design in technology, ensuring advancements benefit society.

Empowering individuals with technical skills and values to create a sustainable and impactful future in the digital age.

Program Educational Objectives (PEO)

To enable graduates to pursue higher education and research, or have a successful career in industries associated with Computer Science and Engineering, or as entrepreneurs.

To ensure that graduates will have the ability and attitude to adapt to emerging technological changes.

To prepare students to analyze existing literature in an area of specialization and ethically develop innovative methodologies to solve the problems identified.

Program Specific Outcome (PSO)

To analyze, design and develop computing solutions by applying foundational concepts of Computer Science and Engineering.

To apply software engineering principles and practices for developing quality software for scientific and business applications.

To adapt to emerging Information and Communication Technologies (ICT) to innovate ideas and solutions to existing/novel problems.

Programme Outcome (POs)

Po1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Cognitive Radio Networks

Vasu Mehta
(14017; CSE)

Cognitive Radio Networks (CRNs) represent a type of wireless communication network where the devices, known as cognitive radios, have the ability to intelligently adapt their communication parameters based on the surrounding radio frequency environment. The primary goal of cognitive radio is to optimize spectrum utilization and improve overall communication efficiency. Here are key aspects and features of cognitive radio networks:

Dynamic Spectrum Access (DSA): The hallmark of cognitive radio networks is DSA, which allows devices to dynamically access and use available spectrum bands opportunistically. Cognitive radios can sense the radio frequency environment, detect unused or underutilized spectrum, and then adjust their transmission parameters to utilize the identified spectrum

Spectrum Sensing: Cognitive radios are equipped with spectrum sensing capabilities, allowing them to detect the presence of primary users (incumbent users) and identify spectrum opportunities. Various sensing techniques, such as energy detection, cyclostationary feature detection, and matched filtering, may be employed.

Adaptive Transmission: Cognitive radios can adapt their transmission parameters, such as frequency, power, and modulation schemes, based on the real-time spectrum availability. This adaptability enables efficient use of spectrum resources and minimizes interference to primary users.

Learning and Decision-Making: Cognitive radios often incorporate learning algorithms to adapt their behavior over time. Machine learning techniques can be used to optimize spectrum access strategies, improve sensing accuracy, and enhance decision-making processes.

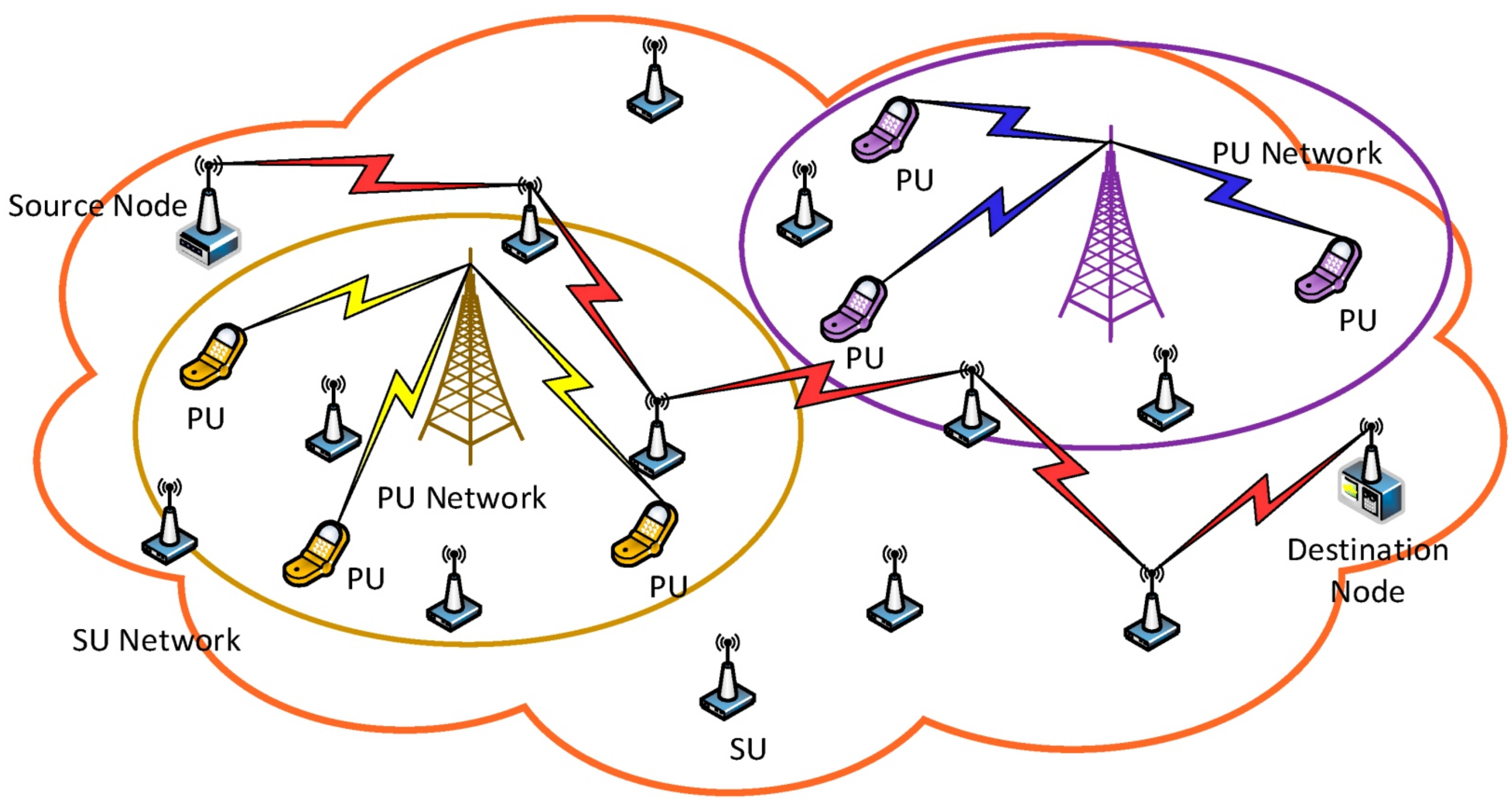
Interference Management: Cognitive radio networks must manage interference to ensure coexistence with primary users and other cognitive radios. This involves employing techniques such as power control, spectrum sensing, and dynamic channel assignment to mitigate interference effects.

Spectrum Policy and Regulation: The implementation of cognitive radio networks requires consideration of regulatory frameworks and policies. Cognitive radios must adhere to rules and restrictions to ensure fair and lawful use of spectrum resources.

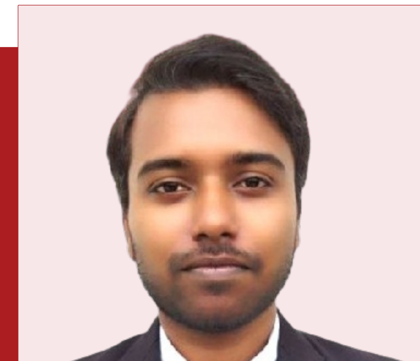
Applications: Cognitive radio networks find applications in various domains, including wireless communications, military communications, public safety, and emergency services. They are particularly valuable in scenarios where spectrum is scarce or underutilized.

Security Challenges: Cognitive radio networks face unique security challenges, such as spectrum sensing data falsification and malicious interference. Robust security mechanisms, including authentication and encryption, are essential to safeguard the integrity and reliability of communication.

The development and deployment of cognitive radio networks aim to address the increasing demand for spectrum in wireless communication, especially as traditional frequency bands become congested. By intelligently managing spectrum resources, cognitive radio networks contribute to more efficient and flexible wireless communication systems.



Ubiquitous Computing



Ankur Pratap Singh
(14019; CSE)

Ubiquitous computing, also known as pervasive computing, refers to a concept in computer science and technology where computing is seamlessly integrated into everyday life, becoming an inherent part of the environment and activities without being explicitly noticed. The vision behind ubiquitous computing is to make computational capabilities available everywhere, at all times, and in various forms, making technology more transparent and enhancing user experiences.

Key features and principles of ubiquitous computing include:

Invisibility: Ubiquitous computing aims to make technology invisible, meaning that users are not constantly aware of the presence of computing devices. Instead, computing capabilities are embedded in everyday objects and environments.

Context Awareness: Ubiquitous computing systems are designed to be aware of the context in which they operate, including user preferences, location, and environmental conditions. This enables systems to adapt and respond intelligently to changing situations.

Sensitivity to User Needs: The systems are designed to be sensitive to user needs and preferences, providing a personalized and adaptive experience. This involves understanding user behavior, learning patterns, and anticipating user requirements.

Interconnected Devices: Ubiquitous computing involves a network of interconnected devices, often communicating with each other to share information and coordinate activities. This may include sensors, actuators, smartphones, wearables, and other embedded computing devices.

User-Centric Design: The design of ubiquitous computing systems prioritizes the user experience. The goal is to create seamless and natural interactions between humans and technology.

Distributed Computing: Ubiquitous computing often involves distributed computing, where tasks are spread across multiple devices rather than being concentrated on a single central computer. This enables better scalability, fault tolerance, and flexibility.

Security and Privacy: Given the pervasiveness of computing in everyday life, ensuring the security and privacy of user data is crucial. Ubiquitous computing systems should implement robust security measures to protect user information.

Applications of ubiquitous computing are diverse and include smart homes, smart cities, wearable devices, healthcare monitoring, intelligent transportation systems, and more. As technology continues to advance, the vision of ubiquitous computing is gradually becoming a reality, with increasing integration of smart devices into various aspects of daily life.

Graphical interactive is debugging for distributed systems.

STUDENTS ARTICLES

Sahil Khan
(14091; CSE)

Debugging distributed systems can be challenging due to the inherent complexity of such systems. Graphical interactive debugging tools can help simplify the process by providing visual representations of the system's components, interactions, and states. Here are some key aspects and considerations for graphical interactive debugging in the context of distributed systems:

Visualization of System Components:

Use graphical representations to show the different components of the distributed system. This could include nodes, services, databases, and communication channels.

Highlight the relationships and dependencies between components to give a clear picture of the system architecture.

Real-time Monitoring:

Incorporate real-time monitoring of system metrics, such as resource utilization, network latency, and error rates.

Visualize these metrics in charts or graphs to identify trends or anomalies that may indicate issues in the distributed system.

Trace and Logging Visualization:

Provide a graphical representation of distributed traces and logs to help trace the flow of requests and identify bottlenecks or errors.

Use color-coded or annotated visualizations to indicate the status of different components and the path of requests through the system.

Interactive Exploration:

Allow developers to interactively explore the distributed system's state and behavior during debugging sessions.

Provide tools for selecting and inspecting specific components, viewing detailed information, and navigating through different layers of the system.

Breakpoints and Stepping:

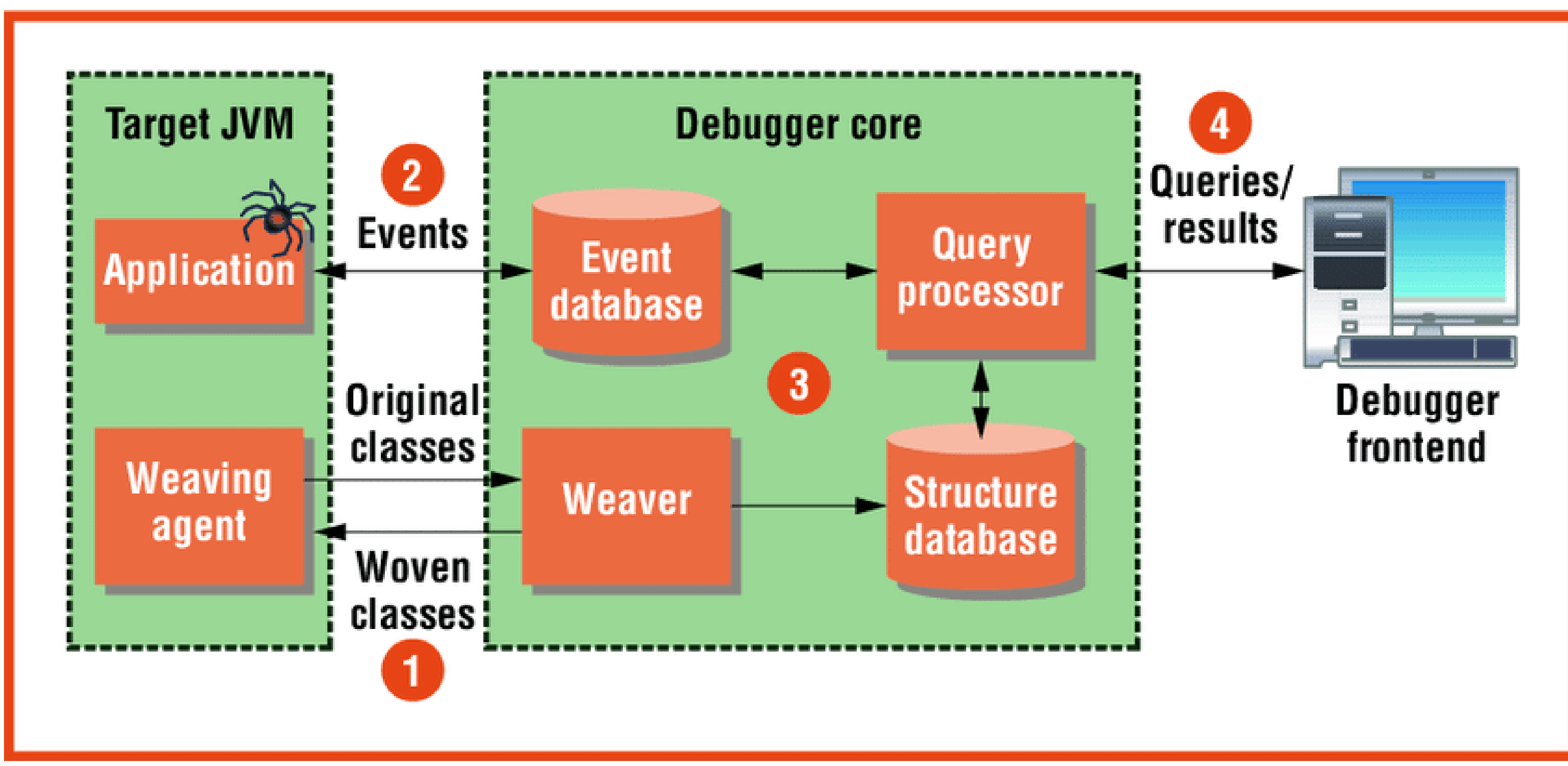
Support traditional debugging features like breakpoints and stepping through code, even in a distributed environment.

Visualize the state of distributed processes at different breakpoints to understand how data and control flow through the system.

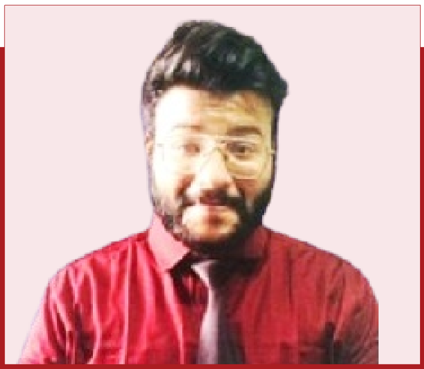
Topology View:

Display a visual representation of the system's network topology, showing the connections between nodes and the flow of data.

Highlight any changes in the topology dynamically as the system evolves.



Web-based Health Monitoring:



Sparsh Jain
(14108; CSE)

Web-based health monitoring and textual mining refer to the use of online platforms and data analysis techniques to monitor and extract valuable information from health-related data in textual form. Here's an overview of these concepts:

Web-based health monitoring involves using online platforms, applications, or devices to track and monitor individuals' health-related data.

Examples:

Fitness Apps: Apps that monitor physical activity, sleep patterns, and nutrition.

Telehealth Platforms: Online platforms that enable remote consultations with healthcare professionals.

Wearable Devices: Devices like smartwatches or fitness trackers that collect health data.

Patient Portals: Web interfaces allowing patients to access their health records & communicate with healthcare providers.

Textual Mining: Textual mining, or text mining, is the process of extracting valuable information and knowledge from unstructured text data.

Applications:

Sentiment Analysis: Analyzing opinions and sentiments expressed in health-related texts (e.g., patient reviews, social media posts).
Information Extraction: Identifying and extracting specific information from clinical notes, research papers, or other health-related texts.
Topic Modeling: Grouping and discovering topics within large sets of health-related documents.
Natural Language Processing (NLP): Using algorithms to understand and interpret human language in the context of healthcare.

Integration of Web-based Health Monitoring and Textual Mining:

Data Sources: Combining data from web-based health monitoring sources (such as wearable devices, patient portals) with textual data (health records, online discussions, articles).
Analysis and Insights: Applying textual mining techniques to extract insights from the combined data. For example, identifying trends in patient feedback, understanding common issues reported online, or monitoring emerging health concerns.
Personalized Healthcare: Using mined information to provide personalized recommendations for individuals based on their health data and textual information.

Challenges and Considerations:

Privacy and Security: Handling sensitive health data requires robust security measures and adherence to privacy regulations.
Data Quality: Ensuring the accuracy and reliability of both quantitative and textual health data.
Interoperability: Ensuring that different web-based health monitoring systems and textual mining tools can work together seamlessly.

Benefits:

Early Detection: Detecting health issues early through continuous monitoring.
Data-Driven Insights: Gaining valuable insights from both structured and unstructured health data.
Improved Healthcare Decision-Making: Enhancing healthcare decision-making based on a more comprehensive understanding of patient data.