CSC Newsletter

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Learning Programming Languages: Challenges, Way Forward

"Despite over 20 years of experience in teaching programming languages both in Nigeria and Abroad, it is still a challenging task" - Prof. Adio Akinwale

Learning to programme is notoriously considered difficult by many computer science students, as they regard programming courses as extremely demanding. Challenges encountered by students during programming include creative thinking, structuring of programmes, syntax, debugging, and code tracing, among others. Large class size with inadequate facilities, shortage of semester duration and time constraints also contribute to the difficulties of learning programming languages. Programming focuses on logic and problem-solving. Fundamentals of programming include breaking down codes into smaller segments while understanding the function of each line of codes. This aids learning and students can further copy online programming tutorials to peruse each line of codes.

Typically, all programming languages are identical in nature and basic operations. They possess similar syntax and looping instructions so that the programmer can use a code segment over and over again. All programming languages have input and output instructions to read data and output the information to the screen which must be mastered. Coding is an art and students should make it a habit while gradually improving at it. Professional writers write every day. Athletes train every day. As a computer scientist, you need to be consistent by coding every day. Daily practices of coding would guarantee great success as a programmer. Writing codes under the supervision of a lecturer also aids perfection as experienced lecturers always love to help those who are curious and willing to learn.

Prof. Adio Akinwale
Dean, College of Physical Sciences,
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Pair programming, a technique commonly used in application development in which two programmers work together on a project, is highly encouraged. Students need to exchange programming ideas among themselves. Weak students are encouraged to seek assistance from the sound ones, if required. Brilliant students that are teaching others should also learn more to internalise concepts and master languages. Mastering and understanding the basic concepts of procedural programming, functional programming, object-oriented programming, data structures, algorithms and semantic programming from reliable sources is necessary. Students should endeavour to get good resources such as books, written tutorials, and online tutorial videos on programming. These resources should be beginner-friendly, which do not assume a prior knowledge of programming.

Becoming a master takes time. Therefore, it is important to keep learning. Renowned programmers such as Dennis Ritchie, Linus Torvalds, Mark Zuckerberg and Bill Gates developed themselves over time with great persistence and hardwork. The use of tools such as HTML, JavaScript, PHP and MySQL should also be learnt for building simple websites. Students need to stick and learn one programming language at a time, and do not learn something new until they are comfortable enough in building simple programmes with it while lecturers should also teach one type of programming language perfectly before introducing another language.

Reinventing Computing Teaching Methods

In recent years, there is an ever-increasing demand for intending students of higher institutions of learning in Nigeria to study computer science and information technology-related courses. This may be due to its global lucrativeness and relevance to all professions. Aside studying computer science as a major course, the curriculum designed by regulatory bodies such as National Universities Commission (NUC) and National Business and Technical Education Board (NABTEB) have also made compulsory, computing courses for all students passing through any higher institution of learning. However, either for major or minor students, most students find it difficult to learn computing subjects, most especially, those aspects that require more critical thinking.

Some basic computer science courses range from Computer Programming Languages, Data Structure and Algorithms, Database System, Operating System, Digital Design and Computer Architecture, Compiler Construction, Software Engineering, System Analysis and Design, Artificial Intelligence, Computer Networks and Data Communications, Computer Graphics, Computer Security and Cryptography, and Human Computer Interaction, among others. To effectively communicate concepts in the aforementioned courses, innovative methods of teaching is inevitable, and this would require the reinvention of teaching methods to make the subjects more interesting to the students. Resulting from quantitative and logical reasoning skills expected from computer science students, it is highly important for lecturers to capture students' attention when conveying ideas or thoughts to create lasting impression by adopting active-learning and evidence-based teaching strategies for ease of teaching and learning.

Prof. Olusegun Folorunso,
Head, Department of Computer Science

Innovative methods for reinvention in teaching computer courses include creative teaching, use of audio and video tools, real-world learning approach, brainstorming and access to existing computer science virtual laboratories. For computer courses at lower levels, especially computer appreciation classes, games with visual experiences that can excite learners' minds and propel their interests which would also give them the freedom to explore that can be employed during teaching. A typical example is the use of kahoot. Audio and video tools of samples lectures may excite the interests of students and the more the students play back the audio visual materials, the more it sparks their interest in learning the subject. Podcasts and Youtube videos on different topics involving case studies, experiments, real life simulation and modelling can also be downloaded and viewed by students prior to classes. This may be necessary for students having problems in learning computer programming courses.

Lecturers can use free tools in creating their own teaching contents through recording on social media platforms such as Whatsapp and Screen castomatic application in recording lecture series and sharing lecture contents before or after the class with students. Furthermore, real-world learning and brainstorming approach may be adopted in teaching computing courses. Infusing real world experience into our teaching and instructions will make the students to have deep knowledge instead of surface knowledge on the subject matter. Relating and demonstrating through real life situations and applications in some computing courses is highly essential, especially for computer networks and data communications infrastructure, database design, algorithms and data structures design as well as simulating scheduling in operating system. The nature of computer science courses makes it crucial for lecturers to always create lecture period for brainstorming. This allows many students to be creative and good at critical thinking.

More importantly, whatever the students derive from the brainstorming session with their colleagues will never be forgotten by making them excel in their examinations. From personal experience, students enjoy computer science courses through hands-on-practicals. However, due to scarce resources, arrangements can be made with foreign institutions by using their virtual laboratories for the training of our students. Conclusively, for training of world-class students, time to time review of teaching strategies and techniques, monitoring of grading system, feedback mechanism, studying the aura of class and its dynamics, adequately preparation for lectures, observation of students learning strategies and personal development, should be carried out by the lecturers. Staff personal development is of utmost importance, following the teaching of an adage that says "you cannot give what you don't have".

KLEPTDIS: Intelligent Diagnostic System for Kleptomanias

Artificial Intelligence (AI) is indeed a welcome innovation in this 21st century. Its adoption towards solving different problems in human endeavours and spheres of life is yielding significant results and improvements. More importantly, in areas where well known traditional, physical and medical approaches have met an abrupt end. AI techniques have not only proven to be very effective but also superior in generating precise and best solutions to problems. AI has necessitated the adoption and application of the modelling system that aids the accurate diagnosis of a mental disorder called Stealing Madness, also known as Kleptomania.

Kleptomania is a psychological disorder creating an irresistible urge on affected persons, who are usually above the age of 18 years to steal worthless items (pins, match sticks, pencils, and crayons, among others) with a pleasurable sense of relief after the action. The stolen items are typically of little or no importance to the 'thief'. This stealing madness, which has no regard for gender or social status, has its origin traceable to the nineteenth century and presently has no confirmed or approved drug as its cure. Hence, it can be regarded as a neglected disorder while its victims are left to face its accrued consequences. Although, clinical studies, statistical surveys, aetiology and diagnosis performed over the years revealed that anti-depressants or anti-convulsants, combined with psychotherapy, has varying degrees of minute success in managing the disorder.

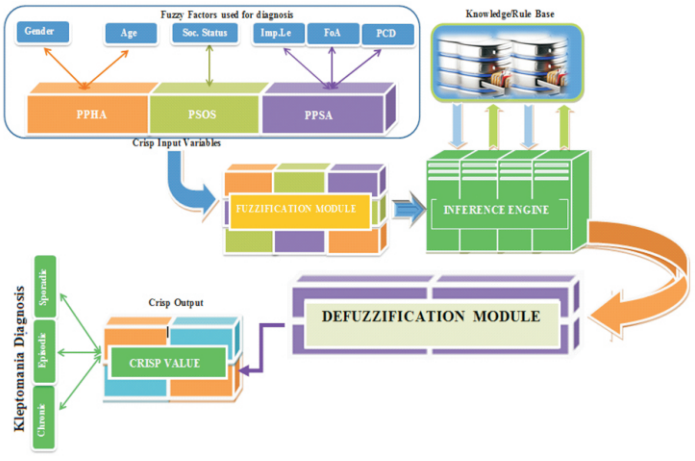
However, clinicians, scientists, psychologists and psychiatrists are still faced with the challenge of diagnosing and the ambiguity in deciding the right management practices for patients suffering from Kleptomania. Artificial Intelligence can proffer an intelligent solution for the diagnosis of the disease. This can be achieved through the use of Fuzzy Logic to generate a crisp value for the classification of a patient's degree of kleptomania into Sporadic, Episodic and Chronic, according to the American Psychiatric Association (APA), in order to determine the best management practices to be adopted. With this model, the six different factors identified for the diagnosis of kleptomania are categorised into three major groups: Patient's Physical Attribute (PPHA), Patient's Psychological Attribute (PPSA) and Patient's Social Status (PSOS). The Patient's Physical Attribute (PPHA) comprises the sex of the patient and age ranging from 18 years and above. The Patient's Psychological Attribute (PPSA) consists of:

i. Impulse Level (ImL): Rated on a Clinical Global Impression (CGI) severity scale administered through structured clinical interview.

ii. Frequency of Action (FoA): The number of times or counts of theft incidence within a week.

iii. Presence of Concurrent Disorder (PCD): Resulting from alcohol, conduct, hormone or pelvic disorder.

The Patient's Social Status (PSOS) is sub-categorised into High, Middle and Low classes. Further analysis was performed to determine the extent of influence or relationship between Impulse level (ImL) and Frequency of Action (FoA). These fuzzy inputs with their respective linguistic variables, are assigned triangular membership function, fuzzified and passed into the inference engine, which interacts with a knowledge-base containing sets of rules used for diagnosis. A centroid method of deffuzification is used to generate a crisp value from the aggregated fuzzy set to appropriately diagnose and classify patients into the three aforementioned groups. Evaluation of results from both the AI approach and the conventional approach (based on Kleptomaniac Symptom Assessment Scale (K-SAS)) would reveal that the proposed intelligent solution is more accurate, efficient, faster and minimises human intervention when compared to conventional solutions.



The KLEPTDIS Architecture

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Essential Guide to Personal Computer TROUBLESHOOTING

An optimal performance of a Personal Computer (PC) results from proper maintenance of such system. Routine maintenance options include cleaning dust from the system, cleaning up the hard drive by removing temporary files, updating software, running antivirus and spyware scans regularly. Computer maintenance can be categorised into Preventive Maintenance and Corrective Maintenance. Preventive Maintenance involves regular care of the system to avoid development of faults. Failure to adhere to preventive maintenance leads to corrective maintenance. Corrective Maintenance identifies and fix-the-fault(s) of the personal computer. These faults are identified through troubleshooting.

Troubleshooting is a process of diagnosing the source of a problem. It can be used to identify problems with the hardware and software of a computer system. Basically, troubleshooting can be achieved through rules and strategies. System troubleshooting rules must be obeyed when diagnosing for faults. These rules include:

Rule 1: **Earth the charges in your hands before touching the computer innards** -As the hands contain electrostatic charges, which can damage computer components especially those made with silicon materials like the RAM, chip, mother board, it is highly necessary to get rid of the electrostatic charges.

Rule 2: Start from the smallest root cause- Every system problem is unique. However, troubleshooting experts depend on factors like the user's complaint(s), error messages, beep codes, and in the absence of the aforementioned, the expert would depend on personal experience to carry out fault isolation.

Rule 3: Do not add more problems -The aim of troubleshooting is to solve a problem, hence in trying to achieve this, one must be very careful not to add more problems to the system.

Rule 4: Do a re-evaluation - If troubleshooting does not produce the desired result, pause and re-evaluate all the previous steps /strategies taken.

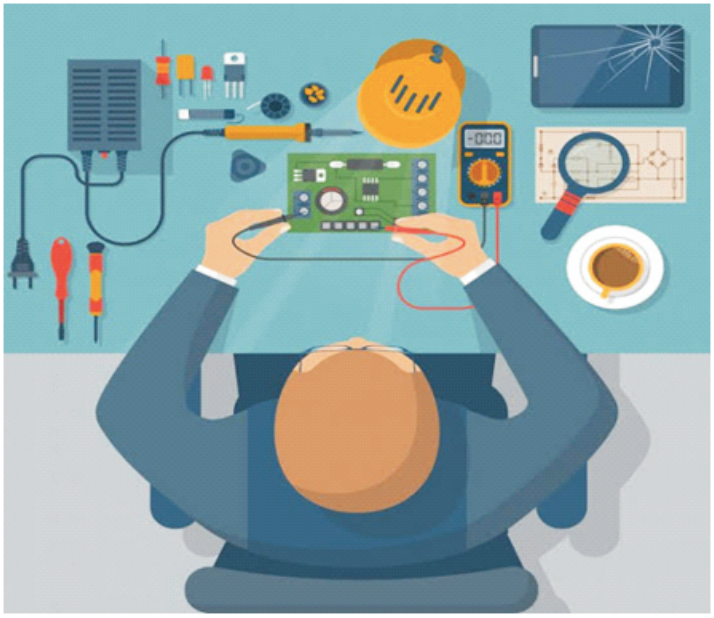
System troubleshooting strategies include:

Strategy 1: Simplify the system -The system can be simplified by changing it to factory settings (system recovery), which can be achieved by pressing F11 at Start Up for most computer systems, clearing the CMOS, running system restore, disk clean-up or uninstalling programmes from the control panel.

Strategy 2: Components swapping -In components swapping, one must be guided by troubleshooting rules and conditions for swapping. Obeying rules number 1, 2 and 3 is the first condition for components swapping. Other conditions include ensuring the components to be swapped are in the same form (size or shape), the component must have been tested in another system of the same configuration, motherboard compatibility test must be carried out in terms of speed and capacity in case of upgrade.

Strategy 3: High concentration – While carrying out system simplification and components swapping to achieve results, one must be focused to know the next step to take.

If these rules and strategies are followed, then system troubleshooting becomes an exciting adventure.



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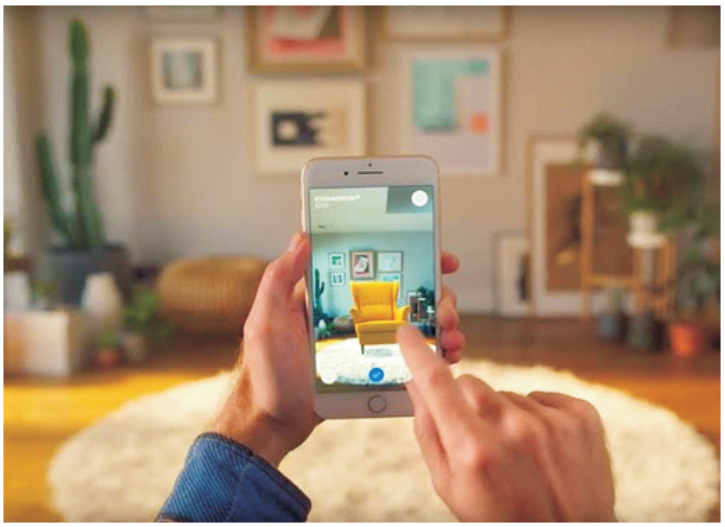
Showcasing the Technology Behind Extended Reality

Extended Reality (XR) is an umbrella term for immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR). All immersive technologies extend the reality we experience by creating a fully immersive experience or by blending 'virtual' and 'real' worlds together. In Augmented Reality (AR), virtual information and objects are overlaid on the real world. This experience enhances the real world with digital details such as text, images, and animation. AR experience can be accessed through glasses via screens, smartphones, and tablets whereby users are not isolated from the real world and are aware of what is going on in front of them. Examples of this are Snapchat filters that put digital images like glasses or hats on the head.

Virtual Reality (VR) involves full immersion in a simulated digital environment. VR users experience this by putting on head, mounted displays or a VR headset to get a 360-degree view of an artificial world that makes viewers think they really are present in the world. Such experiences include walking on the moon, having a roller coaster ride around cities and underwater exploration, among others. Entertainment and gaming industries are early adopters of this technology but presently, other industries are adopting the technology. In education, AR and VR technology are used to engage students and enhance their learning. AR can also be employed by engineers, technicians, or maintenance staff to relay essential information about on-site equipment or machinery thereby reducing the time spent in referring to manuals and looking up information online while on the job. AR also finds relevance in the Healthcare system by surgeons in training and in the theatre to alert them of risks or hazards while working. It is also used to guide users towards defibrillator devices and helps nurses find patient's veins to avoid sticking needles where they are not wanted.

AR is increasingly being adopted in business. For instance, Ikea; a notable furniture company allows buyers to place furniture in their living room or kitchen. Rolex is adopting this technology to allow customers try on watches on their wrist. Nike, a company that produces sportswear and trainers, uses AR to measure the size of foot and recommends shoe sizes. Many more companies and industries are beginning to explore utilising this technology for their operations while technology experts are predicting wider adoption in the nearest future. It becomes interesting by the day how Artificial Intelligence is being used to produce solutions in other application domains.



Sample of Augmented Reality

Sample Showing Virtual Reality

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Aligning IT to Support SDGs

In the previous editions of CSC Newsletter, we highlighted how Information Technology aligns to support Sustainable Development Goals 1,2,3,7,9, 11 and 13. Efforts would now be made to discuss SDGs 17.

ICTs, Catalyst for Driving SDG 17

The 2030 Agenda for Sustainable Development, which was adopted by member states of the United Nations in 2015, provides a blueprint to achieve a better and more sustainable future for all. At its core are 17 Sustainable Development Goals (SDGs) that address global challenges, including those related to poverty, inequality, climate change, environmental degradation, peace and justice. Information and Communication Technology (ICTs) are vital in driving progress towards achieving each of the 17 Sustainable Development Goals since ICTs are the catalysts that accelerate all the three pillars of sustainable development -economic growth, social inclusion and environmental sustainability, as well as providing an innovative and effective means of implementation in today's inter-connected world. SDG 17, which is Partnerships for the Goals, seeks to strengthen global partnerships to support and achieve the ambitious targets of the 2030 Agenda, bringing together national governments, the international community, civil society, the private sector and other key actors.

Partnership entails collaboration and networking. Partnerships are particularly needed for cross sector and country collaboration in the pursuit of all the set goals by the year 2030. It is a vision for an improved and more equitable trade and facilitating investment, inclusion and innovation required for attaining SDGs. The Internet can be used to facilitate partnerships across borders. The mobile Internet has been a game changer in developing countries. Internet has evolved into a widely used tool that offers public access to aid partnership and communication in both urban and rural parts of the world. For regulators in developing countries, the first step towards creating a strong partnership culture should be to connect with this vast number of people and organisations online through social media platforms and instant messaging/video conferencing tools. Thereafter, shifting focus to new services and programmes that would drive societal change and accelerated development.

According to General Jose Graziano da Silva, Food and Agricultural Director, Food and Agricultural Organisation (FAO), "ICT has the capacity to support rural development, increase the resilience of rural families, improve access of famers to markets and other services, and also empower women and youths thereby ensuring that rural population is not left behind". In respect to that, FAO decided to exploit the power of partnership by collaborating with the International Telecommunication Union (ITU), to assist member states of the United Nations in embracing a strategic approach in making the best use of ICT developments for agriculture. Failure to acknowledge the transformative power of ICTs for partnership between individuals, organisations and for the realisation of other 16 SDGs would adversely affect the achievements of the 2030 United Nations' Agenda.

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