INFOLINE

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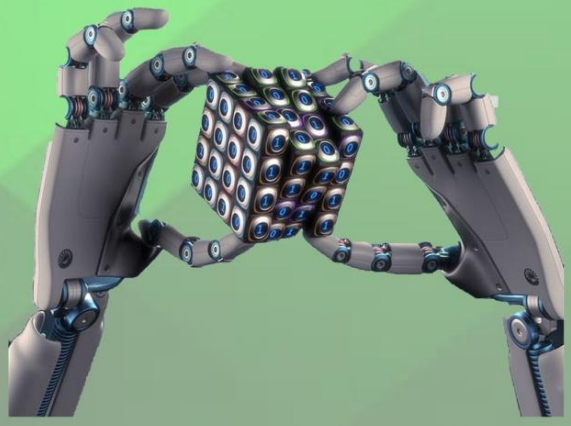

DEPARTMENT OF COMPUTER TECHNOLOGY AND INFORMATION TECHNOLOGY

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INFOLINE

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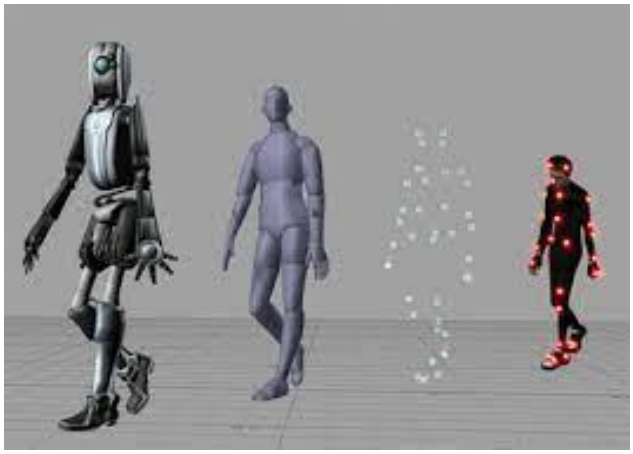
CONTENTS

COMPUTER ANIMATION

Computer animation is the art of creating moving images via the use of computers. It is a subfield of computer graphics and animation. Increasingly it is created by means of 3D computer graphics, though 2D computer graphics are still widely used for low bandwidth and faster real-time rendering needs. Sometimes the target of the animation is the computer itself but it sometimes the target is another medium such as film.



It is also referred to as CGI (Computer-Generated Imagery or Computer-Generated Imaging) especially when used in films. To create the illusion of movement, an image is displayed on the computer screen then quickly replaced by a new image that is similar to the previous image but shifted slightly. This technique is identical to how the illusion of movement is achieved with television and motion pictures.

Computer animation is essentially a digital successor to the art of stop motion animation of 3D models and frame-by-frame animation of 2D illustrations. For 3D animations, objects (models) are built on the computer monitor (modeled) and 3D figures are rigged with a virtual skeleton.

For 2D figure animations, separate objects (illustrations) and separate transparent layers are used with or without a virtual skeleton. Then the limbs, eyes, mouth, clothes, etc.., of the figure are moved by the animator on key frames. The differences in appearance between key frames are automatically calculated by the computer in a process known as tweening or morphing.

For 3D animations, all frames must be rendered after modeling is completed. For 2D vector animations, the rendering process is the key frame illustration process while tweened frames are rendered as needed. For pre-recorded presentations, the rendered frames are transferred to a different format or medium such as film or digital video. The frames may also be rendered in real time as they are presented to the end-user audience.

Low bandwidth animations transmitted via the internet (e.g. 2D Flash, X3D) often use software on the end-users computer to render in real time as an alternative to streaming or pre-loaded high bandwidth animations.

M.BHAVAN

III B.Sc. (Computer Technology)

AUTOMATED TECHNIQUE FOR ANIME COLORIZATION USING DEEP LEARNING

Researchers report the world's first technique for automatic colorization focused on Japanese anime production. The new technique is expected to promote efficiency and automation in anime production. Japanese researchers from IMAGICA GROUP Inc., OLM Digital, Inc. and Nara Institute of Science and Technology (NAIST) have jointly developed a technique for automatic colorization in anime production.

While the number of animation works produced in Japan has been increasing every year, the number of animators has remained almost unchanged. To promote efficiency and automation in anime production, the research team focused on the possibility of automating the colorization of trace images in the finishing process of anime production. By integrating the anime production technology and know-how of IMAGICA GROUP Inc. and OLM Digital, Inc. with the machine learning, computer graphics and vision technology of NAIST, the research team succeeded in developing the world's first technique for automatic colorization of Japanese anime production. The technique is based on recent advances of deep learning approaches that are nowadays widely applied in various fields.

After the trace image cleaning in a pre-processing step, automatic colorization is performed according to the color script of the character using a deep learning-based image segmentation algorithm. The colorization result is refined in a post-process step using voting techniques for each closed region.

This technique will be presented at SIGGRAPH ASIA 2018, an international conference on computer graphics and interactive techniques to be held in Tokyo, Japan on Dec. 4-7. While this technique is still in the preliminary research stage, the research team will further improve its accuracy and validate it in production within the anime production studio. The product of this will be available for commercialization from 2020.

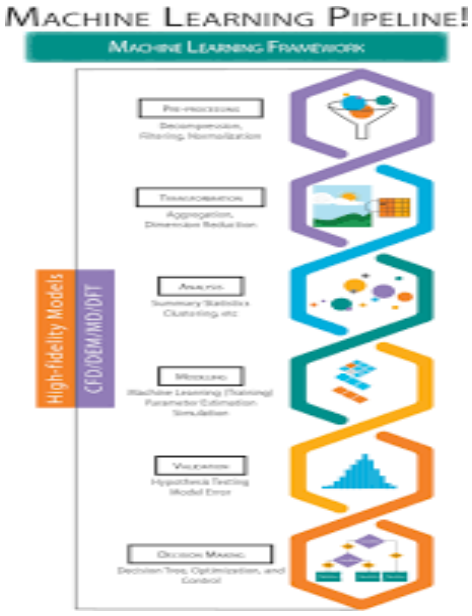
N.R.SHARMILA

III B.Sc. (Information Technology)

NEW FRAMEWORK APPLIES MACHINE LEARNING TO ATOMISTIC MODELLING

Northwestern University researchers have developed a new framework using machine learning that improves the accuracy of interatomic potentials the guiding rules describing how atoms interact in new materials design. The findings could lead to more accurate predictions of how new materials transfer heat, deform and fail at the atomic scale.

Designing new nanomaterials is an important aspect of developing next-generation devices used in electronics, sensors, energy harvesting and storage, optical detectors and structural materials. To design these materials, researchers create interatomic potentials through atomistic modelling, a computational approach that predicts how these materials behave by accounting for their properties at the smallest level. The process to establish materials' interatomic potential called parameterization has required significant chemical and physical intuition leading to less accurate prediction of new materials design.



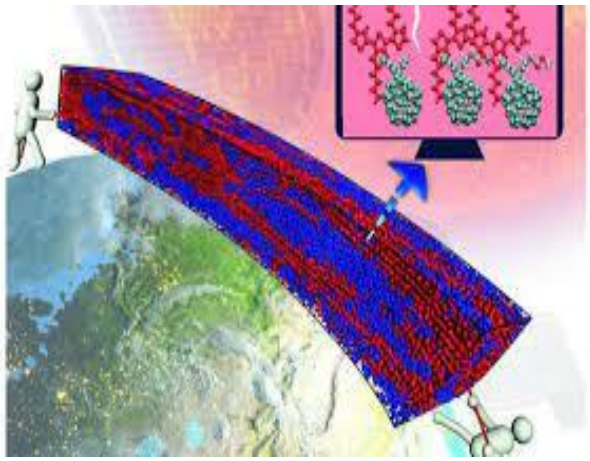
The researchers' platform minimizes user intervention by employing multi-objective genetic algorithm optimization and statistical analysis techniques and screens promising interatomic potentials and parameter sets.

The researchers' framework uses training and screening datasets obtained from density functional theory simulation results, followed by an evaluation step that includes principal component analysis and correlation analysis.

"To defined a sequence of steps to reach an iterative learning approach given specific optimization objectives," said Espinosa who directs the TAM program. "Our statistical approach enables users to realize conflicting optimization goals that are important in setting limits of applicability and transferability to the parametrized potentials." These relations can reveal underlying physics behind some phenomena that seem to be irrelevant to each other.

The team identified a positive correlation between the accuracy of interatomic potential and the complexity and number of the stated parameters a phenomenon believed to be true in the field but previously unproven using quantitative methods. This level of complexity must be met by a commensurate amount of training data. Failure to do so, especially data carrying critical information leads to reduced accuracy.

The researchers found, for example, that to improve the fidelity of interatomic potentials, non-equilibrium properties and force-matching data are required. "This included a better description of large deformation pathways and failure in materials," Nguyen said. "While these are not conventional properties that people target during parametrization, they are critical in understanding the reliability and functionality of materials and devices," Zhang said.



The new approach also helps remove the barrier of user experience to enter this research field. "Through this work, we hope to make a step forward by making the simulation techniques more accurately reflect the property of materials. That knowledge can be expanded upon and eventually impact the design of devices and technology we all use," Zhang said.

Next, the researchers will use their models to expand their investigation to study fracture and deformation in 2D materials, as well as the role of defect engineering in toughness enhancements. They are also developing in situ electron microscopy experiments that will reveal atomistic failure modes, providing a way to assess the predictive capabilities of the parameterized potentials.

The research was supported by the National Science Foundation (award number CMMI 1953806). Computational resources were provided by the Center of Nanoscale Materials at Argonne National Laboratory and the Quest High Performance Computing Cluster at Northwestern University. Use of the Center for Nanoscale Materials, an Office of Science user facility was supported by Office of Basic Energy Sciences within the US Department of Energy's Office of Science (contract number DE-AC02-06CH11357).

R.SHOBIKA

III B.Sc. (Computer Technology)

WIRELESSLY CHARGING MULTIPLE DEVICES SIMULTANEOUSLY

A new type of wireless charger can charge multiple devices simultaneously, researchers report. The device transfers energy with 90 percent efficiency within 20-centimeter charging range. Mobile phones and tablets have allowed us to stay in touch regardless of our location, yet they still rely on plugs, sockets and charging pads to power up. New technology developed at Aalto University may be the key to true wireless charging for these and other electronics in years to come.

While researchers around the globe are working on free-position wireless charging which would unchain devices from set charging points the most common solutions involve complex control and detection functions. A transmitter traditionally has to first detect a device presence and position to be able to send energy in its direction, usually done with cameras or sensors, adding bulk and cost to the device.

The new transmitter bypasses this need by creating power transfer channels in all directions, automatically tuning channels when receiving devices are in motion. Devices like phones, laptops and other small appliance equipped with a new receiver can simultaneously receive energy to charge batteries or directly power their functions without ever being in physical contact or being brought to a specific place.

"What sets this transmitter apart is that it's self-tuning which means you don't need complex electronics to connect with receivers embedded in devices. Since it self-tunes, you can also move the device freely within a wide charging range," explains Prasad Jayathurathnage, a post-doctoral researcher at Aalto University.

The team has achieved the effect through the design of the coils used in the transmitter. By winding the coils in a specific way, they create two kinds of electromagnetic fields: one going outwards and the other around. These fields couple the receiver and transmitter to achieve efficient power transfer.

Currently, the transmitter is highly efficient at 90 percent at up to 20 centimetres distance, but continues to work at longer distances, just with a lower efficiency of energy transfer. In principle, the peak-efficiency range could grow as the technology is refined.

"For now, the maximum range at peak efficiency is dependent on the size of the transmitter and receiver. With the right engineering, we could shrink them down," Jayathurathnage comments. While the team has demonstrated proof of concept, safety tests are still needed to confirm that the electromagnetic field generated by the transmitter is not harmful to humans. It is, however, clear that the resulting electric field which is known to be the main cause for potentially harmful effects, is minimal as the technology relies on magnetic fields.

Once deemed safe, bringing the technology to product would mean a little less hassle in a world increasingly dependent on smart devices. 'True wireless charging means more personal freedom. You won't have to worry about where you put your phone or whether you remembered to plug it in,' says Jayathurathnage. The research team has already applied for a patent for the transmitter. The same group is also developing wireless charging possibilities for industrial applications through the Parkzia project which turns any waiting point for robots like e-movers into a charging spot.

R.JANANI

II B.Sc. (Computer Technology)

ROBOT PROCESS AUTOMATION

What is RPA?

Robot Process Automation is a technology designed to automate regular input-based business operations by configuring software robots or bots. These bots utilize the user interface to emulate a human working within digital systems, create a path to capture data, manipulate applications, and complete a business process. These bots are better in efficiency and accuracy as compared to their human counterparts.

Architecture of RPA

The RPA architecture comprises several tools, platforms and infrastructural elements that help create, design and execute these bots.

RPA Tool

This tool is responsible for a variety of functions performed by bots. This is a comprehensive list of functions the RPA tool performs Reading and/or writing data from different sources for the purpose of execution of bots.

- It allows for the building of shared applications and data repositories along with user interface object stores.
- It allows for automation on different sources, namely – Desktop, Windows, Web, Citric, etc
- It enables the development of software bots,that can be trained through recordings, configurations and altering programming.

RPA Platform

RPA platform acts as a central resource repository for all RPA data, software bots, and resources that are created using the RPA tool. Reusable robotic components library, input/output data files, rather anything created using the RPA tools can be shared on the RPA platform, which is a part of cloud storage. This data will be available as a resource to everyone from the team.

RPA Execution Infrastructure

This is a physical bank of virtual or physical machines that are run on varied configurations of user patterns. These can be scaled up or down through these user patterns for automating said tasks. Since this tool does not require much human intervention, it is usually left alone.

Configuration Management

This tool determines the version of RPA assets as an underlying tool. The functions of this tool comprise aiding in the creation and updating of the bots to newer versions. They are also branched or merged with the help of this tool in case they are being reused.

RPA Life Cycle

Analysis

The very first step in the RPA cycle involves the customer realizing that they need RPA in their organization. With the help of an RPA architect and technical team, the task is analyzed and evaluated to gauge, whether an automatic process can be created out if this or not. After due consideration of the costs involved, and the time that will be taken to produce the said RPA, the task is designed.

Development

After considering various factors and designing the RPA, the development process commences. The process might or might not involve coding, and will either be designed by developers or testers based on that.

Testing

Once the development phase is over, the testing phase begins. Thorough testing happens right from the very first step to the last step of the automation process until everything happens smoothly.

Benefits of RPA

GUI and no coding

RPA doesn't really require coding knowledge. So, in an organization looking to automate clerical processes, the employees can be taught how to create bots using GUI (Graphical User Interface) or varied intuitive wizards. This ensures timely delivery of tasks, without having a very long process of creation. Besides, it also saves an organization a lot of resources with respect to training, educating and installation.

Utmost Security

The entire data on RPA which is accessed by either bots or developers of the team is designed to prevent any malicious tampering. All data that is stored for automating and executing bots is stored within a robust user access management system and can only be accessed by authorized IDs only.

Fails of RPA

Investment Costs

RPA as technology is still under development. Therefore, the costs to introduce it within daily business processes might be high at times. These costs pose a challenge for businesses whether to wait for the technology to expand or employ it immediately.

At times, integrating RPA in day-to-day activities might also lead to unforeseen outcomes were resolving an issue in the software might take up more resources than planned or more time. This might negatively affect efficiency at the organization.

Potential job losses

A lot of employees have this perception that getting an RPA within the system might lead to a lot of lay-offs, as they fear the technology taking over their jobs. This, however, is a myth associated with RPA. Amazon.in is the best company that puts rest to this assumption. It has recorded an increase in the employees hired, all the while increasing its bots from 1000 to 45000.

Tips for creating an effective RPA

Poor design can be a problem

In the process of creating an automated program, companies can omit to check a few things. It can also happen that once an organization has decided to get RPA, they put untimely pressure on the IT team to deliver it. Such lapses can later cost the company a great deal.

In cases where either the planning hasn't been done properly or internal configuration between bots isn't properly done, the RPA designed will lead to problems, one day. So, proper preparation of the development plan has to be a priority for robotic automation.

Similarly, configurations of different segments of the tasks and coordination between the bots have to be a primary requirement for an excellent RPA to work without glitches.

Project Governance and Monitoring is essential

You can't just create bots in an RPA and then set them free without any governance or control. A lot of people can have access to the same data and bots, in order to reflect a change at different checkpoints that data has to be updated throughout the system.

For instance, if the password of a program has changed, it has to be changed across all systems, otherwise, it can lead to significant problems with regards to accessing data.

S.P.VISHVA

III B.Sc. (Information Technology)

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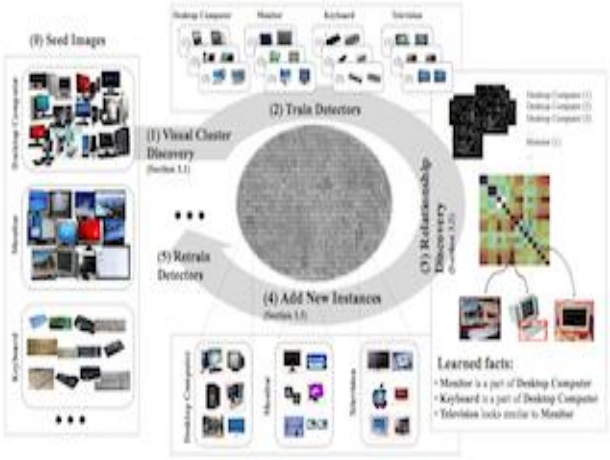
NEVER ENDING IMAGE LEANER (NEIL)



Never Ending Image Learner (NEIL) is a computer program that works 24/7 learning information about images that it finds on the internet. NEIL, which is housed at Carnegie Mellon University, is not looking for just any type of information. Rather, it's goal is to learn common sense relationships found in everyday life. Examples of these relationships include the fact that cashiers are often found at cash registers, or that a door is part of a house. This is common sense information to humans, of course, but it has long been beyond the ken of computers.

It is not incidental that NEIL spends its time analyzing images, rather than audio files or some other type of information. The advantage of NEIL learning common sense through images is that images are chock full of common sense relationships. Think of all of the common sense information available just in my son's school picture. One could derive that boys wear shirts. That boys have eyes, ears, teeth, skin and a nose. That boys have hair, and that this hair is often shorter than girls' hair. And the list goes on.

NEIL is not the first program of its kind, but it is the most autonomous. In other words, very little human interaction is required in order for NEIL to continue doing what it does. This capacity for nonstop work is a big advantage in that it will allow NEIL to collect more data than any of its predecessors. NEIL's autonomy means that creating such a massive database is less daunting than it sounds. Considering that a site like Facebook has well over 2 billion images, and NEIL has the ability to eventually analyze them all, the task of creating the world's largest visual database is only a matter of time.

NEIL will become the largest database of its kind, and more data means more smarts. The more NEIL learns, the greater its capacity for learning becomes. In less than six months, NEIL collected data from 5 million images. From these images, it was able to identify about three thousand relationships.

So, who cares if a computer knows that farmers milk cows? The answer is that many people do, and there are more all the time. As robotic technology becomes increasingly sophisticated, its list of potential applications is growing enormously. Robots will gradually take on larger and more central roles in the world, particularly in industry. Other fields of application include health care, transportation and entertainment, to name just a few.

NEIL's common sense relationships are particularly relevant to machine perception. Any time an image needs to be retrieved, or differentiated from another image, or described, or simply monitored, NEIL will be an invaluable resource.

B.THARNIKA

II B.Sc. (Information Technology)

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APACHEE HADOOP

Apache Hadoop is a collection of open-source software utilities that facilitates using a network of many computers to solve problems involving massive amounts of data and computation. It provides a software framework for distributed storage and processing of big data using the MapReduce programming model. Hadoop was originally designed for computer clusters built from commodity hardware, which is still the common use. It has since also found use on clusters of higher-end hardware. All the modules in Hadoop are designed with a fundamental assumption that hardware failures are common occurrences and should be automatically handled by the framework.

The core of Apache Hadoop consists of a storage part known as Hadoop Distributed File System (HDFS) and a processing part which is a MapReduce programming model. Hadoop splits files into large blocks and distributes them across nodes in a cluster. It then transfers packaged code into nodes to process the data in parallel. This approach takes advantage of data locality, where nodes manipulate the data they have access to. This allows the dataset to be processed faster and more efficiently than it would be in a more conventional supercomputer architecture that relies on a parallel file system where computation and data are distributed via high-speed networking.

The base Apache Hadoop framework is composed of the following modules:

Hadoop Common – contains libraries and utilities needed by other Hadoop modules;

Hadoop Distributed File System (HDFS)- a distributed file-system that stores data on commodity machines, providing very high aggregate bandwidth across the cluster;

Hadoop *YARN* – (introduced in 2012) a platform responsible for managing computing resources in clusters and using them for scheduling users' applications.

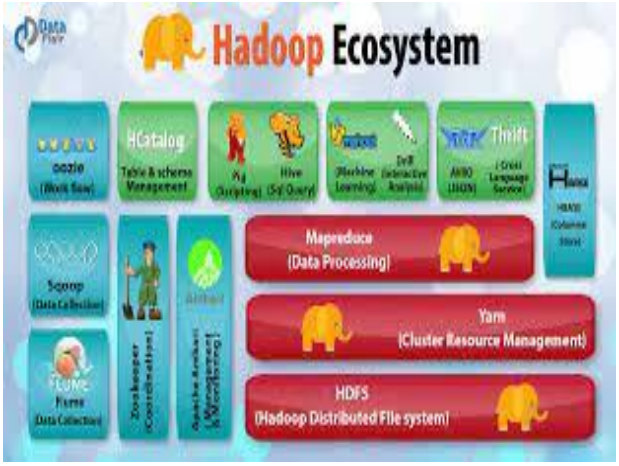
Hadoop MapReduce – an implementation of the MapReduce programming model for large-scale data processing.

Hadoop Ozone – (introduced in 2020) An object store for Hadoop.

The term Hadoop is often used for both base modules and sub-modules and also the ecosystem, or collection of additional software packages that can be installed on top of or alongside Hadoop, such as Apache Pig, Apache Hive, Apache HBase, Apache Phoenix, Apache Spark, Apache ZooKeeper, Cloudera Impala, Apache Flume, Apache Sqoop, Apache Oozie, and Apache Storm.

Apache Hadoop's MapReduce and HDFS components were inspired by Google papers on MapReduce and Google File System.

The Hadoop framework itself is mostly written in the Java programming language with some native code in C and command line utilities written as shell scripts. Though MapReduce Java code is common, any programming language can be used with Hadoop Streaming to implement the map and reduce parts of the user's program.[15] Other projects in the Hadoop ecosystem expose richer user interfaces.



Architecture

Hadoop consists of the Hadoop Common package which provides file system and operating system level abstractions, a MapReduce engine (either MapReduce/MR1 or YARN/MR2) and the Hadoop Distributed File System (HDFS). The Hadoop Common package contains the Java Archive (JAR) files and scripts needed to start Hadoop.

For effective scheduling of work, every Hadoop-compatible file system should provide location awareness, which is the name of the rack, specifically the network switch where a worker node is. Hadoop applications can use

this information to execute code on the node where the data is, and, failing that, on the same rack/switch to reduce backbone traffic. HDFS uses this method when replicating data for data redundancy across multiple racks. This approach reduces the impact of a rack power outage or switch failure; if any of these hardware failures occurs, the data will remain available.

A multi-node Hadoop cluster

A small Hadoop cluster includes a single master and multiple worker nodes. The master node consists of a Job Tracker, Task Tracker, NameNode, and DataNode. A slave or worker node acts as both a DataNode and TaskTracker, though it is possible to have data-only and compute-only worker nodes. These are normally used only in nonstandard applications.

Hadoop requires Java Runtime Environment (JRE) 1.6 or higher. The standard startup and shutdown scripts require that Secure Shell (SSH) be set up between nodes in the cluster. In a larger cluster, HDFS nodes are managed through a dedicated NameNode server to host the file system index, and a secondary NameNode that can generate snapshots of the namenode's memory structures, thereby preventing file-system corruption and loss of data. Similarly, a standalone JobTracker server can manage job scheduling across nodes. When Hadoop MapReduce is used with an alternate file system, the NameNode, secondary NameNode, and DataNode architecture of HDFS are replaced by the file-system-specific equivalents.

File systems

Hadoop distributed file system

The Hadoop distributed file system (HDFS) is a distributed, scalable, and portable file system written in Java for the Hadoop framework. Some consider it to instead be a data store due to its lack of POSIX compliance but it does provide shell commands and Java application programming interface (API) methods that are similar to other file systems. A Hadoop instance is divided into HDFS and MapReduce. HDFS is used for storing the data and MapReduce is used for processing data. HDFS has five services as follows:

1. Name Node
2. Secondary Name Node
3. Job tracker
4. Data Node
5. Task Tracker

Top three are Master Services/Daemons/Nodes and bottom two are Slave Services. Master Services can communicate with each other and in the same way Slave services can communicate with each other. Name Node is a master node and Data node is its corresponding Slave node and can talk with each other.

Name Node: HDFS consists of only one Name Node that is called the Master Node. The master node can track files, manage the file system and has the metadata of all of the stored data within it. In particular, the name node contains the details of the number of blocks, locations of the data node that the data is stored in, where the replications are stored, and other details. The name node has direct contact with the client.

Data Node: A Data Node stores data in it as blocks. This is also known as the slave node and it stores the actual data into HDFS which is responsible for the client to read and write. These are slave daemons. Every Data node sends a Heartbeat message to the Name node every 3 seconds and conveys that it is alive. In this way when Name Node does not receive a heartbeat from a data node for 2 minutes, it will take that data node as dead and starts the process of block replications on some other Data node.

Secondary Name Node: This is only to take care of the checkpoints of the file system metadata which is in the Name Node. This is also known as the checkpoint Node. It is the helper Node for the Name Node. The secondary name node instructs the name node to create & send fsimage & editlog file upon which the compacted fsimage file is created by the secondary name node.

Job Tracker: Job Tracker receives the requests for Map Reduce execution from the client. Job tracker talks to the Name Node to know about the location of the data that will be used in processing. The Name Node responds with the metadata of the required processing data.

Task Tracker: It is the Slave Node for the Job Tracker and it will take the task from the Job Tracker. It also receives code from the Job Tracker. Task Tracker will take the code and apply on the file. The process of applying that code on the file is known as Mapper.

Hadoop cluster has nominally a single namenode plus a cluster of datanodes, although redundancy options are available for the namenode due to its criticality. Each datanode serves up blocks of data over the network using a block protocol specific to HDFS. The file system uses TCP/IP sockets for communication. Clients use remote procedure calls (RPC) to communicate with each other.

HDFS stores large files (typically in the range of gigabytes to terabytes) across multiple machines. It achieves reliability by replicating the data across multiple hosts, and hence theoretically does not require redundant array of independent disks (RAID) storage on hosts (but to increase input-output (I/O) performance some RAID configurations are still useful). With the default replication value, 3, data is stored on three nodes: two on the same rack, and one on a different rack. The trade-off of not having a fully POSIX-compliant file-system is increased

performance for data throughput and support for non-POSIX operations such as Append.

D.UDHYAKUMAR

II B.Sc. (Computer Technology)

COMPUTER OUTPUT TO LASER DISK

COLD (Computer Output to Laser Disk) is a system for archiving data such as business records and reports to one or more optical disks in a compressed but easily retrievable format. COLD systems make it unnecessary to archive reports in printed form and are easier to work with than microfiche, an earlier solution. Vendors of COLD systems point out that more than one million paper pages can be stored on a single 5 1/4 inch optical disk. A COLD system consists of software and hardware. The software allows a user to send a document to the COLD system (much like sending it to be printed) organizes the documents for access and compresses them for storage. The hardware consists of optical disk drives which typically are mounted in a unit called a jukebox.

COLD software may offer the ability to do archiving automatically at scheduled times of day to index documents in a variety of ways and to periodically distribute the archive indexes.

COLD systems are used to archive accounting reports, credit reports, loan records, inventories, shipping and receiving documents, customer bills, lab reports, and many other kinds of records and reports. A COLD system is a form of EDM and is often used together with an imaging system.

The Document Management System creates image files from the raw data which look exactly like the actual printed receipts. Similar to scanned documents, these image files will then be added to the archive. The only difference is that the document's entire text and applicable tags from the original raw data are already available and need not be processed by an OCR.

The term COLD dates back to the early days of digital archiving systems. In the 1980s, the process originally developed by Philips was used for long-term recording of computer output. The term has persisted in the document management system environment to this day, although the technology is of course more advanced in the meantime. COLD is now generally used to describe the direct digital storage of output data from operational software systems. The storage media are

meanwhile various beside WORM and UDO media DVD, BluRay and normal hard disks are used.

COLD in practice

bitfarm-Archiv Document Management offers a universal printer driver which is switched between the operational application and the physical printer. This COLD printer driver allows simultaneous printing and archiving of a document. For the user the process is completely transparent, he prints his documents exactly as before. If the same document is printed several times, the duplicate recognition ensures that only one document is entered into the electronic archive from the COLD data. If desired, bitfarm-Archiv Document Management firmly connects the raw print data of the COLD import with matching stationery in order to store an exact copy of the outgoing document in an audit-proof manner.

The indexing of the documents archived via the COLD interface is done automatically by bitfarm-Archiv Dokumenten management without any user intervention. The DMS recognizes the different document types, special forms and different document languages. It then fully automatically indexes the relevant data such as order number, customer number, date, amount, article, etc. The indexed data can be used for document management. The document can be called up at any time via the indexed data. The benefits of this are:

- Reduced time for indexing
- Less errors
- Higher worker motivation

In addition, an interface exists so that a document archived by COLD can be called directly from the leading system (usually the ERP system). The user thus enjoys the convenience of a fully integrated solution. This does not require an expensive interface or special programming bitfarm-Archiv Document Management already provides this functionality for almost all current ERP systems. Today, COLD archiving with electronic document management is neither complex nor cost-intensive and represents a real alternative to conventional document archiving even for small and medium-sized companies.

S.JAGADESH

II B.Sc. (Information Technology)

EXCORTEX

Excortex is a system integrator for integration-platform-as-a-service. Provides a platform for data integration, process automation, on-premise application integration and hybrid cloud on-premise integration by leveraging IoT and Machine Learning. Offers tools to design, develop and deploy data and application and full life-cycle API management.

Excortex Overview

Founded Year **:** 2014
Location **:** South Africa
Company Stage **:**Unfunded
Similar Compitators: Appian, Kony, Progress

N.R.SHARMILA

III B.Sc. (Information Technology)

HAPTIC TECHNOLOGY

Haptic technology, also known as kinaesthetic communication or 3D touch, refers to any technology that can create an experience of touch by applying forces, vibrations or motions to the user. These technologies can be used to create virtual objects in a computer simulation, to control virtual objects, and to enhance remote control of machines and devices (telerobotics). Haptic devices may incorporate tactile sensors that measure forces exerted by the user on the interface. The word haptic, from the Greek term haptikos means "tactile, pertaining to the sense of touch". Simple haptic devices are common in the form of game controllers, joysticks, and steering wheels.

Haptic technology facilitates investigation of how the human sense of touch works by allowing the creation of controlled haptic virtual objects. Most researchers distinguish three sensory systems related to sense of touch in humans: cutaneous, kinaesthetic and haptic. All perceptions mediated by cutaneous and kinaesthetic sensibility are referred to as tactual perception. The sense of touch may be classified as passive and active, and the term "haptic" is often associated with active touch to communicate or recognize objects.

Implementation

The majority of electronics offering haptic feedback use vibrations, and most use a type of eccentric rotating mass (ERM) actuator, consisting of an unbalanced weight attached to a motor shaft. As the shaft rotates, the spinning of this irregular mass causes the actuator and the attached device to shake.Some newer devices such as Apple's MacBooks and iPhones featuring the "Taptic Engine" accomplish their vibrations with a linear resonant actuator (LRA) which moves a mass in a reciprocal manner by means of a magnetic voice coil similar to how AC electrical signals are translated into motion in the cone of a loudspeaker. LRAs are capable of quicker response times than ERMs and thus can transmit more accurate haptic imagery.

Piezoelectric actuators are also employed to produce vibrations, and offer even more precise motion than LRAs, with less

noise and in a smaller platform, but require higher voltages than do ERMs and LRAs.

Force feedback

Some devices use motors to manipulate the movement of an item held by the user. A common use is in automobile driving video games and simulators which turn the steering wheel to simulate forces experienced when cornering a real vehicle. In 2007, Novint released the Falcon, the first consumer 3D touch device with high resolution three-dimensional force feedback. This allowed the haptic simulation of objects, textures, recoil, momentum, and the physical presence of objects in games.

Air vortex rings

Air vortex rings are donut-shaped air pockets made up of concentrated gusts of air. Focused air vortices can have the force to blow out a candle or disturb papers from a few yards away. Both Microsoft Research (AirWave) and Disney Research (AIREAL) have used air vortices to deliver non-contact haptic feedback.

Ultrasound

Focused ultrasound beams can be used to create a localized sense of pressure on a finger without touching any physical object. The focal point that creates the sensation of pressure is generated by individually controlling the phase and intensity of each transducer in an array of ultrasound transducers. These beams can also be used to deliver sensations of vibration, and to give users the ability to feel virtual 3D objects.

Applications

Tactile electronic displays

A tactile electronic display is a display device that delivers text and graphical information using the sense of touch. Devices of this kind have been developed to assist blind or deaf users by providing an alternative to visual or auditory sensation.

Video games

Rumble packs for controllers, such as this Dreamcast Jump Pack, provide haptic feedback through users' hands

Haptic feedback is commonly used in arcade games, especially racing video games. In 1976, Sega's motorbike game Moto-Cross, also known as Fonz, was the first game to use haptic feedback, causing the handlebars to vibrate during a collision with another vehicle. Tatsumi's TX-1 introduced force feedback to car driving games in 1983. Simple haptic devices are common in the form of game controllers, joysticks, and steering wheels. Early implementations were provided through optional components, such as the Nintendo 64 controller's Rumble Pak in 1997. In the same year, the Microsoft SideWinder Force Feedback Pro with built-in feedback was released by Immersion Corporation. Many console controllers and joysticks feature built-in feedback devices, which are motors with unbalanced weights that spin causing it to

vibrate,
including Sony's DualShock technology
and Microsoft's Impulse Trigger technology. Some automobile steering wheel controllers, for example, are programmed to provide a "feel" of the road. As the user makes a turn or accelerates, the steering wheel responds by resisting turns or slipping out of control.

Notable introductions include:

- 2013: Steam Machines micro consoles by Valve including a new Steam Controller unit that uses weighted electromagnets capable of delivering a wide range of haptic feedback via the unit's trackpads. These controllers' feedback systems are user-configurable.
- 2014: A new type of haptic cushion that responds to multimedia inputs by LG Electronics.
- 2015: The Steam Controller with HD Haptics, with haptic force actuators on both sides of the controller, by Valve.
- 2017: The Nintendo Switch's Joy-Con, introducing the HD Rumble feature developed with Immersion Corporation and using Alps actuators.
- 2018: The Razer Nari Ultimate, gaming headphones using a pair of wide frequency haptic drivers, developed by Lofelt.
- 2020: The Sony PlayStation 5 controllers can adapt the resistance of the trigger controls, such as simulating the increasing resistance felt while drawing the string of a bow, as well as more precise haptic feedback through voice coil actuators.

Personal computers

In2008, Apple
Inc.'s MacBook and MacBook Pro started incorporating a "Tactile Touchpad" design with button functionality and haptic feedback incorporated into the tracking surface. Products such as the Synaptics ClickPad followed.

In 2015, Apple introduced "Force Touch" trackpads onto the 2015 MacBook Pro which simulates clicks with a "Taptic Engine".

Mobile devices

Tactile haptic feedback is common in cellular devices. In most cases, this takes the form of vibration response to touch. Alpine Electronics uses a haptic feedback technology named PulseTouch on many of their touch-screen car navigation and stereo units. The Nexus One features haptic feedback, according to their specifications. Samsung first launched a phone with haptics in 2007.

Surface haptics refers to the production of variable forces on a user's finger as it interacts with a surface such as a touchscreen. Tanvas uses an electrostatic technology to control the in-plane forces experienced by a fingertip as a programmable function of the finger's motion. The TPaD Tablet Project uses an ultrasonic technology to modulate the apparent slipperiness of a glass touchscreen.

In 2013, Apple Inc. was awarded the patent for a haptic feedback system that is suitable for multitouch surfaces. Apple's U.S. Patent for a "Method and apparatus for localization of haptic feedback" describes a system where at least two actuators are positioned beneath a multitouch input device, providing vibratory feedback when a user makes contact with the unit. Specifically, the patent provides for one actuator to induce a feedback vibration while at least one other actuator uses its vibrations to localize the haptic experience by preventing the first set of vibrations from propagating to other areas of the device. The patent gives the example of a "virtual keyboard," however, it is also noted that the invention can be applied to any multitouch interface.

Virtual reality

Haptics are gaining widespread acceptance as a key part of virtual reality systems, adding the sense of touch to previously visual-only interfaces. Systems are being developed to use haptic interfaces for 3D modeling and design, including systems that allow holograms to be both seen and felt. Several companies are making full-body or torso haptic vests or haptic suits for use in immersive virtual reality to allow users to feel explosions and bullet impacts.

Teleoperators and simulators

Teleoperators are remote controlled robotic tools. When the operator is given feedback on the forces involved, this is called haptic teleoperation. The first electrically actuated teleoperators were built in the 1950s at the Argonne National Laboratory by Raymond Goertz to remotely handle radioactive substances. Since then, the use of force feedback has become more widespread in other kinds of teleoperators, such as remote-controlled underwater exploration devices.

Devices such as medical simulators and flight simulators ideally provide the force feedback that would be felt in real life. Simulated forces are generated using haptic operator controls, allowing data representing touch sensations to be saved or played back.

Robotics

Haptic feedback is essential to perform complex tasks via telepresence. The Shadow Hand, an advanced robotic hand, has a total of 129 touch sensors embedded in every joint and finger pad that relay information to the operator. This allows tasks such as typing to be performed from a distance. An early prototype can be seen in NASA's collection of humanoid robots, or robonauts.

Medicine and dentistry

Haptic interfaces for medical simulation are being developed for training in minimally invasive procedures such as laparoscopy and interventional radiology and for training dental students. A

Virtual Haptic Back (VHB) was successfully integrated in the curriculum at the Ohio University College of Osteopathic Medicine. Haptic technology has enabled the development of telepresence surgery, allowing expert surgeons to operate on patients from a distance. As the surgeon makes an incision, they feel tactile and resistance feedback as if working directly on the patient.

Haptic technology can also provide sensory feedback to ameliorate age-related impairments in balance control and prevent falls in the elderly and balance-impaired.

Neurorehabilitation

For individuals with upper limb motor dysfunction, robotic devices utilizing haptic feedback could be used for neurorehabilitation. Robotic devices, such as end-effectors, and both grounded and ungrounded exoskeletons have been designed to assist in restoring control over several muscle groups. Haptic feedback applied by these robotic devices helps in the recovery of sensory function due to its more immersive nature.

Art

Haptic technologies have been explored in virtual arts, such as sound synthesis or graphic design and animation. Haptic technology was used to enhance existing art pieces in the Tate Sensorium exhibit in 2015. In music creation, Swedish synthesizer manufacturer Teenage Engineering introduced a haptic subwoofer module for their OP-Z synthesizer allowing musicians to feel the bass frequencies directly on their instrument.

Aviation

Force-feedback can be used to increase adherence to a safe flight envelope and thus reduce the risk of pilots entering dangerous states of flights outside the operational borders while maintaining the pilots' final authority and increasing their situation awareness.

Space

The use of haptic technologies may be useful in space exploration including visits to the planet Mars, according to news reports.

Automotive

With the introduction of large touchscreen control panels in vehicle dashboards, haptic feedback technology is used to provide confirmation of touch commands without needing the driver to take their eyes off the road. Additional contact surfaces, for example the steering wheel or seat, can also provide haptic information to the driver, for example, a warning vibration pattern when close to other vehicles.

V. R. LEEPIKA

II B.Sc. (Information Technology)

RIDDLES

1. I can write without a pen, without the number 10, what am I?
2. I have a tail and two flat ears. I move with no feet.
3. A box to anywhere. Just watch for my glare.
4. I move slower than molasses, if you use me, you probably wear glasses.
5. 25 years old, but only turned 10.

Answer

1. Keyboard
2. Mouse
3. Monitor
4. Internet Explorer
5. Windows

D.UDHYAKUMAR

II B.Sc. (Computer Technology)

FREQUENTLY ASKED QUESTIONS

1. Where does the symbol @ come from?
   a) Arabic
   b) Greek
   c) Latin

2. From which company Steve Jobs took the idea for the graphical user interface with a mouse?
   a) Xerox
   b) Microsoft
   c) IBM

3. Which large IT company doesn't have its headquarters in the silicon valley?
   a) IBM
   b) AMD
   c) Google

4. What was the first electronic computer created and what was its time?
   a) 1945-Eniac
   b) 1943- Colossus
   c) 1939-Atanasoff-Berry ABC

5. What was the first computer virus in the DOS system?
   a) Strom worm virus
   b) Melissa virus
   c) Brain virus

6. Who is the forerunner of virtual reality?
   a) Wang Ganchang
   b) Palmer Luckey
   c) Myron Krueger

7. Who is the first computer programmer?
   a) Ada Lovelace
   b) Charles Babbage
   c) Herman Hollerith

8. When was the first e-mail message sent?
   a) 2001
   b) 1971
   c) 1981

9. Who among the following had developed the first commercially available portable computer?
   a) Ada Lovelace
   b) Adam Osborne
   c) Adi Shamir

10. Who among the following is popular as 'Mother of Internet?'
    a) Radia Perlman

b) Grace Hopper

c) Anita Borg

Answer

1. Latin
2. Xerox
3. IBM
4. 1939-Atanasoff-Berry ABC
5. Brain virus
6. Myron Krueger
7. Ada Lovelace
8. 1971
9. Adam Osborne
10. Radia Perlman

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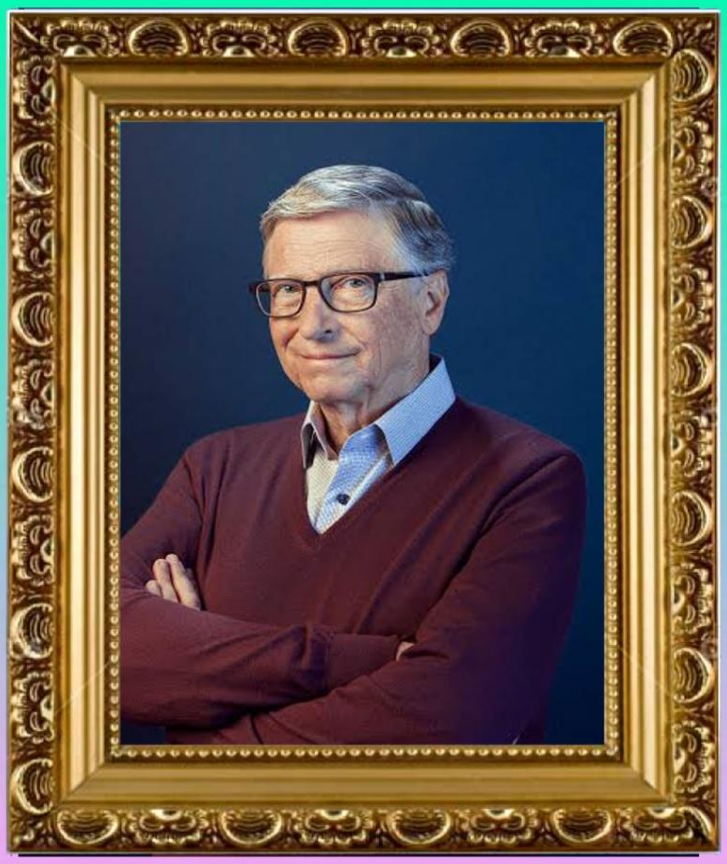

We are Changing the World with Technology

- Bill Gates