Artificial intelligence applications in robotics pdf

AI in Robotics: Reference Imageobots were the first known automated type machines people got to know. There was a time when robots were developed to perform specific tasks, yes such machines were developed previously without any artificial intelligence (AI) to perform only repetitive tasks. But now the scenarios are different, AI in integrating into robots to develop the advanced level of robotics that can perform multiple tasks, and also learn new things with a better idea of the environment. AI in robotics helps robots perform the crucial tasks with an anthropomorphic vision to detect or recognize the different objects. Robots are now being developed through machine learning training. A huge amount of datasets are used to train the computer vision model, so that robotics can recognize the different objects and perform the actions accordingly with the right results. And, further, day by day, with more quality and precise machine learning processes, robotics performance is getting better. Here's how we discuss machine learning in robotics and types of datasets used to train the AI model developed for robots. How is AI used in Robotics? AI in robotics not only helps to learn the model of performing certain tasks, but also makes machines more intelligent to act in different scenarios. There are various functions integrated into robots such as computer vision, motion control, grabbing the objects, and training data to understand physical and logistical data patterns and act accordingly. And to understand the scenarios or recognize the different objects, labeled training data is used to train the AI model through machine learning algorithms. Here, image annotation plays a key role in creating a huge amount of datasets that help robotics recognize and understand different types of objects or perform the desired action correctly, making AI successful in robotics. Application of Sensors in the Robotics Sensor helps the robots to sense the environment or perceive the visual in the environment. Like five important sensors by humans, combinations of different sensing techniques are used in robotics. From motion sensors to computer vision for object detection, there are several sensors that provide a sensing technology to changing and uncontrolled environments that make AI possible in robotics. Uses of types of sensors in Robotics:Time-of-flight (ToF) Optical sensorsTemperature and humidity sensorsUltrasian sensorsVibration SensorsMillimeter-wave SensorsNowadays a wide range of increasingly sophisticated and precise similar sensors, combined with systems that can fuse all these sensor data together, allows robots to have ever better perception and awareness of the right actions in real life. Application of Machine Learning in RoboticsBasically, machine learning is the process of training an AI model to make it intelligent enough to perform specific tasks or a few different actions. And to feed the ML algorithms- ML algorithms- the set of data is used on a large scale to ensure that AI models such as robotics can perform accurately. As much as training data will be used to train the model, the accuracy would be at the best level. In robotics, it is trained to recognize the objects, with the ability to grab or hold the same objects and the ability to move from one location to another location. Machine learning primarily helps to recognize the wide-ranging objects that are visible in different shapes, sizes, and different scenarios. And the machine learning process keep going if robots detect new objects, it could make the new category to detect such objects if they are visible again in the near future. However, there are different disciplines to teach a robot through machine learning. And deep learning is also used to train such models with high-quality training data for a more accurate machine learning process. APPLICATION OF AI IN ROBOTICSAI in robotics makes such machines more efficient with the self-learning ability to recognize the new objects. But currently, robotics is used in the industrial purpose and in various other areas to perform the various actions with the desired accuracy at higher efficiency, and better than humans. Video: Most Advance AI RobotsFrom handling cardboard boxes in stock, robotics performs incredible actions that make certain tasks easier. Here we will discuss the application of AI robotics in different areas with types of training data used to train such AI models. Robotics in HealthcareRobotics in healthcare now plays a major role in providing an automated solution to medicine and other divisions in the industry. AI companies now use big data and other useful healthcare data to train robots for different purposes. From medical supplies, to decontamination, disinfection and performing remote operations, AI in robotics makes such machines become more intelligently learned from data and perform various important tasks without the help of humans. Robotics in agricultureIn the agricultural sector, automation helps farmers to improve harvesting and increase productivity. And robotics plays a major role in growing and harvesting crops with precise detection of plants, vegetables, fruits and other unwanted flora. In agriculture AI robots can perform fruit or vegetable picking, spraying pesticides, and monitor the health of plants. Robotics in the Automotive automotive industry moved to automation leading to fully automatic assembly lines to assemble vehicles. With the exception of some important tasks, there are many processes performed by robotics to develop cars reducing the cost of manufacturing. Usually, robotics is specially trained to perform certain actions with better accuracy and efficiency. Robotics at WarehousesWarehouse needs manpower to handle the huge amount of inventory held by mainly eCommerce to deliver the products to their customers or move from place to another is trained to handle such inventories with the ability to accurately carry from one place to another place reducing the human workforce in performing such repetitive tasks. Robotics at Supply ChainJust like warehouse management in stock, Robotics on logistics and supply chain play a crucial role in moving the items transported by the logistic companies. The AI model for robotics may be trained by computer vision technology to detect different objects. Such robotics can pick the boxes and be held in the desired location or load and unload the same from the vehicle at faster speed with accuracy. Training Data for RoboticsAs you already know a huge amount of training data is required to develop such robots. And such data contains images of annotated objects that help machine learning algorithms learn and recognize similar objects when they are visible in real life. And to generate a huge amount of such training data, image annotation techniques are used to comment on the various objects to make them recognizable to machines. And anolytics provide the solution for a single data note to AI companies to render high-quality training datasets for machine learning-based model development. Other AI articles Trending on Medium:How AI in Pregnancy Can Help Predict Health RiskHow AI Is Used in Healthcare to Control COVID-19: Use CasesHow Does Google AI Detect Breast Cancer Better Than RadiologistsHow AI Can Be Used in Smart Cities: Applications Role & ChallengeHow AI Based Drone Works: Artificial Intelligence Drone Use CasesHow AI is Changing Fashion: Impact on the Industry with Use Cases , do not forget to clap!! Robotics is a domain in artificial intelligence that deals with the study of creating intelligent and effective robots. What are Robots? Robots are the artificial agents that act in real world environment. Objective robots aim to manipulate the objects by perceiving, picking, moving, modifying the object's physical properties, destroying it or having an effect that thereby frees labor from doing repetitive functions without getting bored, distracted or exhausted. What is Robotics? Robotics is a branch of AI, consisting of electrical engineering, mechanical engineering and computer science for the design, construction and application of robots. Aspects of the Robotics Robots have mechanical design, shape, or shape that is designed to perform a particular task. They have electrical components that drive and control the machinery. They contain a certain level of computer programs that determine what, when, and how a robot does something. Difference in Robot System and Other AI Programs Here is the difference between the two − AI programs Robots They usually operate in computer stimulated worlds. They operate in the real physical world The entrance to an AI program is in symbols and rules. Inputs to robots are analog signals in the form of or pictures De De computers for general purposes to operate on. They need special hardware with sensors and effectors. Robot Locomotion Locomotion is the mechanism that allows a robot to move in its environment. There are different types of movements − Legged Wheeled Combination of Legged and Wheels Locomotion Tracked slip / skid Legged Locomotion This type of movement consumes more power while demonstrating walking, jumping, trotting, hop, climbing up or down, etc. It requires more number of engines to achieve a movement. It is suitable for rough as well as smooth terrain where irregular or too smooth surface allows it to consume more force for a wheel-driven movement. It is not difficult to implement because of stability issues. It comes with different one, two, four and six legs. If a robot has multiple legs then bone coordination is necessary for movement. The total number of possible gaits (a periodic sequence of elevator and release events for each of the total legs) a robot can travel depends on the number of its legs. If a robot has k legs, then the number of possible events N = (2k-1)!. In the case of two-legged robot (k=2), the number of possible events is N = (2k-1)! = (2*2-1)! = 3! = 6. Therefore, there are six possible different events − Lift left leg Dropping left leg Lifting right leg Dropping right leg Lifting both legs together Dropping both legs together At k=6 legs there are 39916800 possible events. Hence the complexity of robots is directly proportional to the number of bones. Wheel movement It requires fewer engines to achieve a movement. It is a bit easy to implement because there are less stability issues at more number of wheels. It's low-power compared to leg movement. Standard wheel − Rotates around the wheel axle and around the Castor wheel connector − Rotates around the wheel axle and the displaced steering joint. Swedish 45o and Swedish 90o wheels − Omni wheels, rotate around the point of contact, around the wheel axle, and around the rollers. Ball or spherical wheel − Omnidirectional wheel, technically difficult to implement. Slip/Skid Locomotion In this type, vehicles use tracks as in a tank. The robot is controlled by moving the tracks at different speeds in the same or opposite direction. It offers stability because of large contact area of the track and ground. Components of a Robot Robots are designed with the following − Power supply − The robots are powered by batteries, solar energy, hydraulic or pneumatic power sources. Actuators − They convert energy into movement. Electric motors (AC/DC) − They are required for rotational movement. Pneumatic Air Muscles − They contract almost 40% when air is sucked into them. Muscle Wires − They contract by 5% when electric current passes through them. Piezo Motors and Ultrasonic Motors − Best for industrial robots. Sensors − They provide knowledge of real-time information about the task environment. Robots are equipped with vision to be to calculate the depth of the environment. A tactile sensor imitates the mechanical properties of touch receptors of human fingertips. Computer vision This is a technology for AI that the robots can see. Computer vision plays an important role in the field of security, security, health, access and entertainment. Computer vision automatically extracts, analyzes, and understands useful information from a single image or a series of images. This process involves the development of algorithms to achieve automatic visual understanding. Hardware of Computer Vision System This involves − Power supply Image acquisition device such as camera A processor A software A display device for monitoring the system Accessories such as camera stands, cables and contacts Data of Computer Vision OCR − In the domain of computers, Optical Character Reader, a software to convert documents to editable text, which comes with a scanner. Face Detection − Many state-of-the-art cameras come with this feature, which allows you to read your face and take the picture of the perfect expression. It is used to allow a user to access the software on the correct match. Object recognition − They are installed in supermarkets, cameras, high-end cars like BMW, GM, and Volvo. Estimate Position − It is to estimate the position of an object with respect to the camera as in the position of tumor in the human body. Application Domains of Computer Vision Agriculture Autonomous Vehicles Biometrics Character Recognition Forensic Medicine, Security and Monitoring Industrial Quality Inspection Facial Recognition Gesture Analysis Geoscience Medical Imaging Technology Pollution Monitoring Process Control Remote Sensing Robotics Transport Applications of Robotics Robotics Have been crucial in the different domains such as − Industries − Robots are used for handling materials, cutting, welding, paint coating, drilling, polishing etc.m. Military − Autonomous missiles can reach inaccessible and hazardous zones during war. A robot named Daksh, developed by the Defense Research and Development Organization (DRDO), is in operation to destroy life-threatening objects safely. Medicine − The robots are able to

perform hundreds of clinical tests simultaneously, rehabilitate permanently disabled people and perform complex operations such as brain tumors. Exploration − The robot mountaineers used for space exploration, underwater drones used for marine exploration are to name a few. Entertainment − Disney engineers have created hundreds of robots for filmmaking. Make.