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Robotis Can Create Numerical Inverse Kinematic Problems Because Continuously Replace Humans

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ABSTRCT:
Robotic process automation is an smart way to manage work across those machines which AI can easily be categorize. Robot Automation is a sequence of steps that gives result in a meaningful action without interference of human being. robotics, design, construction, and use of machines (robots) to perform tasks done traditionally by human beings. Robots are widely used in such industries as automobile manufacture to perform simple repetitive tasks, and in industries where work must be performed in environments hazardous to humans. Medical robotics is an interdisciplinary field that focuses on developing electromechanical devices for clinical applications. The goal of this field is to enable new medical techniques by providing new capabilities to the physician or by providing assistance during surgical procedures. robotics is revolutionizing the future of work in a variety of industries. From manufacturing and logistics to healthcare and education, robots are improving efficiency, productivity, and safety. The application of the inverse kinematics method will herald a new approach in the robot nondestructive testing industry. Meanwhile, complicated matrix operations greatly limit traditional inverse kinematics methods.

Keywords: What is the key concept of robotics? Robotics Basics: Definition, Use, Terms - Infineon Technologies Robotics deals with the design, construction, operation, and use of robots and computer systems for their control, sensory feedback, and information processing. A robot is a unit that implements this interaction with the physical world based on sensors, actuators, and information processing

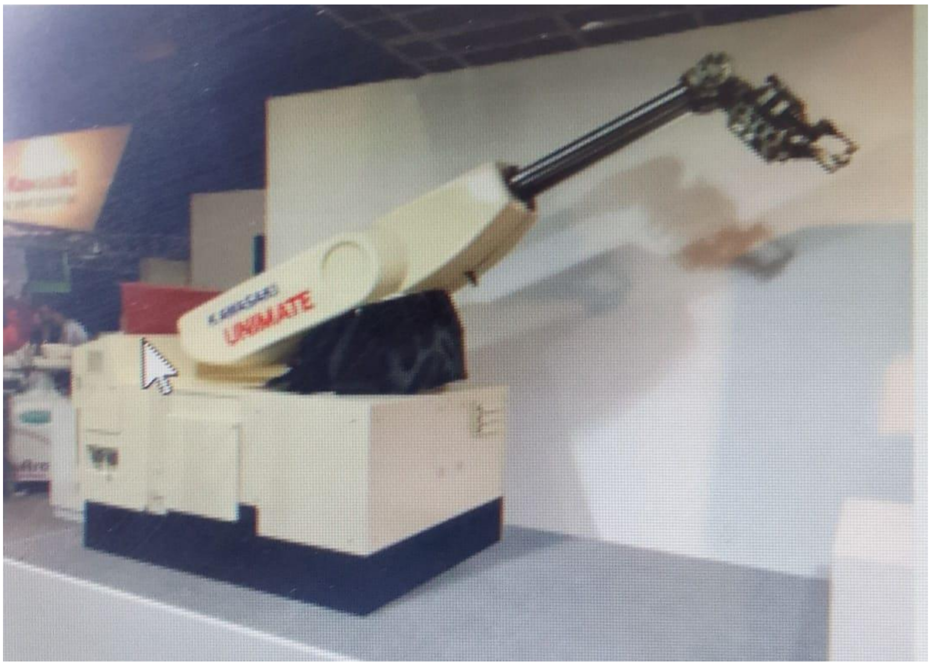
OBJECTIVE:
The objective of the Robotics Field is , To create intelligent machines That can assist human in a variety of ways.

- **Adaptation:** Increase of automation & Intelligent devices,becoming familiar with the use of robots wilhelp children adapt to the world of tomorrow more easily
- **Creativity:** search for solution and to assign new functions to these robots stimulate imagination & creativity
- **Self-esteem:** Achieving success in a new field improves students self-awareness.

INTRODUCTION:

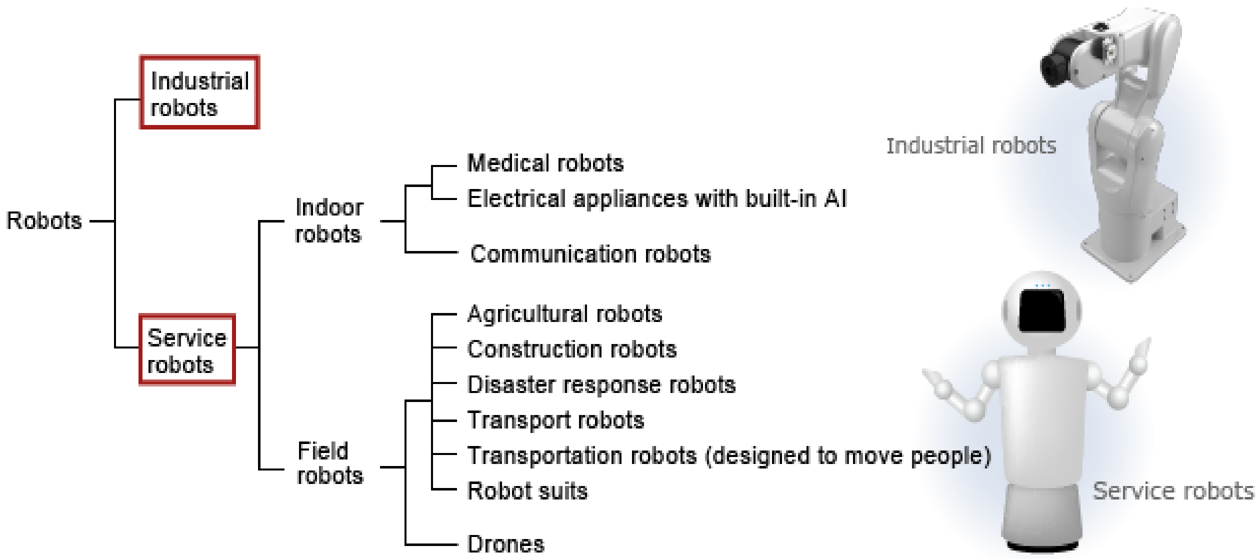
The first industrial Robots were developed by "George C. Devol", American Inventor and the robot named as 'unimate'.

- In our imagination,a robot is a machine that looks and acts like a human being.
- Robots can be guided by sensors,programmed instructions,or combination of both, including manufacturing Healthcare exploration & Reasearch.
- This field overlaps with Electronics , computer science,Artificial intelligence, mechatronics , nanotechnology.

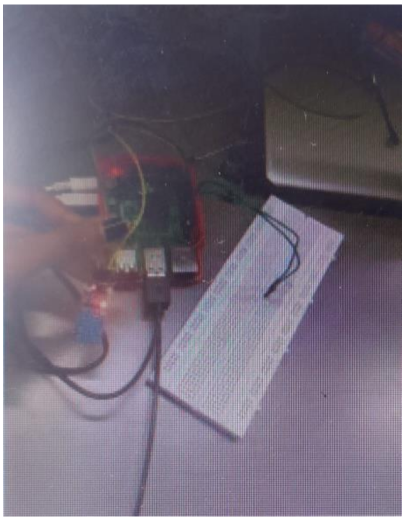
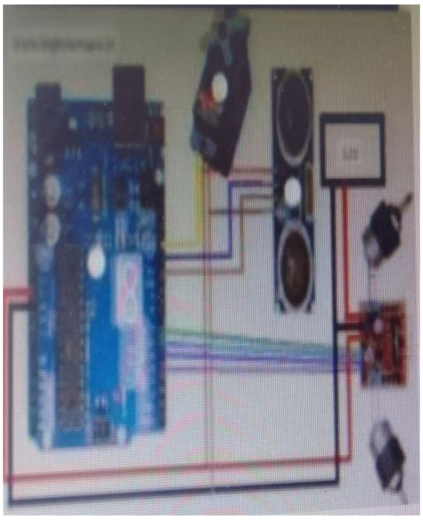


DIFFERENT TYPES OF ROBOT:

We can broadly classify robots into industrial robots and service robots. Robots used to automate industry are called "industrial robots", and robots used to assist us in everyday life are called "service robots".



WORK DESCRIPTION / SKILL DESCRIPTION:

Creating a robot Involves Combining mechanical, electrical and programming elements .

- **Design and planning :** Create a detailed design plan for the mechanical structure,wheel placement andcomponent layout.
- **Material selection :** Selection suitable motors, wheels, an Arduino microcontroller, LED lights, andnecessary electronic components.
- **Mechanial fabrication :** Attach the wheels &motors tothe chassis securely.
- **Electrical component integration :** integrate Sensors for obstacle avoidance Or navigation
- **Programming :** Develop and implement the robots control software to enabled desired functionality
- **Testing and iteration** : Iterate on the design and the fabrication process needed
- **Quality Assurance :** Ensure that the robot meets Safety and performance standard
- **Documentation :** Document the fabrication process , assembly instructions And any troubleshooting guidelines.

METHODOLOGY:

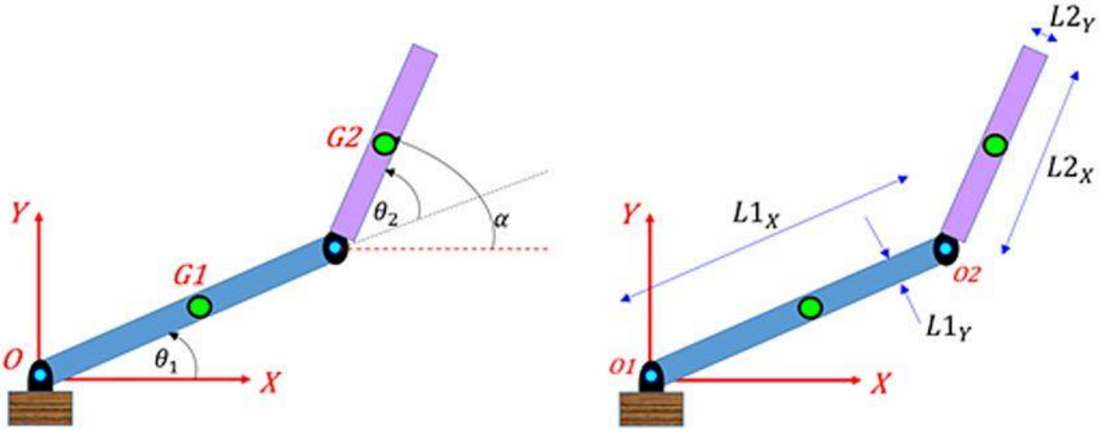
A robotic arm is a manipulator, usually works similar to the human arm.The robotic arm's links are connected to the joints where rotational motion is provided.This connection is considered to form a kinematic chain. The end of the kinematic chain is called an end effector, and it is similar to a human hand.

ANALYTICAL INVERSE KINEMATIC SOLUTIONS:

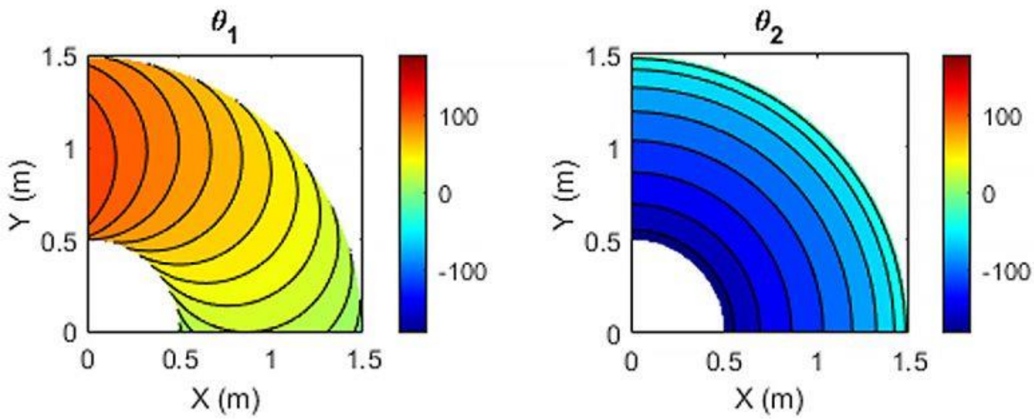
Each joint angle is calculated from the pose of the end-effector based on a mathematical formula. By defining the joint parameters and end-effector poses symbolically, IK can find all possible solutions of the joint angles in an analytic form as a function of the lengths of the linkages, its starting posture, and the rotation constraints.

Analytical IK is mainly used for robots with low degrees of freedom (DoF) due to the nonlinearity of the kinematics equations and the lack of scalability for redundant robot configurations.

Example: Derive and Apply Inverse Kinematics to Two-Link Robot Arm



A two-linkage robot arm with the joint angles θ1 and θ2 and the joint parameters to calculate the inverse kinematics solutions.



Analytic inverse kinematic solutions of the joint angles θ1 and θ2 at the desired end-effector pose.

Robotics System Toolbox™ and Symbolic Math Toolbox™ can be used for analytical IK.

With these products,

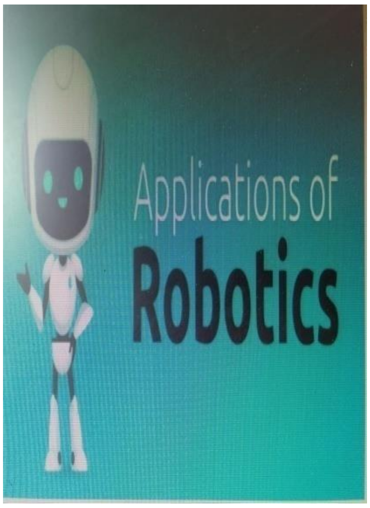
In some, but not all cases, there exist analytical solutions to inverse kinematic problems. One such example is for a 6-DoF robot (for example, 6 revolute joints) moving in 3D space (with 3 position degrees of freedom, and 3 rotational degrees of freedom). If the degrees of freedom of the robot exceeds the degrees of freedom of the end-effector, for example with a 7 DoF robot with 7 revolute joints, then there exist infinitely many solutions to the IK problem, and an analytical solution does not exist. Further extending this example, it is possible to fix one joint and analytically solve for the other joints, but

perhaps a better solution is offered by numerical methods (next section), which can instead optimize a solution given additional preferences (costs in an optimization problem).
An analytic solution to an inverse kinematics problem is a closed-form expression that takes the end-effector pose as input and gives joint positions as output, Analytical inverse kinematics solvers can be significantly faster than numerical solvers and provide more than one solution, but only a finite number of solutions, for a given end-effector pose.
Many different programs (Such as FOSS programs IKFast and Inverse Kinematics Library) are able to solve these problems quickly and efficiently using different algorithms such as the FABRIK solver. One issue with these solvers, is that they are known to not necessarily give locally smooth solutions between two adjacent configurations, which can cause instability if iterative solutions to inverse kinematics are required, such as if the IK is solved inside a high-rate control loop.
we can:

- Generate analytical IK solvers for subsets of 6-DoF robots defined in MATLAB
- Write custom solvers by defining robot's end-effector location and joint parameters symbolically as sine and cosine functions
- Solve inverse kinematics equations for the joint angles and generate motion profiles
- Convert the derived expressions into MATLAB® function blocks and create a Simulink® or Simscape™ model to simulate the robot
- Generate equivalent C code to incorporate with other applications.

APPLICATIONS:

1. Picking,sortingand packing



2. Security
3. Entertainment
4. Manufacturing and Automation
5. Military
6. Customer Service
7. Environmental Monitoring
8. Logistic and warehousing.

CONCLUSION OF ROBOTICS:

In conclusion, robotics is revolutionizing the future of work in a variety of industries. From manufacturing and logistics to healthcare and education, robots are improving efficiency, productivity, and safety. robots are human-made versions of animal life .they are machines that replicate human and animal behavior used in world. The application of the inverse kinematics method will herald a new approach in the robot nondestructive testing industry. Meanwhile, complicated matrix operations greatly limit traditional inverse kinematics methods.

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