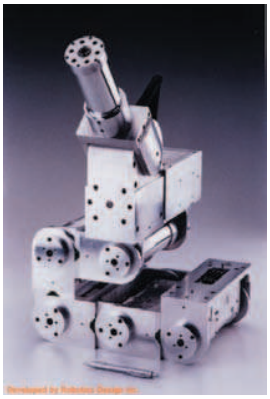
ROBOTICSDESIGN INC

Articulated
Nimble
Adaptable
Trunk



Robotics Design Inc. is the leader in advanced technology of modular robots. Our patented[1] robotic technology **ANAT** allows the industry to be more competitive and effective for applications where flexibility and obstacle avoidance are critical. Our goal is to provide the user with maximum flexibility in operation. This technology allows the robot to modify its shape according to the environment constraints, satisfying the need of a wide range of applications for fixed and mobile robots. The robot may have many arms; each arm is formed by a series of identical modules, all arms work in coordination.

After many years of R&D, Robotics Design is proud to present the **ANAT** family.

Robotics Design sets out to create a revolutionary robot. But we did not start until we had confirmed for ourselves that conventional robots suffer from complexity, singularity, and high cost. We work to provide the most versatile simple robot in the world reducing the cost, increasing the reliability, dexterity and simplifying the programming task. Let us show you how to get the extra edge on your competitors. **ANAT** robots increase productivity and quality, speed-up development, optimize and reduce costs. The **ANAT** robot pictured below has 8 articulations kinematically hyper-redundant. **ANAT** robot is the lightest electric drive, zero backlash, articulated robot arm available for a given reach and payload. For instance, **ANAT** offer a 60-inch reach and 40 lb. continuous-duty payload, and weigh only 100 lbs. Continuous-duty payload represents the maximum load that the system can handle in any arm pose, indefinitely. **ANAT** satisfy the need of a wide range of motion and dexterity through simplicity and efficiency of design.

ANAT robots are currently in use by universities in coordination with Robotics Design. Our R&D department works hand in hand with universities to develop the coming intelligent generation of **ANAT**. The robot offers a "Snake like" manipulative capabilities, with a high degree of precision, in a compact light-weight package. The standard 8 degrees of freedom manipulator configurations are built from a family of modular actuators, covering a wide range of torque capabilities. Different types of configurations can be built from the family of modules. Robots of up to 32 degrees of freedom can be assembled, all operating under real-time coordination control.

1 U.S. Patent 6,323,615 and Patent Pending technology JAPAN, USA, CANADA

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Key features of this technology

DEXTERITY

ANAT robots are no gravity loading design, kinematically hyper-redundant, incorporating one to 32 degrees of freedom for the Yaw added to one Pitch and one Roll for each arm. This results in a structure, which is modular, expandable and reconfigurable. This architecture displays the highest level of dexterity available today with the maximum of simplicity. This type of arm can position and orient an end effector through a combination of a complete cylindrical and spherical workspace, with an infinite range of arm poses. In addition, this architecture allows the arm to fold compactly, a feature exploitable in operations requiring manipulation through risers or small portholes, as well as minimizing the storage requirements when saved. While manipulators with fewer degrees of freedom can be produced using the same standard set of modules, the increase in dexterity of redundant manipulators is extremely beneficial in many applications.

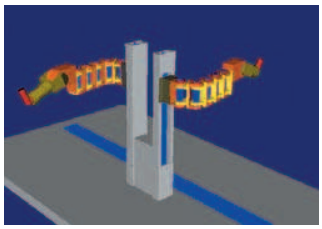
MODULAR ARM CONSTRUCTION

ANAT manipulator mechanisms are modular. In this patented design, each joint module contains a DC motor component set to gear reducer with zero backlash, sealed axis bearings, drive output position transducers, and a controller, all integrated into a lightweight aluminum structure. Each self-contained joint module is joined to its adjacent modules by screws. Two adjacent modules can be mechanically decoupled in seconds facilitating maintenance or retrofit. These modules are grouped together to form a stair-like shape, which handles a substantial load. The internal component holding the actuator of each module can be replaced, maximizing the applications and the functionality. This modular construction allows for manipulator configuration covering a broad range of sizes, payloads, and kinematics configurations for different applications, using all standard modules.

MODULAR SERVO ELECTRONICS CONTROL

The module incorporates an advanced, fully digital distributed servo control system, containing a micro controller. All necessary servo electronics (communication, data acquisition, PWM amplifier, computing, etc.) are co-located in each module. This distributed hardware architecture eliminates the complex arm harness previously required, reduces it to a single power supply and one cable to communicate with an external PC or internal DSP. This on-board electronics system is particularly valuable for mobile vehicle installations, since the size of the control cabinet is dramatically reduced. Furthermore, this on-board electronics system allows the module to be fully independently controlled.

PC CONTROL AND **ANAT** SOFTWARE



This PC-based high-level controller operates on a PC interfaced via fight-speed serial network to the robot. The Pentium system runs the complete real time trajectory planning, inverse kinematics and dynamics loops. The inverse kinematics problem associated to the obstacle avoidance property of the robot as well as the redundancy due to the high number of degrees of freedom is solved. The ANAT software provides also a full new generation of friendly 2D or 3D user interfaces, to simulate and visualize in real-time the robot movement.

Applications

The previously described design becomes evident for the need of innovative compound serial manipulators and robotic arms for manufacturing, or manipulating tools; serpentine in its flexibility, it exceeds human dexterity and allows accessing confined spaces and tortuous paths. Scalability from small to large diameters makes it adaptable to many tasks. Modularity increases the fault tolerance of **ANAT** by providing redundant yaw axes. If one of the modules fails, the next modules would be able to provide sufficient mobility to complete the mission. This innovative technology opens the door to many applications such as: telerobotics, spray finishing, manipulating, cutting, welding, grinding, as well as prospecting. This same technology allows using the robot as a fixed manipulator or a mobile robot.

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