News Release

CyboSoft Introduces CyboNoid Software for Humanoid Robot Control System Design and Implementation

July 22, 2024 – CyboSoft (Rancho Cordova, California), the developer of Model-Free Adaptive (MFA) control technology and products, announced today that it is introducing CyboNoid, a patent-pending control system design, simulation, and implementation software for Humanoid Robots.

CyboSoft CEO Dr. George Cheng said, “A general-purpose humanoid robot has many joints, each of which may have 3 degrees of freedom. The robot needs to perform undefined tasks in an unknown environment. Gen-AI has the potential to develop a robot guidance system using tools such as NVIDIA’s GR00T and Isaac. However, the robot control system remains the most challenging obstacle in developing general-purpose humanoid robots. Since it must be a deterministic system with 100% repeatability, LLM-based generative AI, which is a statistical-based approach, is not suitable. There is an urgent need for tools in robot control system design and implementation."

Humanoid robots face unique motion control challenges due to their complex biometric design and the need to maintain dynamic stability during locomotion and manipulation tasks. There are several layers in humanoid robot guidance and control. At the lowest layer, which is also the most difficult, is a high-speed servo control problem with variations in motion, dynamic behavior, inertia, and friction. Sudden and large load changes can cause instability and failed motions.

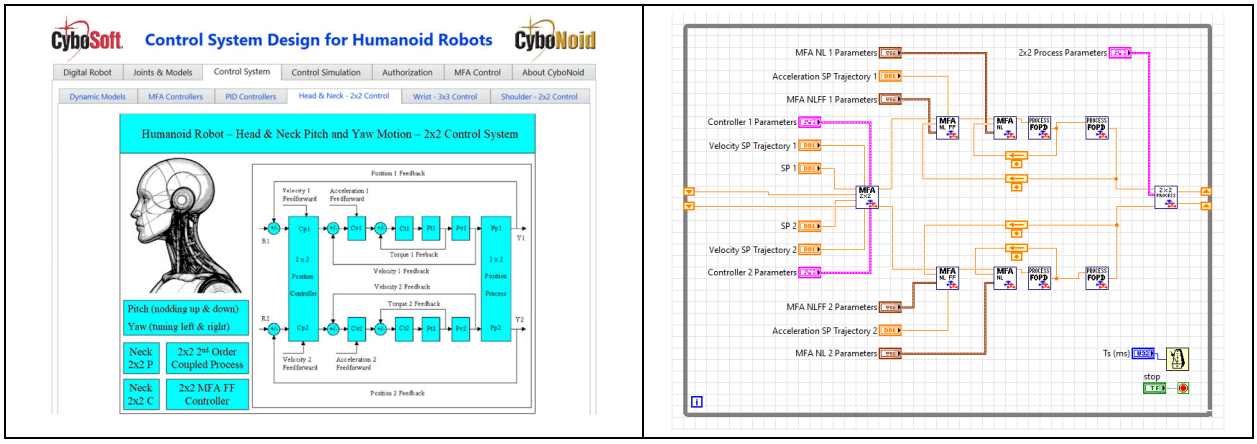
Traditional PID control is not sufficient, and model-based control is too complicated to implement. CyboSoft is a leader in high-speed motion control with its patented Model-Free Adaptive (MFA) control technology. MFA is the only commercially successful smart controller that does not require mathematical models. Due to its intelligent and versatile nature, it is well suited for controlling both special and general-purpose humanoid robots.

CyboNoid includes a set of MFA controller VIs (Virtual Instruments) that can work seamlessly with the LabVIEW Robot Module. The setpoint trajectories of position, velocity, and acceleration of a

robot joint can be generated by the LabVIEW Robot Path Planner. The MFA robot control system can control the joint to follow these setpoint trajectories, enabling smooth motion.

CyboNoid presents a digital humanoid robot with dynamical models. The dynamic behavior of each robot joint is represented by equations in Laplace transfer functions with a set of parameters that can vary to simulate dynamic changes, varying conditions, and other uncertainties. CyboNoid can simulate the behavior of a humanoid robot in complex environments, facilitating the design, testing, and validation of a robot control system before a real humanoid robot is built.

As an example, the picture on the left below shows a Neck joint with Pitch and Yaw motions. Since these two motions are coupled, a 2-input-2-output (2x2) dynamical model (Neck 2x2 P) can be selected by the user. A 2x2 MFA Feedforward controller (2x2 MFA FF) can be chosen to control this 2x2 process. The LabVIEW program that implements this 2x2 control system is shown on the right.



Once the robot control system design and testing are complete, the same PID or MFA controllers can be loaded into a LabVIEW cRIO or sbRIO high-speed control device to control a real robot. By working with NVIDIA and LabVIEW software tools, CyboNoid enables robot control system design, testing, validation, and implementation in one step, significantly reducing time to market for robotics companies. CyboNoid allows for easy control system upgrades to support ongoing efforts in developing new robots with new designs, types, actuators, sensors, and materials. CyboSoft also offers embedded MFA control software in various platforms and control system design services.

About CyboSoft

CyboSoft is the leader in control technology serving the worldwide process control, building control, and equipment control markets. CyboSoft's patented Model-Free Adaptive (MFA) control technology for automatically controlling physical processes is a major breakthrough. No other comparable technology possesses all the attributes of MFA. For more information, please contact: CyboSoft, e-mail: Josh Bear, JBear@cybosoft.com. Website: www.cybosoft.com.