## ROBOSOFT SA & ACTIV MEDIA ROBOTICS PRESENT

## WORLD'S MOST POPULAR INTELLIGENT WHEELED ROBOT

# *P3-DX*

PIONEER 3-DX8 is an agile, versatile intelligent mobile robotic platform updated to carry loads more robustly and to traverse sills more surely with high-performance current management to provide power when it's needed. Built on the same core client-server model as all MobileRobots robots, the P3-DX8 offers an embedded computer option, opening the way for onboard vision processing, Ethernet-based communications, laser, DGPS, and other autonomous functions. The P3-DX stores up to 252 watt-hours of hot-swappable batteries. It arrives with a ring of 8 forward sonar and with an optional 8 rear sonar ring. 3-DX's powerful motors and 19cm wheels can reach speeds of 1.6 meters per second and carry a payload of up to 23 kg. In order to maintain accurate dead reckoning data at these speeds, the Pioneer uses 500 tick encoders. Its sensing moves far

beyond the ordinary with laser-based navigation options, bumpers, gripper, vision, stereo rangefinders, compass and a rapidly growing suite of other options.

The bare P3-DX base with included ARIA software has the ability to:

- WANDER randomly
- DRIVE controlled by keys or joystick
- PLAN PATHS with gradient navigation
- DISPLAY a map of its sonar and/or laser readings
- LOCALIZE using sonar (with optional laser upgrade)
- COMMUNICATE SENSOR & CONTROL information relating sonar, motor encoder, motor controls, user I/O, and battery charge data
- RUN C/C++ PROGRAMS
- TEST ACTIVITIES QUICKLY
- SIMULATE BEHAVIORS OFFLINE with the simulator that accompanies each development environment

With Laser Mapping & Navigation System and MobileEyes, your robot can map buildings and constantly update its position within a few cm while traveling within mapped areas. With the appropriate accessories, you can view the robot's view remotely, speak, play and hear audio and send the robot on patrol.

The Pioneer 3-DX is an all-purpose base, used for research and applications involving:

- mapping
- teleoperation
- localization
- monitoring
- reconnaissance
- vision
- manipulation
- cooperation
- and other behaviors

P3 -DX's run best on hard surfaces. They can traverse low sills and household power cords and climb most wheelchair ramps.

## P3-DX COMPONENTS

Pioneer 3-DX's provide a ready-to-use general purpose base with:

- body with hinged battery access door
- 1 battery
- 2 wheels and 1 caster
- motors with encoders
- front sonar ring
- microcontroller
- sonar board
- motor power board
- ARCOS microcontroller server software
- user I/O bus integrated into hardware and ARIA software
- ARIA Robotics API for developers
- operations manual

In addition, the robot requires:

- communication with a PC client, via one of the following:
  - wireless radio modem
  - robot-to-laptop connector
  - robot-to-desktop tether
  - or connection to an embedded computer
- a recharger
  - standard for overnight charging
  - high-capacity to cut charge time 80% or to use as a computer power supply *(requires 3 batteries)*

## P3-DX OPTIONS

Pioneer 3-DX's wide suite of integrated options makes it the most versatile platform available. Other robots may provide accessories that are integrated in hardware; they can be physically run by the robot. However, they often do not provide the software to gather sensing or other data from the accessory and to send control commands to any motors or other effectors. Writing these integration programs takes valuable research time. By handling these integration worries, MobileRobots saves you headaches. In addition, custom accessories plugged into P3-DXe's user I/O bus are already integrated into ARIA through ARCOS packets

P3-DX's accessories range from:


*(shown leaving Dock / Charge Station )*

- Wireless Ethernet
- Laser Mapping & Navigation
- *New!* Pioneer arm
- Active Pan-tilt-Zoom color camera
- Stereo rangefinding camera
- 360 Omni-cam with de-warping software
- Color-tracking
- Compasses & tilt-position sensor
- Bumpers
- Gripper
- ***New!*** Docking Station
- *and more!*

## TECHNICAL SPECIFICATIONS

The rugged P3-DX is 44cm x 38cm x 22cm aluminum body with 16.5cm dia drive wheels. The two motors use 38.3:1 gear ratios and contain 500-tick encoders. This differential drive platform is highly holonomic and can rotate in place moving both wheels, or it can swing around a stationery wheel in a circle of 32cm radius. A rear caster balances the robot.

P3-DX can climb a 25% grade and sills of 2.5cm. On flat floor, the P3-DX can move at speeds of 1.6 mps. At slower speeds it can carry payloads up to 23 kg. Payloads include additional batteries and all accessories and must be balanced appropriately for effective operation of the robot.

In addition to motor encoders, the P3DX base includes eight ultrasonic transducer (range-finding sonar) sensors arranged to provide 180-degree forward coverage. They read ranges from 15cm to approximately 7m.

P3-DX's hinged battery door makes hot-swapping batteries simple, though a bare P3-DX base can run 18-24 hours on three fully charged batteries. With a high-capacity charger, re-charging time is only 2.4 hours.

The P3-DX's easily removable nose allows quick access to any optional embedded computer for addition of up to 3 PC104+ cards. All P3-DX's include a 32-bit RISC-based controller. On the microcontroller, we have 8 digin and 8 digout plus 1 dedicated A/D port; 4 digin can be reconfigured as A/D in; 4 digout can be reconfigured to PWM outputs. This user I/O is integrated into the packet structure, accessible through ARIA.

A small proprietary ARCOS transfers sonar readings, motor encoder information and other I/O via packets to the PC client and returns control commands. Users can run the robot from the client or design their own programs under Debian Linux or under WIN2000 using their favorite C/C++ compiler. Our robotics development environments supply library functions to handle navigation, path planning and many other robotic tasks.