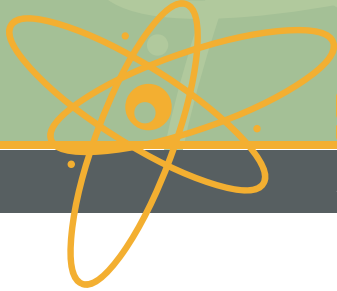
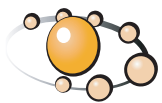


# PRODUCT GUIDE



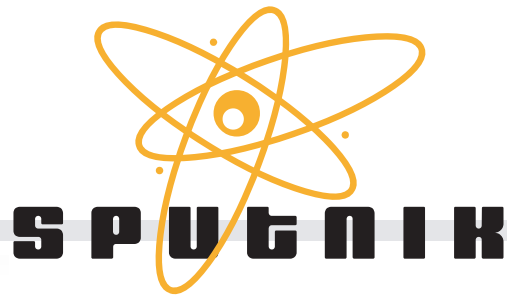
## SPURDOK

A Complete Robot for Developers and Hobbyists



**Dr Robot**<sup>®</sup>  
[www.drrobot.com](http://www.drrobot.com)

Dr Robot Inc.  
25 Valleywood Drive, Unit #20  
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# SPUTNIK



## INTRODUCTION

Sputnik is the next generation in Dr Robot's line of research and development robots. Responding to requests for a robot that had the speed and payload of X80 with the development versatility of the DRK8080, we built Sputnik, a robot with the complexity expected of a research tool, but the simplicity of use required by hobbyists and enthusiasts.

In addition to all the features offered in the model X80 robot, included with SPK-1 are software modules enabling remote access and control of the robot via Internet protocol. For home users, this means the ability to navigate and monitor the robot's surroundings remotely. Other software elements permit remote listening through the robot's microphone as well as two-way verbal communication through the robot to a remote user.

## SPECIFICATIONS



Sputnik's included software modules also offer functions that support the remote monitoring applications. These include capturing and storing still images as well as video on a local or remote PC. Microsoft's freely available text-to-speech (TTS) software is also compatible with Sputnik and is easily installed to permit typing dialogue which the robot will speak.

## Mechanics

Like its cousin the X80, Sputnik is a balance of speed and strength with portability and precision. The wheel-based platform's two 12V DC motors each supply 300 oz.-inches of torque to the robot's 18 cm (7 in.) wheels, yielding a top speed in excess of 1 m/s (3.3 ft/s). A high-resolution (1200 count per wheel cycle) quadrature encoders mounted on each wheel provide high-precision measurement and control of wheel movement. Weighing only 5.5 kg (12 lb.), the system is light, but it can carry an additional payload of 10 kg (22 lb.). Sputnik has a total of 7 degrees of freedom: 5 for the animatronic head and 2 for the mobile platform. The eyes can pan and tilt, and the eyecovers and mouth can open and close independently. Likewise, the mechanics of the neck enable it to pan and tilt separately from the rest of the head.

## Electronic System Highlights:

Full color video and two-way audio capability. (CMOS color image module and audio module are fully integrated.)

Fully integrated WiFi (802.11b) system with dual serial communication channels (max of 912.6 Kbps per channel), supporting both UDP and TCP/IP protocol.

Battery: 2 9-cell 10.8V 4100 mAh Ni-MH battery packs with over 3 hours for nominal operation and stand-by time over 8 hours.

Collision detection sensors include 3 sonar range sensors and 7 IR range sensors

2 Pyroelectric Human Motion Sensors

Additional sensors such as supplementary sonar sensors, temperature sensors, acceleration/tilting sensor, or customized sensors can be added.

## Component Modules:

WHD8010	Animated Head Mechanical Construction Set	1
SPK1-ME	Sputnik SPK-1 Mechanical Construction Set	1
PMS5005	Robot Sensing and Motion Controller	1
PMB5010	Multimedia Controller	1
MDM5253	DC Motor Driver Module with Position and Current Feedback	1
MCI3908	Color image module with camera	1
DUR5200	Ultrasonic range sensor module	3
DHM5150	Pyroelectric human motion sensor module	2
GP2Y0A21YK	Sharp IR Distance measuring sensor	7
MCR3210	RS232 Interface module	1
WFS802b	WiFi 802.11 Wireless module	1
BAS8100	80hm 1W Speaker	1
MAC5310	Audio Codec and Audio Power Amplifier Module	1
SAM5247	Uni-directional Electret microphone	1
CCR2150	RS232 crossover serial cable	1
MGL5128	128x64 graphic LCD module	1
N/A	Servo	5
MOT120R	12V DC Motor	2
N/A	10.8V Ni-MH 4100mAh battery pack	2
N/A	SPUTNIK battery charger	1

## WiROBOT SOFTWARE DEVELOPMENT TOOLKIT



Bundled with Sputnik is the WiRobot Software Development Kit (SDK), a part of the WiRobot development system and powerful toolkit for researchers and developers. As a PC-based software framework for robotic system development, SDK contains the facilities for memory management, system communication and user interface, as well as the utilities for audio/video input and output, sensor data acquisition and motion control. SDK provides full control over Sputnik's systems and owing to its broad adaptability, you can focus on your R&D project work, instead of first building a hardware and software platform for it. For more detailed information on the SDK architecture, organization and programming, please visit the Dr Robot website at [www.drrobot.com](http://www.drrobot.com).

## Sensors

Sputnik offers full WiFi (802.11b) wireless, multimedia, sensing and motion capabilities and comes with a wide range of sensor, camera, and audio modules, sufficient to serve in any variety of applications. The robot offers broad expandability as well for projects that may require additional sensors, even specialized modules. Powered by separate RC servo motors, the integrated camera head can pan and tilt independently.

## Architecture

The technology underlying Dr Robot's WiFi robots evolved from its Distributed Computation Robotic Architecture, originally developed for Dr Robot's Humanoid (HR) Robot. Using this approach, high-level control of the robot is maintained by a remote or local PC/server communicating by a secure wireless link. Low-level functionality is managed primarily by two onboard digital signal processor (DSP) while computationally intensive operations are performed offboard. The result is a robot that's lighter, draws less power, runs longer and is dramatically less expensive than a fully bundled or self-contained system. Moreover, since primary processing resides in a server, any hardware upgrades to the central unit are shared by all the robots it controls.

With its integrated high bandwidth (11Mbps) WiFi 802.11 wireless module, the SPK-1 series robots can upload all sensor data (including encoder sensor readings) to a PC or server at rates in excess of 10Hz. Similarly, streaming audio (8KHz 16bits) and video (up to 4 fps) either for direct monitoring or for processing by high-level AI schemes is a snap. Commands and instructions sent to Sputnik via the same wireless link also pass at rates exceeding 10Hz, providing real-time control and access.

Sputnik includes all WiRobot development software components (for MS Windows 2000 and later), enabling easy access to all data and information in a standard Microsoft Windows programming environment (e.g., MS VB and VC++). Under the approach of using a separate PC for high-level control, there are no longer onboard restrictions on a mobile system's processing power, memory and storage.

With Sputnik, researchers are free to develop a range of specialized intelligent robotic assistants or service units, or simply use it as a platform for projects built around applications such as human-machine interaction, mobile system navigation, robot behavior, image processing, object recognition, voice recognition, teleoperation, remote sensing, map building and localization etc.

Each robot is fully integrated and each robot is fully assembled and tested prior to shipping so that it arrives ready for use.

### **Mechanical and Control Highlights:**

Two 12V motors with over 300oz.-inch torque each

7 inch driving wheel

Max speed of 1 m/sec

Dimensions:

40.5 cm (16 inch) diameter

47 cm (18.5 inch) height

Weight: 5.5 kg (12 lb)

Mounting deck for some additional device hardware

Additional carrying payload: 10 kg

Pre-programmed fine speed and position control achieved by an integrated PMS5005 module employing two 1200 count per wheel-cycle quadrature encoders.

## GETTING STARTED



In order to set-up and operate the Sputnik SPK-1 robot, a PC operating on Windows 2000 or Windows XP with an Internet connection are required. For remote monitoring use (with the included Remote Access and Remote Monitoring software modules), you will need a separate PC similarly operating on a Windows 2K/XP platform with Internet access.

Included with the purchase of a Sputnik robot are a charging unit and Logitech joystick controller (both shown below) and a preconfigured D-Link wireless router.

joystick controller



robot charging unit



## OPERATING MODES



Sputnik has three primary operating modes: **Manual**, **Auto Patrol** and **Idle**.

In **Manual mode**, Sputnik will navigate according to commands from a user. Control can originate from a local PC or a remote PC, and the robot software permits instruction by joystick (included) or by mouse. Because Sputnik's head and chassis servos are independent, a user can separately manipulate the robot's animatronic head system while navigating its environment. Also, Sputnik's collision avoidance system assists a user by preventing unintended impact with nearby obstacles. Manual mode is the most useful for remotely interacting/communicating with people in the robot's presence.

In **Auto Patrol mode**, the robot will wander its environment, using its battery of sensors to avoid collisions with nearby obstacles. Patrol mode permits monitoring without active guidance from a remote user.

**Idle mode** allows the robot to remain powered-on in a standby setting while minimizing power consumption. In this mode, Sputnik will maintain charge for up to 10 hours. While in Idle mode, the robot can be awakened at any time by selecting either of the alternate mode settings.

Sputnik's user software enables easy switching across modes remotely.

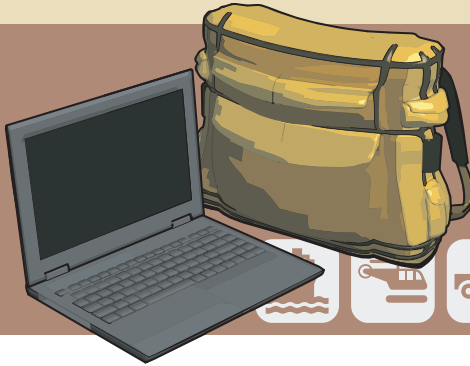
## POWER



Sputnik's power consumption depends on its level of activity. In Idle mode, it conserves power while remaining on-call for local or remote commands for up to 8 to 10 hours. In active mode (Auto Patrol or Manual mode), operating continuously, Sputnik may function for up to 3 hours, depending on the actual activity (e.g., patrolling, communicating, observing). Fully charging Sputnik's batteries with the included charging unit requires 1.5 to 2 hours.



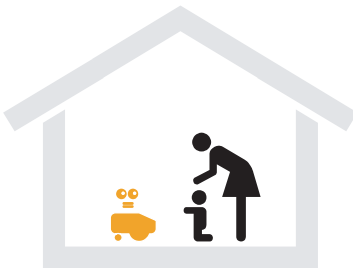
## BUNDLED SOFTWARE APPLICATIONS: REMOTE ACCESS AND REMOTE MONITORING MODULES



For hobbyists looking for immediate functionality, Sputnik comes with a suite of remote access and monitoring software modules. With these installed, Sputnik becomes your proxy while you're away from home. Tap an IP connection anywhere and Sputnik's eyes, ears and voice are at your service...



Remote monitoring enables you to stop by your home when you're actually away from home. From any location with an Internet connection, you can see and hear exactly what Sputnik does, and Sputnik will also patrol your home under your remote guidance or its own wandering, providing a first-person sense of the robot's surroundings. Moreover, its onboard pyroelectric sensors will report if the robot detects the presence of a person in its vicinity.



Likewise, Sputnik supports two-way communication between individuals in the presence of the robot and anyone connected to Sputnik remotely by IP. As a form of telepresence, Sputnik permits verbal communication with individuals without requiring them to use a telephone or sit at a computer to do so. When actively linked to a remote user, Sputnik's RA/RM modules offer convenience for those who may not have immediate access to an alternate means of communication.



Like any Internet traffic, information exchanged between a remote user and Sputnik can span the globe. Recognizing the importance of secure and private communication, all data transmissions both wired and unwired are encrypted.

## ANCILLARY FUNCTIONS



Sputnik's included software modules also offer functions that support the remote monitoring applications. These include capturing and storing still images as well as video on a local or remote PC. Microsoft's freely available text-to-speech (TTS) software is also compatible with Sputnik and is easily installed to permit typing dialogue which the robot will speak.



video capture




image capture




TTS

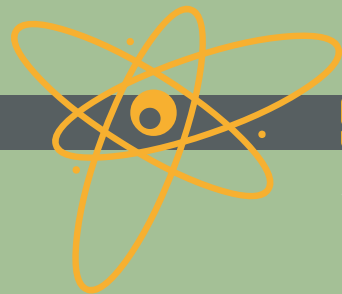
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To learn more about Sputnik or any other of our robots, or to purchase a robot, contact Dr Robot at the address above or visit us at our [drrobot.com](http://drrobot.com).

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