



Wireless Networked Autonomous Mobile Robot with  
HAWK Animated Head System

*Sputnik<sup>3</sup>*

Quick Start Guide



## WARNINGS

Do **NOT** power on the robot before reading and fully understanding the operation procedures explained in this manual.

Never position your finger(s) in between the head's moving parts even when the power is off.

The robot head must be positioned to the rest position before turning on the robot.

Neither the robot, nor the program is bug free, accident could happen; you have to make sure that the robot always maintains a safe distance from people during operation.

The robot should be turn off (i.e. the power switch should be on OFF position) when not in used. Battery should be fully charged before storage. Battery pack should be recharged every two weeks while in storage.

Failure to follow these warnings could cause serious injury or death and/or damage to the robot.

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# Introduction

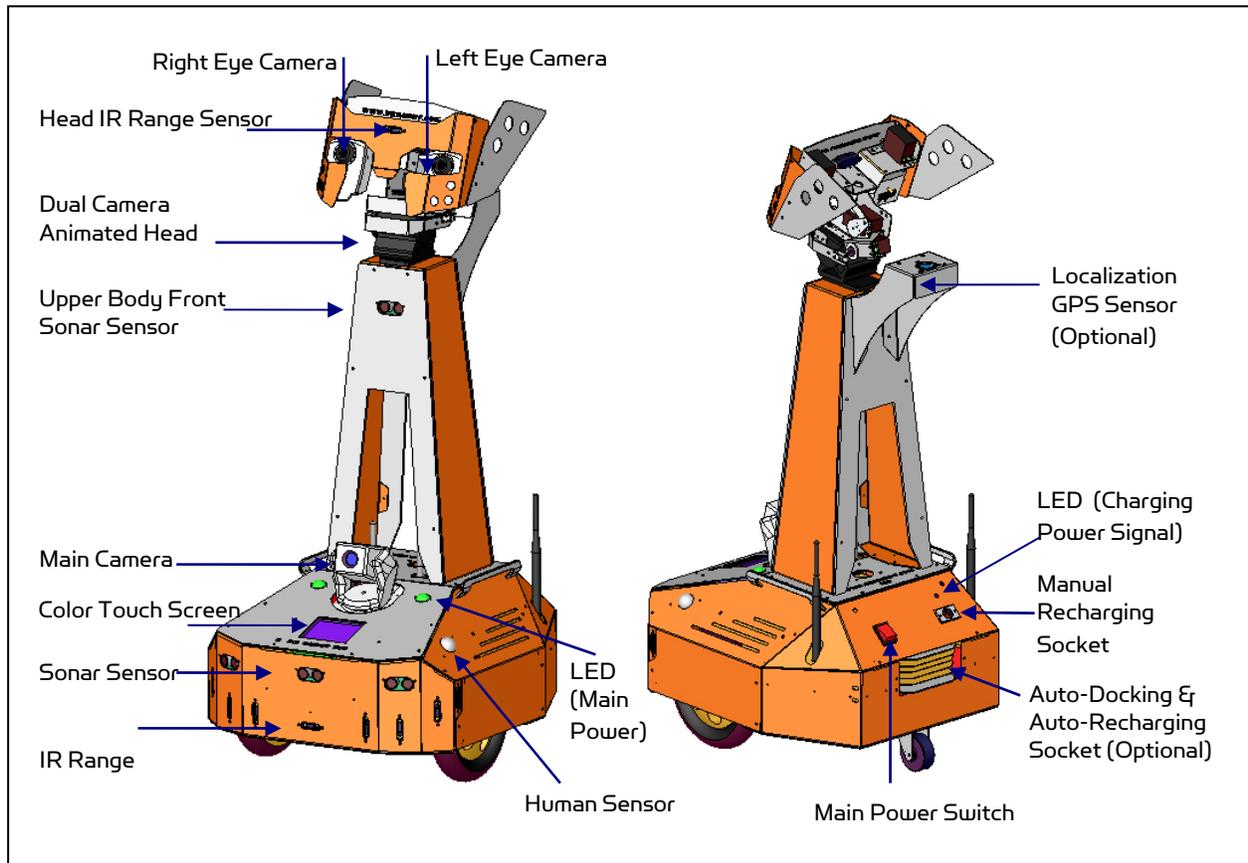
Sputnik<sup>3</sup> is designed and built on i90 robot base, featuring dual-camera animated head (HAWK head).

## Key Features

- *6DOF animated head with dual 640x480 color cameras*
- *3.5 inch color display, playing video (.wmv), audio and displaying images*
- *Overall height of 90cm; Dimension 43cm (L) x 38cm(W) x 90cm (H)*
- *Fully wireless networked 802.11g*
- *OS independent application development tools*
- *Max speed of 75cm/sec*
- *Navigation sensors including 4 sonar and 10 IR range sensors*
- *Comprehensive circuit protection*
- *High resolution pan-tilt-zoom camera*
- *Max payload 10 kg (optional 40 kg) with robot weight of 8 kg*
- *Tele-operation and remote monitoring*
- *Extended operating time. 2 hours nominal operation time for each recharging.*
- *Upgrade options:*
  - *Navigation and localization providing collision-free point-to-point autonomous navigation*
  - *Vision-landmark base indoor localization (indoor GPS, position/orientation) sensor and the landmarks together provide precise position and direction information covering every inch of the floor.*
  - *Auto-docking and recharging station*
  - *Laser scanner; Power and battery systems for 4, 8 hours operation time are available.*

## Sensors and External Components

The figure below illustrates the key functional components you will identify on the outside of Sputnik<sup>3</sup> robot.

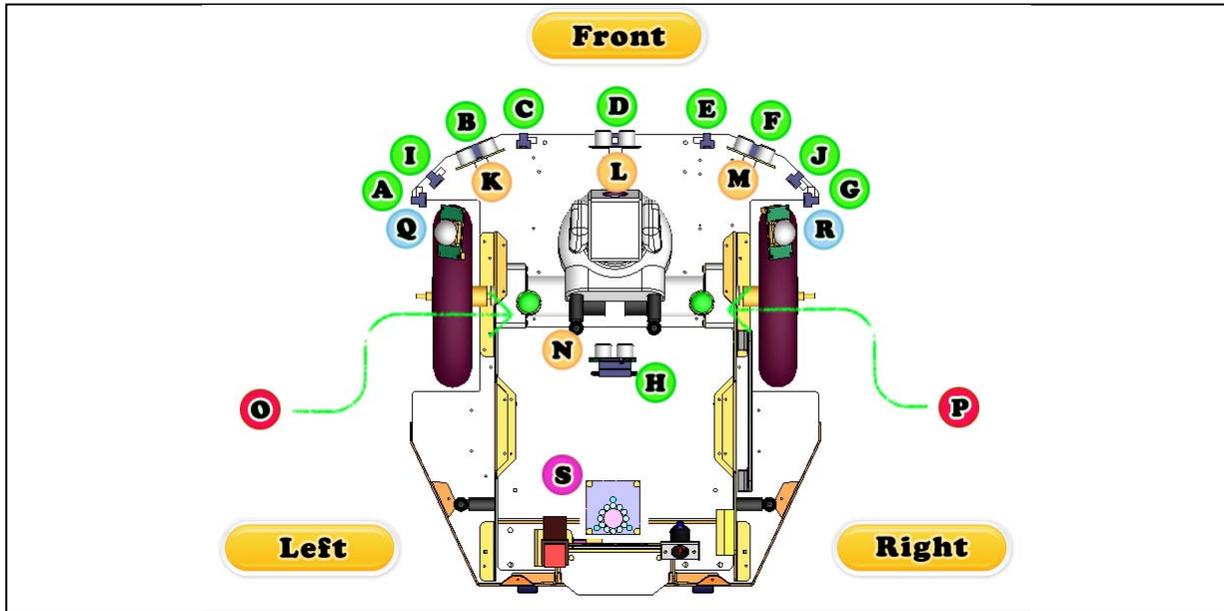


**Sputnik<sup>3</sup> Overview**

When the main power switch is on, the main power LED will be lit. When the robot detects input power from the recharging socket, the charging power signal LED will be lit.

The robot comes with 4 sonar and 10 IR range sensors. These range sensors are for environment detection and collision avoidance.

The optional localization GPS sensor on Sputnik<sup>3</sup> provides precise robot position and direction information for autonomous navigation docking task through working with the ceiling mounted landmarks.



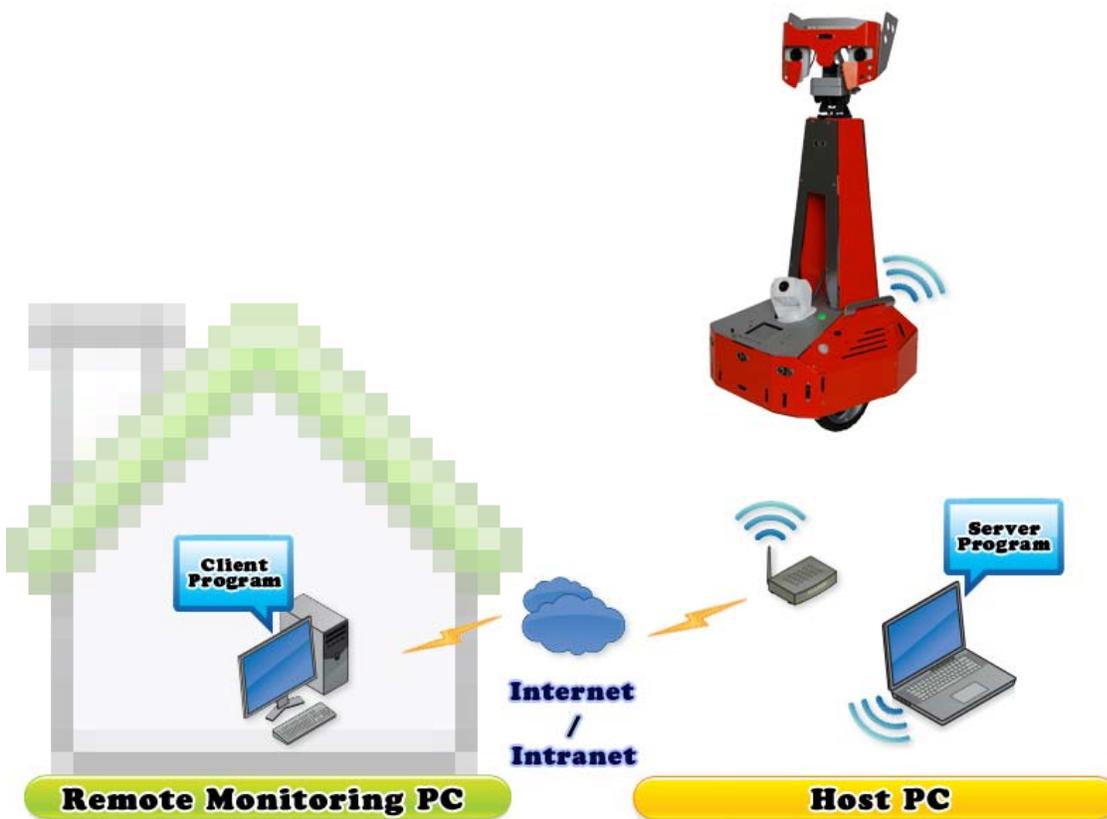
Sputnik<sup>3</sup> Sensor Module Location (Top View)

Sensor Module	Location
Ultrasonic #1	K - Left front
Ultrasonic #2	L - Middle front
Ultrasonic #3	M - Right front
Ultrasonic #4	N - Upper body front
Human Sensor #1	Q - Left front
Human Sensor #2	R - Right front
Infrared Range Sensor #1	A - Front left
Infrared Range Sensor #2	B - Front left
Infrared Range Sensor #3	C - Front middle
Infrared Range Sensor #4	D - Front middle
Infrared Range Sensor #5	E - Front middle
Infrared Range Sensor #6	F - Front right
Infrared Range Sensor #7	G - Front right
Infrared Range Sensor #8	H - Head front
Infrared Range Sensor #9	I - Front left
Infrared Range Sensor #10	J - Front right
DC Motor #1 with quadrature encoder	O - Left , use channel 1
DC Motor #2 with quadrature encoder	P - Right, use channel 2
Localization Sensor (optional)	S - Localization Sensor

## Operation Scenario

Diagram below shows the typical operation scenario. The Sputnik<sup>3</sup> is a wireless networked robot. It connects to the wireless AP or router via IEEE 802.11b/g network. The host PC (or called server PC) running the Sputnik-III Control program could connect to this network via either:

- Network cable – Connect the host PC to one of the LAN ports on the back of the router (DO NOT connect to the WAN port), or
- Wireless – To connect the host PC to the wireless router, configure the host PC's wireless settings using the default wireless configuration settings found in the Network Connection session of this manual.



Typical Operation Scenario

Note: The host PC (or called server PC) could also be mounted on the robot instead off the robot if your application requires so.

User could be able to control the robot, see, talk and listen through the robot via the Dr Robot Remote Control program from anywhere around the world with Internet connection.

User could also play video, audio and displaying images on the Sputnik<sup>3</sup> color display.

# Software Installation

## Server PC

On the Server Computer, you should install the "Sputnik-III Control" program from the installation CD.

After program installation, you will find the following programs under the "Start-All Programs" list, and they are installed under the "Program Files" folder.

Dr Robot Inc	-	Sputnik-III Control	-	DrRobotDualCameraHeadControl
			-	DrRobotMotionPowerControl
			-	DrRobotLocalization-GPSSetup (optional)

Application data folder is set to "C:\DrRobotAppFile\"

You will find the following files in this folder:

<i>DrRobotServiceConfig.xml</i>	It contains the IP and port information about the service programs.
<i>RobotConfig.xml</i>	It contains the robot information, such as WiFi modules' IP, Cameras' IP, robot ID, camera user ID and password.
<i>gatewayConfig.xml</i>	Control Center program will save communication settings in this file. Gateway program will use it to setup communication with the robot.
<i>WiRobotGateway.exe</i>	This communication program will setup communication with robot.
DrRobotPortConfig.xml	
RobotHardWareConfig.xml	

Following sub-directories could be found under "C:\DrRobotAppFile\"

.\HeadMotionFile\	contains head motion script files.
.\PathFile\	contains path script files.
.\ServoConfig\	contains the head servo configure file "HeadServoConfig.xml" and arm servo configure file "ArmServoConfig.xml".
.\SensorConfig\	contains the IR Range sensor location information file "IrSensorConfig.xml" and the ultrasonic sensor location information file "UsSensorConfig.xml".
.\Record\	contains all camera video recording files.

## PDA (Color Touch Screen) on the Robot

Programs have been pre-installed on the PDA (color touch screen) on Sputnik<sup>3</sup>.

DrRobotPDASensorClient This program displays Sputnik<sup>3</sup> sensor information.

## Remote Client Program on Client PC

On the client computer, you should install the "Sputnik-III Remote Control" program from the installation CD.

After program installation, you will find the following programs under the "Start -> All Programs" list, and they are installed under the "Program Files" folder.

Dr Robot Inc - DrRobotSputnikIIIRemoteControl

Application data folder is set to "C:\DrRobotAppFile\"

Following sub-directories could be found under "C:\DrRobotAppFile\"

*DrRobotServiceConfig.xml* It contains the IP and port information about the service programs.

*RobotConfig.xml* It contains the robot information, such as WiFi modules' IP, Cameras' IP, robot ID, camera user ID and password.

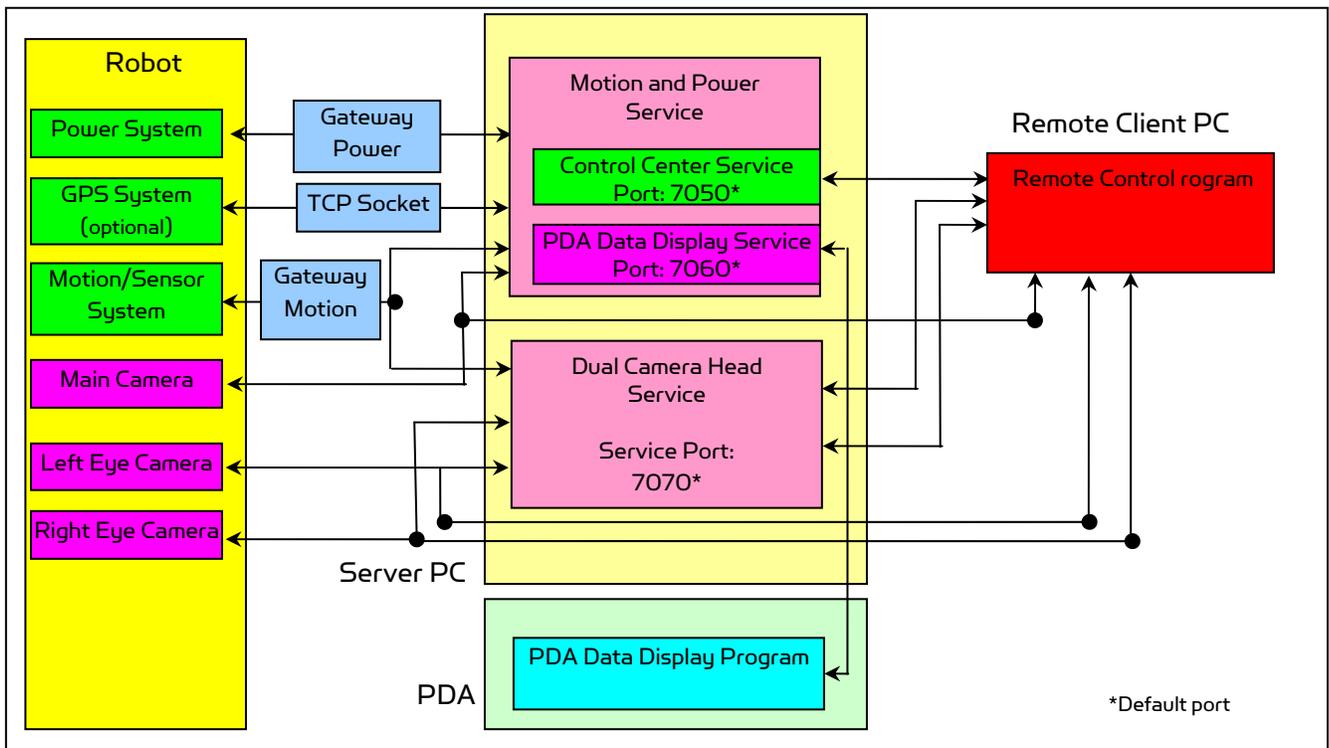
*DrRobotPortConfig.xml*

Following sub-directories could be found under "C:\DrRobotAppFile\"

.\HeadMotionFile\ contains head motion script files.

.\ServoConfig\ contains the head servo configure file "HeadServoConfig.xml"..

.\Record\ contains all camera video recording files.



# Robot Operations

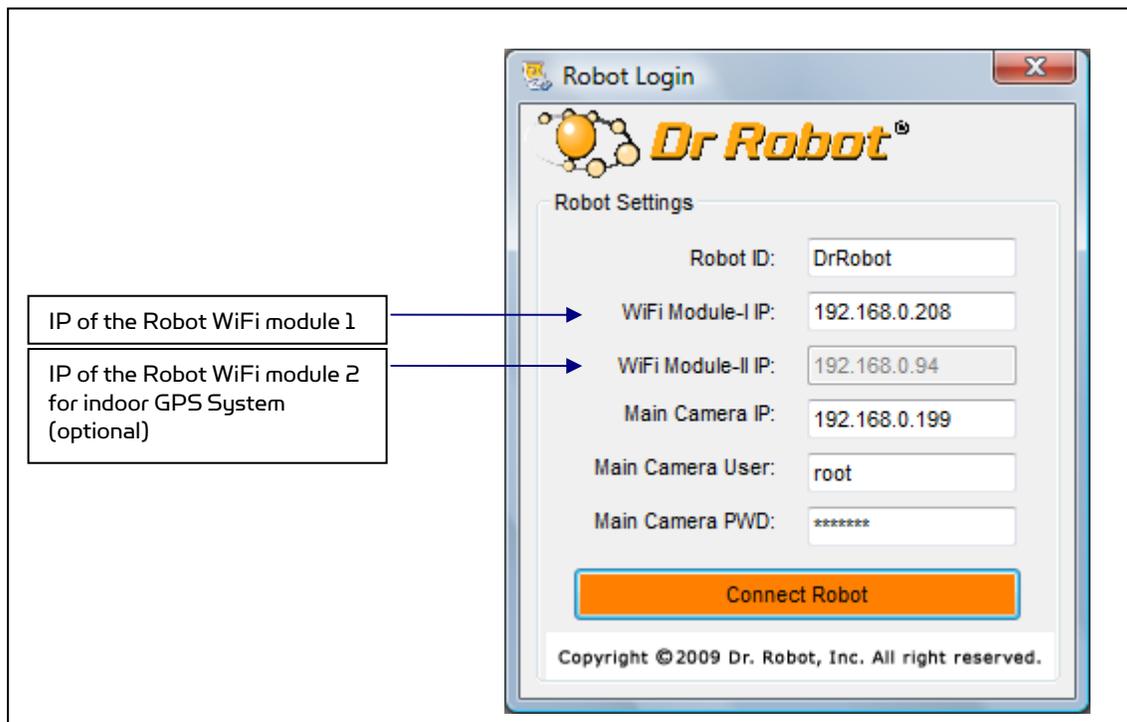
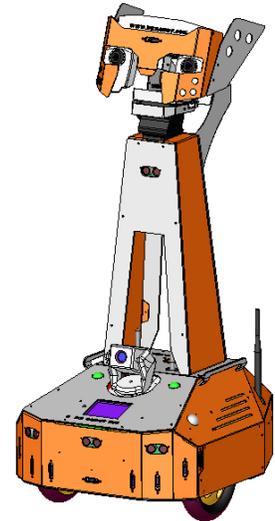
Step 1: If you have not installed the programs, insert the installation CD to CDROM and run the "Setup.exe" program which under "Sputnik-III Control Installation" folder to a PC (called server PC), set your PC IP to 192.168.0.104, Gateway: 192.168.0.200 and Subnet Mask 255.255.255.0.

Step 2: Connect the server PC to the wireless router (one of the LAN ports) (the router has IP 192.168.0.200) included in the package.

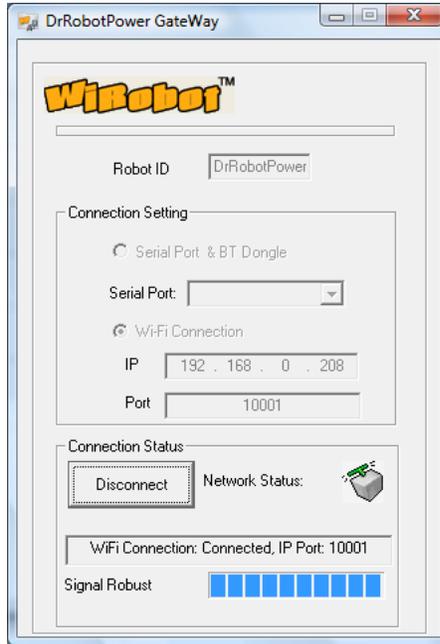
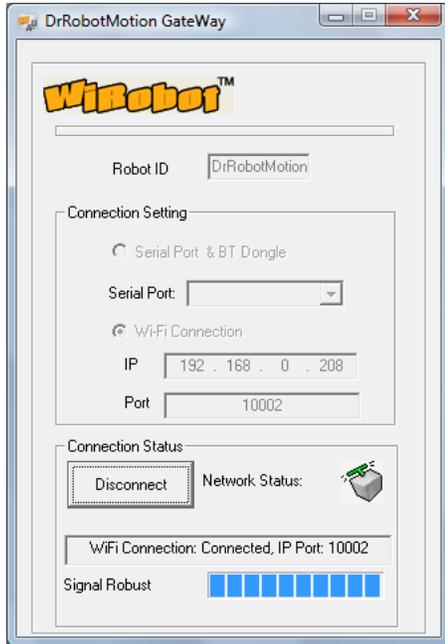
Step 3: Position the robot head to the rest position as shown on the right. This is VERY IMPORTANT for your and robot's safety.

Step 4: Turn on the robot main power switch on the back. NOTE: Always keep a safe distance from the robot.

Step 5: Run the "DrRobotMotionPowerControl" from Start -> All Programs -> Dr Robot Inc -> Sputnik-III Control -> DrRobotMotionPowerControl. The "DrRobotMotionPowerControl" connect to robot via the DrRobotMotion gateway & DrRobotPower gateway programs. It requires robot information which can be found in "Networking Connection and Login Information" section. After entering or confirming the information, then click "Connect Robot".



Two gateway programs will be called up to establish communication connections with the electronic system on the robot.



To record video under  
C:\DrRobotAppFile\Record\

To take snapshot under  
C:\DrRobotAppFile\Record\

Talk to robot

Robot sensor data

Robot position and  
direction estimated by  
dead reckoning system

DrRobot Sputnik-III Motion & Power Service

Main Sensor Info & Control | Path Control | Localization/GPS & SensorMap & Remote Control

2008/11/06 18:20:50



Camera  
 Camera P: 192.168.0.199  
 Camera Port: 8081  
 Camera ID: root  
 Password: \*\*\*\*\*  
 Connected   
 Camera Control

Power Status

	Voltage	Temperature	Status
Battery-I:	10.98	1758	Using
Battery-II:	10.86	1746	Using
DCIN:	0.00V		Using

Power Path Control  
 PowerByBattery-I  PowerByBattery-II  PowerByDCIN

Charge Path Control  
 Charge Battery-I  Charge Battery-II

Charge Timer:  Stop

Charge Current Control  
 Full Current  Half Current  1A Current  Trickle Current

Power Switch Control

Channel-I	Channel-II	Channel-III
<input checked="" type="radio"/> ON <input type="radio"/> OFF	<input checked="" type="radio"/> ON <input type="radio"/> OFF	<input checked="" type="radio"/> ON <input type="radio"/> OFF

Motion Control

Set Drive Power  
 Left: 26384  
 Right: 6384

Set Drive Speed  
 Left: 200  
 Right: -200

Set Drive Distance  
 Distance: 0.5  
 Unit: m

Set Rotation  
 Turn: 45  
 Unit: degree  
 Time: 2000  
 Unit: ms

Chassis Control

Speed

Joystick  
 X: 4960  
 Y: 4960  
 Enable Joystick  
 Joystick Collision Avoidance Drive

MaxPower: 75%  
 Joystick Sent Power  
 Left: 25251  
 Right: 25251

Ultrasonic Sensor

#	Distance	#	Distance	#	Distance
#1	2.55m	#2	2.55m	#3	2.55m
#4	2.55m	#5	2.55m	#6	2.55m

IR Sensor

#	Distance	#	Distance	#	Distance	#	Distance	#	Distance	#	Distance
#1	0.30m	#2	0.81m	#3	0.81m	#4	0.81m	#5	0.81m	#6	0.81m
#7	0.81m	#8	0.81m	#9	0.81m	#10	0.81m				

Motor Sensor

	Encoder Position	Encoder Speed	Current Feedback	HeatProtect	StuckState
Left Motor	16943	0	0.05A	False	False
Right Motor	28734	0	0.05A	False	False

Human Sensor  
 Motion Alarm  
 Left: 2019 2007  
 Right: 2012 2015

Extended IO  
 Input: 255  
 Output: 0

Position Information  
 Dead Reckoning: (2.58, -4.31, -103.15) GPS: 0  Enable GPS Sensor

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Exit

Showing status of all power sources:  
Battery I, II and external DC input

From where the system will take power from:  
Battery I, II or external DC input

To control which battery or both to be charged and the max charging time

Charging speed/mode control

Power on/off the sub-systems (detail in Appendix III)

Motor PWM control

Motor speed control

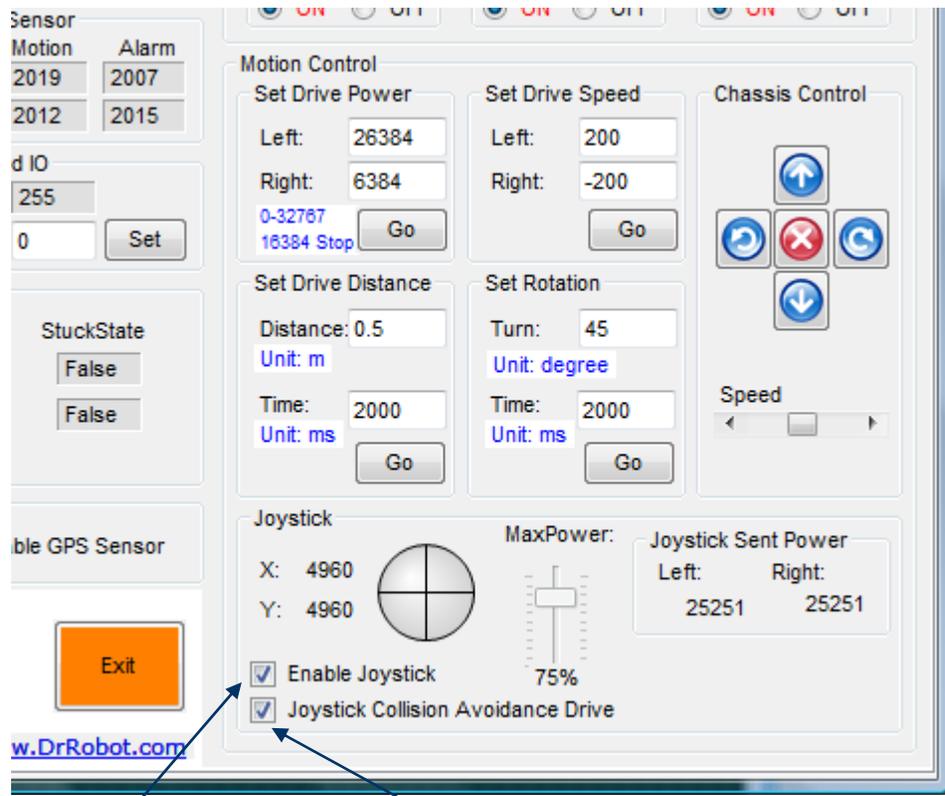
Simple motion control:  
drive forward, backward, left, right and stop

To turn within set time

Drive forward (set distance) within set time

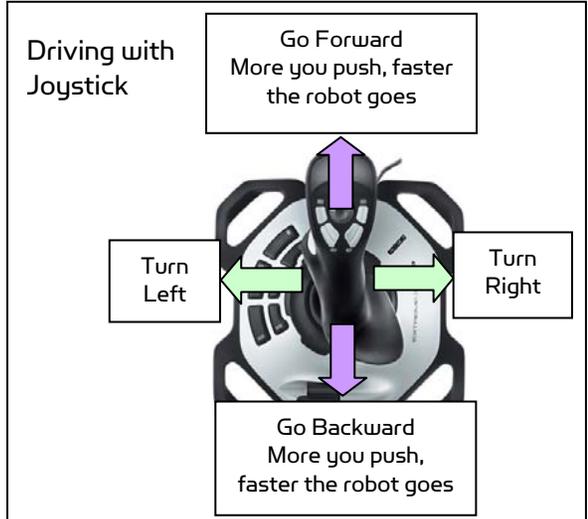
When checked, autonomous collision avoidance feature will be activated during the joystick control

Max power output when joystick is fully pushed



To Enable Joystick Control

Robot base collision avoidance feature is enabled by default. During joystick operation, you could temporarily disable this feature by holding the side button (#2) on the joystick handle (as shown above)



Via points displayed here. Via points can be manually modified here.

\* Reserved for Sputnik<sup>3</sup> with indoor GPS sensor upgrade option

\* Reserved for Sputnik<sup>3</sup> with automatic charger upgrade option

Manual path test tool:

1. Open the path file, via points on the path will be displayed on the display above; via points can be manually modified.
2. Select the type of task that robot to accomplish with the selected path:
  - a. **P2P task** – robot will run from the first via point on the path to the last one and stop
  - b. **Wander task** – robot actually don't use the path, and runs on its own.

P2P PointNum	TargetX	TargetY	TargetDir	S	FinalPostu	TargetTime	TargetTole	MaxTurnS	CAEnable	ReverseDi	TargetDirT	SeqNo
1	0.3	-3.9	0	0		200	0.1	35	<input checked="" type="checkbox"/>	<input type="checkbox"/>	15	1

P2P Task Type: P2P Task

Wandering Speed:

Mouse Point To Move

Zoom:

Map X0: 465

Map Y0: 222

Map displaying robot location and via points

The Path Editor opened from the "Path Control" allows you to edit a path file such as the charging and patrol path

The screenshot shows the Path Editor window with several callout boxes:

- Top Callout:** "All path files are listed here, when double clicking on the file, the via points will be loaded onto the via point list for editing." (Points to the Path Motion table)
- Left Callout 1:** "You could create a new path file or save the edited path file from here." (Points to the New, Edit, Delete, and Save buttons)
- Left Callout 2:** "This path via point list allows you to modify the motion specification of each via point." (Points to the main data table)
- Bottom Callout:** "You could position the robot to the location you like the robot to go. The robot location will be displayed here. You could add this location into the path by using the 'Add Point'" (Points to the status bar)
- Bottom Callout:** "This path via point display windows shows the via point location. You could drag the point to the location you want the robot to go." (Points to the map area)

FileName	PointNum
Charge.xml	4
patrol.xml	2

TargetX	TargetY	TargetDir	StopTime	ForwardSp	Forgetable	NonStop	FinalPostur	TargetTime	TargetTole	MaxTurnSp	CAEnable	ReverseDr	TargetDirT	SeqNo
-0.41	0.18	0	2	0.5	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	200	0.2	75	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	1
-0.78	0.17	0	2	0.3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	200	0.2	90	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5	2
-1	0.175	0	2	0.3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	200	0.2	90	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5	3
-1.3	0.175	0	2	0.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	200	0.2	45	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5	4

Robot Position X: -3.98    Robot Position Y: -3.93    Robot Orientation: -0.6    Add Point    Delete Point    Map X0: 471    Map Y0: 170    Zoom: + -

The screenshot shows the 'DrRobot Sputnik-III Motion & Power Service' application window. It has three tabs: 'Main Sensor Info & Control', 'Path Control', and 'Localization/GPS & SensorMap & Remote Control'. The 'Localization/GPS & SensorMap & Remote Control' tab is active and contains two main sections: 'Localization/GPS' and 'Remote Client Control'.

**Localization/GPS Section:** Includes input fields for IP Address, Port Number, Mark ID (set to 0), Position X (0 m), Position Y (0 m), and Position Dir (0 degree). There is a 'WiFi Connection' button and a small robot icon. Below these is a 'GPS Sensor Info' section.

**Remote Client Control Section:** Includes a 'Stop Server' button, a 'Server Log' area showing 'A client connected with server', a 'Remote Client IP' field with the value '192.168.0.108:55045', and a 'Received Command' section with a 'MONITOR' button and Joystick X/Y fields.

**SensorMap Section:** Located at the bottom, it shows a black square representing a sensor map with a green cone indicating the range of sonar and IR sensors.

**Annotations:**

- A box on the left points to the 'Localization/GPS' section with the text: '\* Reserved for Sputnik<sup>3</sup> with indoor GPS sensor upgrade option'.
- A box in the center points to the 'Remote Client Control' section with the text: 'Information about the tele-operation and remote monitoring client. You could disable the remote client'.
- A box on the left points to the 'SensorMap' section with the text: 'Range (sonar and IR) sensor object distance measurement'.

Step 6: Run DrRobotDualCameraHeadControl program. It provides motion control of the animated head and functions to the two eye cameras. You could run pre-edited head motion script files (.xml). The format and sample head motion script file can be found in Appendix II. You could control the head movement manually (through the "Manual Control" tag) or by the included joystick (NOTE: Do not forget to enable the joystick first).

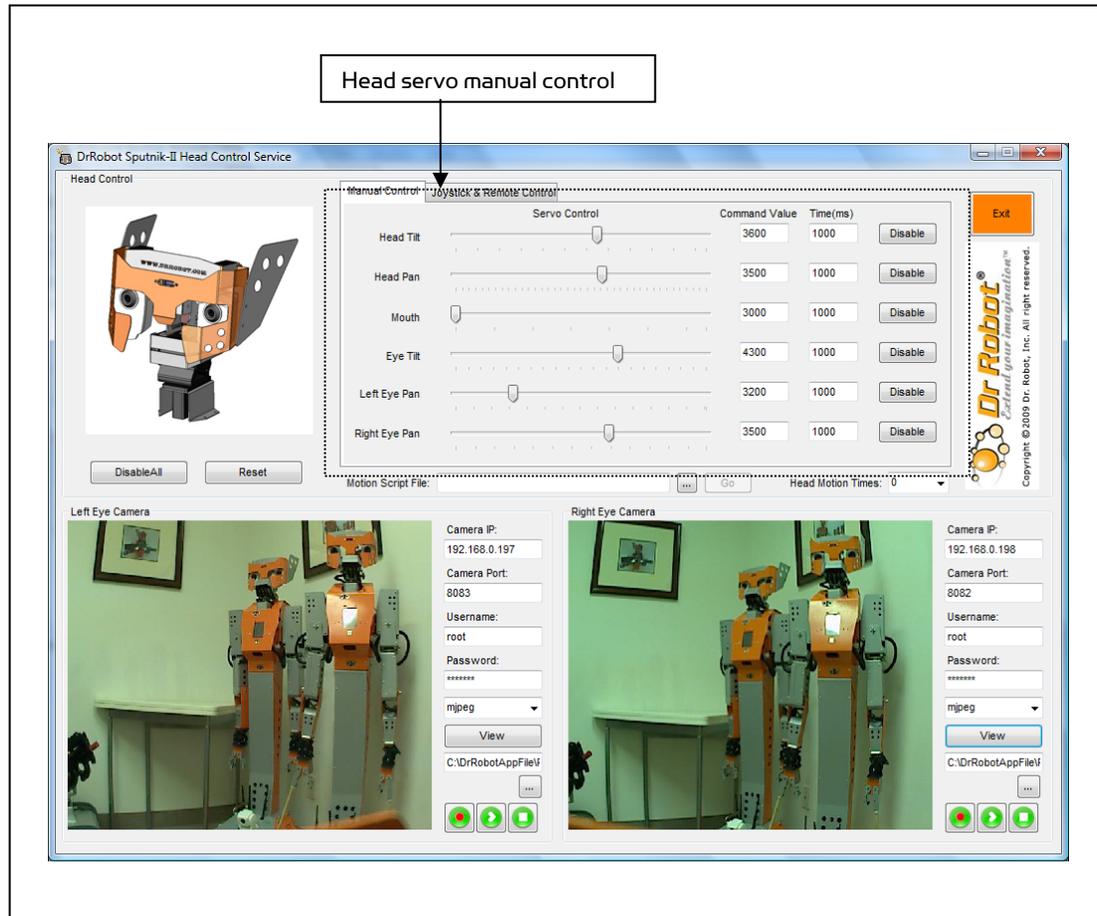
The diagram illustrates the control interface for the DrRobotDualCameraHeadControl program. It includes several key components:

- Joystick and Head Movement:** A joystick is shown on the left, with a red circle highlighting its top button. To its right, a central image of the robot head is shown with four directional arrows: a purple arrow pointing up labeled "Head & Eye Up", a purple arrow pointing down labeled "Head & Eye Down", a green arrow pointing left labeled "Turn Head to Left", and a green arrow pointing right labeled "Turn Head to Right".
- Head Servo Control:** On the right, a close-up of the robot head shows two red circles around the mouth area, with labels "Mouth to Close" and "Mouth to Open".
- DrRobot Sputnik-II Head Control Service Window:** The central software window is divided into several sections:
  - Manual Control:** Contains a "Joystick" section with an "EnableJoystick" button and a red joystick icon.
  - Server Control:** Includes a "Stop Server" button, a "Server Log" area showing "A client connected with server", and fields for "Remote Client IP" (192.168.0.108:56326), "Received Command" (MONITOR), "Received Channel" (-1), "Received Value" (R), and "Received Time" (2000).
  - Head Motion:** A "Motion Script File" field and a "Go" button.
  - Head Motion Times:** A counter showing "0".
  - Buttons:** "DisableAll" and "Reset" buttons are located at the bottom left of the main window.
- Camera Viewing Windows:** At the bottom, two windows show the "Left Eye Camera" and "Right Eye Camera" views. Each window includes fields for "Camera IP" (192.168.0.197 and 192.168.0.198), "Camera Port" (8083 and 8082), "Username" (root), "Password" (masked), and a "View" button. Below the video feeds are three control buttons: a red stop button, a green play button, and a green stop button.

Annotations and callouts provide additional context:

- "Enable or disable joystick control of the head" points to the "EnableJoystick" button.
- "This will bring the head to its initial position. NOTICE: you have to make sure the head retrieving path is safe since the motion could be un-predictable" points to the "Reset" button.
- "Viewing window for the left eye camera" points to the left video feed.
- "Viewing window for the right eye camera" points to the right video feed.
- "Recording the video" points to the red stop button.
- "Playing back the video" points to the green play button.
- "Head servo control" points to the "Mouth to Close" and "Mouth to Open" labels.
- "You could run a pre-edited head motion script file" points to the "Motion Script File" field.

You could also manually control the head motion joint by joint through the "Manual Control" tag.



## Remote Monitoring and Tele-operation

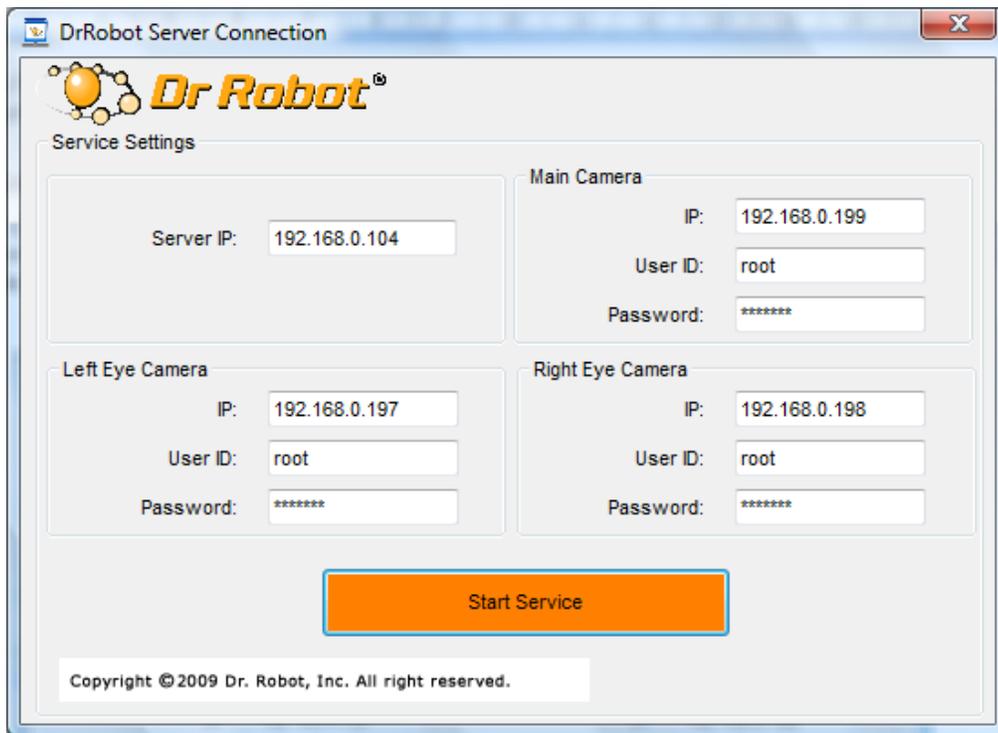
Step 1: If Internet remote monitoring/control is required, you need to connect the wireless router WAN port to your broadband Internet modem. You need to find out the public IP assigned by your ISP. (you should be able to find this information from the router status page) This IP will be used by the remote client to connect to the host PC and the devices on the robot.

If firewall is in-place in your network, you also need to make sure all the network ports used by the wireless devices (e.g. the 8081, 8082, 8083, 8084 for cameras), 7030 and 7040 on the server and remote client sides are not blocked for the Internet remote monitoring/control tasks to operate properly.

Step 2: Installing the Sputnik-III Remote Control program from the installation CD. "DrRobotSputnik-IIIRemoteControl" program allows you to remotely control the robot, obtain main robot sensor information, view, listen and talk through robot.

Step 3: Run the DrRobotSputnik-IIIRemoteControl program.

Step 4: Enter or confirm the remote server and other devices' IP. When you are connecting from public network, your server IP must be a public IP, and with the pre-configured router settings, all the devices on the robot will share the same public IP with the server IP. Then click the "Connect".



Step 5: After login, the DrRobotSputnik-IIIRemoteControl program will look as below.

DrRobot Sputnik-III Remote Control

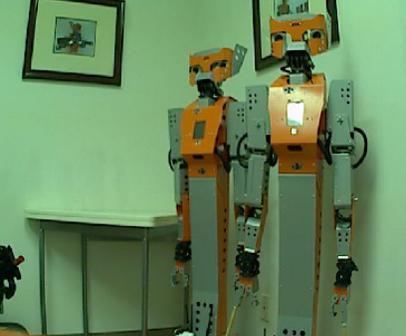
Camera & Main Sensor & Control | Motion & Head Manual Control

**Left Eye Camera**



Camera IP: 192.168.0.197  
 Camera Port: 8083  
 Username: root  
 Password: \*\*\*\*\*  
 mjpeg  
 View  
 C:\DrRobotAppFile\

**Right Eye Camera**



Camera IP: 192.168.0.198  
 Camera Port: 8082  
 Username: root  
 Password: \*\*\*\*\*  
 mjpeg  
 View  
 C:\DrRobotAppFile\

**Robot Mode**  
TELEOP

**Robot Position**  
 Position X: 2.58 m  
 Position Y: -4.31 m  
 Position Dir: -103.15 deg.

**Power Status**

Battery-I	Voltage	Status
10.82V	Using	
10.71V	Using	
DCIN: 0.00V	Using	

Channel-I:  ON  OFF  
 Channel-II:  ON  OFF  
 Channel-III:  ON  OFF

**Camera Control**



2008/11/06 18:20:50

Camera  
 Camera IP: 192.168.0.199  
 Camera Port: 8081  
 Camera ID: root  
 Password: \*\*\*\*\*  
 Disconnect

Connecting

Camera Control  
 Snapshot Pan Reset  
 AVI Rec Stop

**Power & Motion Service**  
 192.168.0.108 Disconnect  
 Connected with service.

**Joystick**  
 X: 4960  
 Y: 4960

Head Control Left  
 Mouth Control Close

Joystick Collision Avoidance Drive  
 Enable Head Joystick Control

**Robot P2P Status**  
 Point Num: 1  
 Status: P2POver

**Human Sensor**

Left	Right
2016	2023

**Motor Sensor**

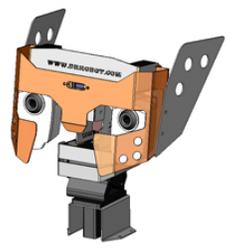
Encoder	Current	Encoder	Current
Left 0	0.05A	Right 0	0.04A

**Command**

Sent Command: MONITOR Joystick Stop

DrRobot Sputnik-III Remote Control

Camera & Main Sensor & Control | Motion & Head Manual Control



DisableAll Reset

**Head Control**

Servo Control	Command	Time(ms)	Disable
Head Tilt	2949	1000	Disable
Head Pan	5081	1000	Disable
Mouth	3000	1000	Disable
Eye Tilt	4599	1000	Disable
Left Eye Pan	2879	1000	Disable
Right Eye Pan	2709	1000	Disable

**Head Motion File**

FileName	Time
cup1.xml	1
cup2.xml	1
cup3.xml	1
cup4.xml	1

Send Stop Head Motion Repeat: 0 Update

**Head Control Service**

192.168.0.108 Disconnect

Connected with service.

Sent: JOYSTICK

**Manual Control**

**Set Drive Distance**  
 Distance: 0.5 Unit: m  
 Time: 2000 Unit: ms  
 Go

**Set Rotation**  
 Turn: 45 Unit: degree  
 Time: 2000 Unit: ms  
 Go

**Chassis Control**



Speed

# Recharging

To keep the battery at ideal condition, we recommend recharging the robot at least once every two weeks during storage (e.g. robot is not in use).

Plug the charging plug from the portable charger onto the secondary recharging socket on the back of the robot, **and then turn on the robot**. The charging process will normally take about 2 hours if the battery power is totally exhausted. The charging process will automatically stop when completed.

## Further Development & Programming

The Sputnik<sup>3</sup> Control program is written with C# program with Visual Studio 2008 express under .Net 3.5 framework. You could download the development tools (Visual Studio 2008 express under .Net 3.5 framework) free from Microsoft. Please refer to the “Dr Robot Application Development Notes on C# Programming for Robot Control” for further information.

The control program uses the supporting components and libraries that should have been installed when you install the control program from the installation CD:

1. **DRROBOTSentinelCONTROL.OCX**: Please refer to “WiRobot SDK API Reference Manual.pdf” for detail.
2. **WiRobotGatewayPlus.exe**
3. **DrRobotSensorMapBuilder.dll**: This dll file provides functions to build the environmental map for collision avoidance feature.
4. **DrRobotP2PSpeedDrive.dll**: This dll file provides functions to drive a robot from one specific point to another.
5. **DrRobotConstellation.dll**: Sputnik<sup>3</sup> robot uses the sonar based Constellation indoor GPS localization system. This dll file provides the functions to locate the robot position with the Constellation system.
6. **DrRobotGPS.dll** Sputnik<sup>3</sup> use the vision-landmark based indoor GPS localization system. This dll file provides the functions to locate the robot position with vision based GPS system.
7. **VitaminControl.dll** This is the camera control component for the Pan-Tilt-Zoom camera (P/N: AV-PTZ-VH) used for i90 robots such as Sentinel -II, Sentinel-III, and Sputnik<sup>3</sup>. Please refer to “PTZ Camera ActiveX Control Reference Manual.pdf” for detail.
8. **AXIS Media Control Library Set** These are the camera control component for the AXIS Mini Camera (P/N: AXCAM) used for the Dual-camera Head and Scout arm. Please refer to “AXIS Media Control SDK Help” for detail.

For support on development using Microsoft Robotics Studio, operation system other than MS Windows, or raw communication protocol, please contact [support@DrRobot.com](mailto:support@DrRobot.com).

# Network Connection and Login Information

## Network Settings

As default, your PC running the Sputnik-III Control program should have IP settings as below:

<b>Name</b>	<b>Server PC</b>	<b>IP (Port)</b>	192.168.0.104
<b>Gateway</b>	192.168.0.200(Router IP)	<b>Subnet Mask</b>	255.255.255.0

The included pre-configured wireless 802.11 b/g router has the following pre-set settings:

<b>SSID</b>	dri	<b>Router LAN</b>	192.168.0.200
<b>WEP</b>	128bits	<b>Login ID</b>	admin
<b>KEY</b>	112233445566778899AABBCCDD	<b>Password</b>	drrobot
<b>Key Type</b>	Open Key		

with virtual server settings as followings:

Virtual Server	Port	Protocol	Server IP
Sputnik-III Remote Control program	7050,7070	TCP/IP	192.168.0.104
Main PTZ Camera	8081	TCP/IP	192.168.0.199
Left Eye Camera	8083	TCP/IP	192.168.0.197
Right Eye Camera	8082	TCP/IP	192.168.0.198

WiFi module connects to two serial devices through channel I and II (TCP/IP port 10001 and 10002 respectively). They are pre-configured as below:

<b>Name</b>	<b>Robot WiFi Module 1</b>	<b>IP</b>	192.168.0.208
<b>Channel-I (10001)</b>	115200, 8,N,1, no flow control, UDP, Datagram 01, remote IP:0.0.0.0	<b>Channel-II (10002)</b>	115200, 8,N,1, flow control, UDP, Datagram 01, remote IP:0.0.0.0

Other wireless devices settings are listed below:

Name	IP (Port)	Login	Password
Main PTZ Camera	192.168.0.199 (8081)	root	drrobot
Left Eye Camera	192.168.0.197 (8083)	root	drrobot
Right Eye Camera	192.168.0.198 (8082)	root	drrobot

## Advanced Network Settings

It's possible to use different network settings (e.g. IP) for the server PC, but the "Virtual Server" settings on the router must also be changed accordingly in order for the Internet remote monitoring feature to work properly.

You could also change the router settings such as IP and SSID etc. If you need to do so, you are required to change the network settings on the WiFi modules on the robot by following the guidelines as illustrated on the WiFi Module manual.

## Appendix I Power Switching Control

Three power sub-systems as defined below could be turn on or off individually through the "DrRobotMotionPowerControl" or "DrRobotSputnik-IIIRemoteControl" Program.

<b>Channel-I</b>	DC-DC board -I	Main Camera (12V)
<b>Channel-II</b>	DC-DC board -I	1. PMS5005 Main power (5V)
		2. PDA, LED 5V
<b>Channel-III</b>		Left Eye Camera, Right Eye Camera power 5.1V
		Head Servo Power 6V

## Appendix II Servo Control for Sputnik<sup>3</sup> Animated Head

Sputnik<sup>3</sup> animated head uses RC servo motors. RC Servo motor position is defined by the pulse width from the control signal line. The pulse width value in milliseconds for specific position (e.g. 0°, 90° and 180°) is servo manufacturer and model depending.

The conversion between the servo command used in the Sputnik<sup>3</sup> Control programs and the pulse width is:

$$\text{The servo command} = 2250 * \text{Pulse Width in millisecond.}$$

The max, min and initial servo position (in servo command) are defined in HeadServoConfig.xml for the Sputnik<sup>3</sup> animated head respectively. Servo motion (e.g. joint motion) range will be limited therefore by the max and min value specified in these files.

## Appendix III Head Motion Script File

Here is the sample head motion script file extracted from "yes.xml" that can be found under C:\DrRobotAppFile\HeadMotionFile\

Note, the servo command values are NOT the absolute servo command value, they are the difference relative to the servo initial value (initial servo position in servo command are defined in HeadServoConfig.xml).

<pre> &lt;HeadServoMotionTable xmlns="http://tempuri.org/headServoMotionTable.xsd"&gt;    &lt;ServoMotionStep&gt;     &lt;Servo1&gt;0&lt;/Servo1&gt;     &lt;Servo2&gt;0&lt;/Servo2&gt;     &lt;Servo3&gt;0&lt;/Servo3&gt;     &lt;Servo4&gt;0&lt;/Servo4&gt;     &lt;Servo5&gt;0&lt;/Servo5&gt;     &lt;Servo6&gt;0&lt;/Servo6&gt;     &lt;Time&gt;1000&lt;/Time&gt;   &lt;/ServoMotionStep&gt;    &lt;ServoMotionStep&gt;     &lt;Servo1&gt;300&lt;/Servo1&gt;     &lt;Servo2&gt;0&lt;/Servo2&gt;     &lt;Servo3&gt;0&lt;/Servo3&gt;     &lt;Servo4&gt;0&lt;/Servo4&gt;     &lt;Servo5&gt;0&lt;/Servo5&gt;     &lt;Servo6&gt;0&lt;/Servo6&gt;     &lt;Time&gt;1000&lt;/Time&gt;   &lt;/ServoMotionStep&gt; </pre>	<pre> (continued...)    &lt;ServoMotionStep&gt;     &lt;Servo1&gt;-600&lt;/Servo1&gt;     &lt;Servo2&gt;0&lt;/Servo2&gt;     &lt;Servo3&gt;0&lt;/Servo3&gt;     &lt;Servo4&gt;0&lt;/Servo4&gt;     &lt;Servo5&gt;0&lt;/Servo5&gt;     &lt;Servo6&gt;0&lt;/Servo6&gt;     &lt;Time&gt;2000&lt;/Time&gt;   &lt;/ServoMotionStep&gt;    &lt;ServoMotionStep&gt;     &lt;Servo1&gt;600&lt;/Servo1&gt;     &lt;Servo2&gt;0&lt;/Servo2&gt;     &lt;Servo3&gt;200&lt;/Servo3&gt;     &lt;Servo4&gt;0&lt;/Servo4&gt;     &lt;Servo5&gt;0&lt;/Servo5&gt;     &lt;Servo6&gt;0&lt;/Servo6&gt;     &lt;Time&gt;2000&lt;/Time&gt;   &lt;/ServoMotionStep&gt;    ... </pre>
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