

EIT-Phantom-Positioning-System: User Guide

Version 1.0

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1. Requirements

The EIT-Phantom-Positioning-System (EIT-P-PS) requires first of all a thorax-phantom which is suitable to the grey ring of the EIT-P-PS. The EIT-P-PS-Software requires a computer with at least Windows XP SP2 and a JIT-Compiler. The JIT-Compiler is included in the .NET Framework and in the most Windows OS. Otherwise it is possible to download and install .NET Framework (msdn.microsoft.com/netframework). The protocols will be stored in a Microsoft Office Excel 12.0 sheet, so Microsoft Office 2007 (English version) is necessary. On the CD-ROM is a free trial-version of the Microsoft Office 2007 if it is not already installed. The EIT-P-PS Software has not been tested on a Mac OS yet. Because of the communication of the controllers with the computer via Bluetooth the computer should have integrated a Bluetooth module and WIDCOMM Bluetooth Software for Windows v 1.4.2.10 SPS or newer. Otherwise it is possible to buy a Bluetooth-USB-Stick.

MINDSTORMS NXT Bluetooth Compatibility Matrix

| Bluetooth Device Name | Compatibility |
|--|---------------|
| Abe UB22S | *** |
| Belkin F8T003 ver. 2 (short range) | *** |
| BlueFRITZ! AVM BT adapter, BlueFRITZ! USB v2.0 | *** |
| Cables Unlimited USB-1520 | *** |
| Dell TrueMobile Bluetooth Module | *** |
| Dell Wireless 350 Bluetooth Internal Card | * |
| Dlink DBT-120 | *** |
| MSI Btoes | *** |
| MSI StartKey 3X-faster | *** |
| TDK GoBlue | *** |
| Qtrek, Bluetooth USB Adapter v2.0 | *** |

The EIT-P-PS-Software does not use a lot of RAM, so every newer computer should easily handle the program.

2. Construction

The EIT-P-PS-Hardware is made of LEGO, so it can easily be built together. The orange marks show the places where the different parts should be stuck together. NXT 1 should be placed on the orange "1" and NXT 2 on the orange "2". It is also labeled which motor/sensor belongs to which in-/output. If the light-marks on the grey ring are not usable anymore, print the document "lightmarks" on the CD-ROM and "tinker" a new one.

3. Installation

To install the EIT-P-PS-Software, open the CD-ROM-Folder "EIT-P-PS-Software\Computer-Program" and click "setup". If an error message occurs, that says that the computer does not have Excel 12.0, install the Microsoft Office 2007 Trial Version. This version can be found on the CD-ROM as well as in the internet. After installing the Software, start it.

4. Control of the EIT-P-PS-System

4.1 Connection

The computer communicates with the controllers with Bluetooth. So first of all you have to make sure that a connection between the computer and NXT1 respectively NXT2 exists. Click on the "Connection"- button or open manually a Bluetooth-Device-Manager in "Control Panel" on your computer. Create a shortcut on the desktop to use the "Connection"-button in future. Click "Add" and follow the instructions. Make sure that Bluetooth is turned on and every contact is deleted in "Bluetooth - myContacts" on the bricks. Then look at the COM-Ports and type the "Outgoing"-Ports in the fields in "Options".

4.2 Bluetooth problems

There can appear many different problems with Bluetooth-connections. For example, the computer does not find the NXT's while you want to add them, or, after you clicked on "Start", a "Cannot find brick"-message shows up. In this case you should try it again. If the error occurs again, there exists one common solution: Reconnect.

1. Click "Connection" and remove NXT1 respectively NXT2 on the computer
2. Delete the computer in "myContacts" on the controllers
3. Turn Bluetooth off: On the computer as well as on the NXT's
4. Reconnect!
5. If there are still the same problems, try again

To avoid problems with Bluetooth, try to hold the battery level on the bricks high and do not interrupt the contact while the controllers are working, neither on the computer nor on the NXT's.

4.3 Initialization

Click on the button "Initialize" to start programs on the controllers which allows you to control every single motor. The touch-sensors on both controllers have a small orange mark on the rack. But this orange mark on the other racks on the x-, y, and z-axis and drive with the carriage against the sensor by using the left- and right-buttons on the controllers. The motors will immediately stop and the home position is reached. Because of the length of the cable on the touch-sensor of NXT2 it is necessary to drive with the y-axis near to NXT2 to initialize the z-axis. To initialize the rotation, let rotate the system until the light-sensor reaches the orange marked lightmark. Make sure that the

light-sensor "sees" the black mark before the program starts, because it will then calibrate automatically the barrier between white and black.

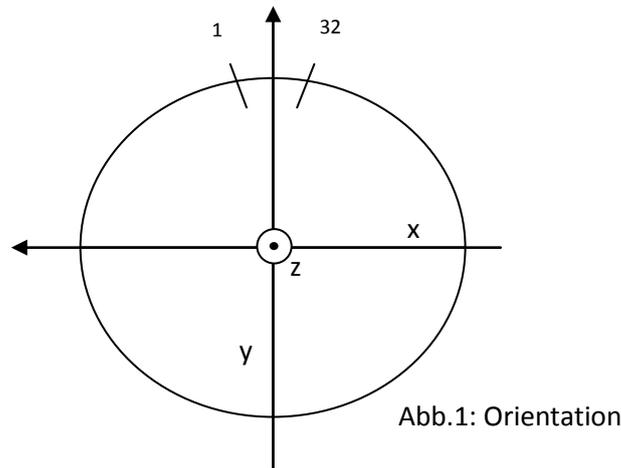
4.4 Positions

Positions is a tool to calculate medical useful coordinates.

1. Select objects from the list and choose the impedance for both objects. It is also possible to work with one object. Remove the tick on object 2 for that.
2. E. Nr. means "number of the electrode":
It is not really the number of the electrode, but the number of the "space" between two electrodes. Meaning E.Nr. "0" is between electrode 32 and 1, E.Nr. "1" between electrode 1 and 2, and so on. Thus input "0.5" would be electrode number 1 and so on. From the top of the phantom, the electrodes are in a clockwise orientation.
3. Rad. means "radial distance"
Choose the radial distance between object 1 and the point of origin. Notice that the unit of your input is millimeter.
4. Vert. means "vertical distance"
Choose the vertical distance between object 1 and the xy-plane. Notice that the unit of your input is millimeter.
5. Distance "rad" or "tan"
Now you can place object 2. Choose rad if you want to place it in a radial distance or tan for a tangential distance. Then fill in a decimal number that will be the distance between the two objects. The unit is the diameter of the object(2).
6. Vert. means "vertical distance"
Choose the vertical distance between object 2 and the xy-plane. The unit of your input is millimeter.
7. Click on the button "Calculate Coordinates" and they will show up in "Coordinates".

4.5 Coordinates

"Coordinates" is the buffer store between "Positions" and the protocol. It shows the new, meaning the calculated, position. It is also possible to fill in whole numbers directly, without using the positions tool. To add the coordinates to the protocol, click the button "Add to protocol". The program will now check the reachability of the position and then add the coordinates and, if filled in, the position. This is the orientation of the coordinate-system from the top of the phantom:



4.6 Protocol

The protocol is the list of the coordinates where the objects will be placed. The program will store it later automatically so please choose a valid name.

It is possible to choose between .txt and .xlsx files in options. It is recommended to use the Excel file. In this case, the coordinates and the positions will be stored in real time in an Excel-sheet. If you click on the button "Create protocol", an Excel-sheet will be opened where you can create a protocol using all the tools which Excel offers. It is possible to fill in coordinates as well as positions. If you want to work with just one object, please fill in "0" in the empty cells under object 2 and remove the tick on object 2 before you load the protocol. Otherwise, an error message will occur. After finishing the protocol, type the number of the positions into the field [2, 1]. Now store it at a specific path and load it in options. You can also load an automatically created protocol. The protocol will now appear in "Protocol".

If you choose .txt-file., the coordinates will be stored in a textfile on the path chosen under "Storage locations" in "Options". It is not possible to create protocols external and to load a protocol.

To delete coordinates in the protocol, select them and click on the "Delete Coordinates"- button. If the protocol is empty again, all the fields will be enabled again.

4.7 Start

The "Start"- button lets begin the transmission of the coordinates to the controllers. If a message shows up, it is either a problem with your input (protocol name, objects, ...) or a problem with the connection ("Cannot find brick"). In the first case, fill in valid input and start again. In the second case, look at "Bluetooth-Problems". If everything is alright, the controller will place the objects and the computer will store the protocol. Please do not interrupt this process without cause. While the system is positioning the objects, an excel sheet shows up where the coordinates will be filled in in real time.

4.8 Options

You can change some settings like the COM-Ports, the storage location for the protocol, and so on in "Options".