

Quick Start Guide

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1 INTRODUCING MAV SOFTWARE

NEURA Robotics works together with Nativec System to automate MAV. Thanks to the Navitec experience and NEURA Know How and innovative thinking, MAV can work in every possible application.

To automate MAV, a natural feature navigation, also called SLAM (simultaneous localization and mapping) navigation, is used. Laser scanners identify objects in the environment and the system compares these measurements with previously created map points to position and navigate MAV.

If needed, a highly flexible fleet management solution is available. High traffic density, dead-lock free, complex route systems, precise docking, automatic pallet/load finding. Fully integrated with the factory environment.

Different vehicle types and third-party vehicles in the same system are possible (VDA 5050).

In this user guide you will fine only a short Introduction about the software. This introduction will help you to make the first steps using and programming MAV.

The complete Software Guides are available:

- Navithor Tools
- Navitrol Monitor
- > Navitor Fleet

Please contact NEURA Robotics or your Integrator to get the Software guides if needed.

1.1. Connecting to MAV

<u>Step1</u>: A connection to the vehicle's internal router must be established.

- Connect your system (computer, cell phone, etc) with the WiFi of MAV. The WiFi name corresponds to the MAV Serial number (e.g.: NR226851). The Serial number can be found in the identification plate.
- MAV WiFi Password: NeuraRobotics

Step2: Go to network settings and reconfigure the "IPV4" your computer using the following IP address:

- IP address: 10.10.6.157
- Subnet mask: leave empty (it will be filled in automatically)
- Default gateway: leave empty (it results from establishing the WiFi connection)

ŵ Home	Status	Internet Protocol Version 4 (TCP/IPv4) Properties	×
Find a setting	Network status	General		
Network & Internet Ø Status Mi-Fi Zi Ethernet	Vou're connection or change other properties.	You can get IP settings assigned auto this capability. Otherwise, you need t for the appropriate IP settings. O Obtain an IP address automatica	matically if your network supports o ask your network administrator Illy	
😤 Dial-up	Change connection properties	Our of the following IP address:		
% VPN	Show available networks	IP address:	10 . 10 . 6 . 157	
步 Airplane mode	Change your network settings	Subnet mask:	255.0.0.0	
0y0 Mobile hotspot	Change adapter options View network adapters and change connection settings.	Default gateway:		
🕒 Data usage	Bharing options	Obtain DNS server address auto	matically	
Proxy	For the networks you connect to, decide what you want to share.	Ose the following DNS server ad	dresses:	
		Preferred DNS server:	192.168.0.1	
		Alternate DNS server:		
		Validate settings upon exit	Advanced	
			OK Cance	4

Fig. 1: IPV4 Parameter.

<u>Step3</u>: Open your Browser and enter the following IP 10.10.6.100 in the addres bar.



The System Page opens and the AGV can be moved manually after the <u>Request Control-> Manual "on"</u> is activated (in the upper right corner)

Ø Systems × +			- 0
← → C 🔺 Nicht sicher 10.10.6.100		\$	2 0 * O I
	Systems		н
State: - disuality Manual possible:- Velocity: 0.00 m/s = 0 ft/min Teach:			ŝ
	•		

Fig. 2: System Page in the Web Browser.



Step4: Go back to the main window and use your finger or mouse to move MAV.

NOTE: be careful not to accelerate too fast. The finger swipe must be smooth.





Fig. 3: Moving MAV Manually

Step5: The environment can be scanned and saved to be used in the route planning as a map. To do that the software must be in "Teach Mode".

- In the same "Request Control Menu", activate "<u>Teach</u>" to start saving the enviroment.
- Move MAV through the area you want to scan to later create a map. The vehicle has to be moved manually in the entire environment in order to generate the data. If the "non-stop" is activated the teach process must be started again.
- Stop the "Teach Mode" when the desire environment is scanned. The data is saved as a file and contains all relevant information.

An additional Windows based **Tool** is used to export the recorded data to a model.

Manual:	
Teach:	On 📄
Save Po	S

Fig. 4: Request Control Menu



1.2. Introducing to Navithor Tools

1.2.1. Creating a new Project

<u>Step1</u>: Open the software Navithor tools: "Navithor tool.exe." <u>Step2</u>: The login window will show up. Default password for login is **ntnavitec**. The password can be reset or changed if needed.

🛅 · 🔚 · @, Q, 💥 🛄 🔄 · 🧀 👘	Mouse position: {X=3,287643, Y=24,71	263} Current machine type: AGV_500_MaschineType
Project Manage project settings and CAD files Project settings	26 3 3,5 4	4,5 5 5,5 8 8,5 7 7,5 8
Area name:	25,5	
Roor: 0		
Edit Version: 1 🗢	25	
Machine Type		
ID: 180001 Name: AGV_500_Maschi neType		Enter password
Change	24,5	
Machine type file 0 version number:		Password:
CAD Files	24	
Filename		OK Cancel Change
	23,5	
	23,5	
	23,5	
	23,5	
Add Remove Selected	23,5	
Add Pernove Selected	23.5	
Add Remove Selected Teach files Matching Select teach file fint	23,5 23 22,5	
Add Remove Selected Teach files Matching Select teach file fint Finironment	23.5	
Add Pemove Selected Teach files Matching Select teach file fint Environment Reflectors	23,5 23 22,5 22	
Add Permove Selected Teach files Matching Select teach file fint Environment Reflectors Routes and Symbolic Points	23.5 23 22.5 22	
Add Remove Selected Teach files Environment Reflectors Routes and Symbolic Points Zones	23,5 23 22,5 22 22	

Fig. 5: Navithor User Interface.

<u>Step2</u>: The login window will show up. Default password for login is **ntnavitec**. The password can be reset or changed if needed.

Step3: Open or create a new Project.

Open existing project	Create new project		
Area Info			
Area name:			
Floor:)		
CAD			
	Load CAD		Remove CAD
CAD offset			
X 0		Y 0	
			1
Area limits	carefully as they cannot be changed	manually la	ter after project has been created
	currently us they current be changed	inditionally to	
minX: -1,00		maxX:	51,00
minY: -1,00		maxY:	51.00
	Create n	ew project	
	Create II	ew project	

Fig. 6: Project window

<u>Step 4</u>: Assign a name; define area limits and create new project.



Open existing	project Create	new project				
Area Info Area name:	0815					
Floor:	0					
Area limits						
minX: -1.0	its carefully as the	ey cannot be change	ed manually la maxX:	ter after project has 51,00	been created.	
minY; -1.0	D		maxY:	51,00		

Fig. 7: Create a Project.

<u>Step 5:</u> The machine parameters must be selected an added into the project. Select the parameters according to your AGV when the program ask for it.

MAV_500.xml	
MAV_1500.xml	

Fig. 8: Machine Parameter

1.2.2. Selecting and Loading Teach files from AGV

<u>Step 1</u>: After scanning an area (as explained in 6.1.1, step 5), go to the Teach file Menu and load the teach files from the AGV.

Handle teac	ch files	schittles
Selected	Filename	
Ac	łd	Remove selected
Ac	ld Load teach file	Remove selected
Ac Change ena	dd Load teach file	Remove selected s from AGV of selected teach fil
Ac Change ena	dd Load teach file ibled scanners	Remove selected s from AGV of selected teach fill O Both

Fig. 9: Teach files menu

Step 2: Select the corresponding AGV for your project and press "Connect and Search for files".



	AGV	10.10.6.100	navitec	navitrol	navitec	1235	
	AGV1	10.10.6.100	navitec	navitrol	navitec	1235	
	AGV2	10.10.6.100	navítec	navitrol	navitec	1235	
Get to	each files from co ailable teach files	onnected AGV		Find/Add teach f	files		
Get to Ava	each files from co ailable teach files	Dinnected AGV	Cine (A-D)	Find/Add teach f	files		1.
Get ti Ava Sel	each files from co ailable teach files lected	Filename	Size (kB)	Find/Add teach f	files Connect and searc	h for files	
Get ti Ava	each files from co ailable teach files lected	Filename	Size (kB)	Find/Add teach f	files Connect and searc Add selected files t	h for files	
Get ti Ava	each files from co ailable teach files lected	Filename	Size (kB)	Find/Add teach f	files Connect and searc Add selected files t	h for files	

Fig. 10: Teach files window

<u>Step 3:</u> Select the desired map (usually is the newest one) and "add selected files to project". Be careful to select only one map.

onfigure c	onnection							
Na	ame	IP Address	Usemame		Password	Home folder	Port	-
AG	iV	10.10.6.100	navitec		navitrol	navitec	1235	
AG	iV1	10.10.6.100	navitec		navitrol	navitec	1235	
AG	V2	10,10,6,100	navitec		navitrol	naviteo	1235	
iet teach fi Available t	iles from conn teach files	ected AGV			Find/Add teach t	files	1200	
et teach fi Available t Selected	iles from conn teach files Filename	ected AGV	Size (kB)	^	Find/Add teach t	files Connect and searc	th for files	
iet teach fi Available t Selected	iles from conn teach files Filename map_2020_	ected AGV	Size (kB) 1356	^	Find/Add teach f	files Connect and searc	th for files	
iet teach fi Available t Selected	iles from conn teach files Filename map_2020_ map_2020_	ected AGV 11_11_06.58.38_6.28.ntt 11_13_07.09.51_6.28.ntt	Size (kB) 1356 21192		Find/Add teach t	files Connect and searc Add selected files t	ch for files	
iet teach fi Available t Selected	iles from conn teach files Filename map_2020_ map_2020_ map_2020_	ected AGV 11_11_06.58.38_6.28.ntt 11_13_07.09.51_6.28.ntt 11_11_03.46.09_6.28.ntt	Size (kB) 1356 21192 29703	^	Find/Add teach t	files Connect and searc Add selected files t	th for files	

Fig. 11: Selecting teach files for the project.

This procese could last a couple of minutes



Fig. 12: Loading a map to the project.





Fig. 13: Selected teach files from the AGV.

1.2.3. Matching and Generating Environment Points

Matching

The purpose of matching is to create uniform map from the raw measurements. Select "Matching" in the menu.

In the menu the option "Inter Match" can be selected as standard for the uncomplicated maps:

- Select the map with doble click. The completely scann must turn pink.
- Click "intern Match" and after some seconds you can select "finalize selected".

Match selected measure	ements
Inter Match	New Match (Beta)
Match to Finalized	Match and Finalize
Match to CAD	Match to Exits
Finalize selected measu	rements
Finalize Selected	Release Selected
Disable unwanted meas	urements
Disable Selected	Enable Selected
Edit selected path odor	netry
Restore Original	Clear Selected Locks
Calculate SI	AM Odometry
Detect high odometry c	orrection errors
Show Odometry Errors	Hide Errors

Fig. 14: Matching Menu.

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Fig. 15: Data without matching (left). Data with matching (right).

Environment

Environment point generation is the next step after the measurements have been matched. Select "Environment" in the menu.



Generate from finalized	measurements	
Preview	Generate	
Use high resolution	settings	
Generate from other so	urces	
Objects to import		
 Environment points 	3	
Reflectors		
Frased environment	t pointe	
Eldace crivitorinici	it points	
-Select import source -		
Generate	e from CAD	
Import from prev	rious machine type	
Import	from file	
Visualize length of seer	natural features	
Low length limit:	Show	
2 m (Medium)		`
Clear environment	points and reflectors	
dit Environment		

Fig. 16: Environment Menu.

Step 2: Edit environment > Manual erase tools > Erase: It is important to remove all contours that do not correspond to fixed objects. For example: persons, chairs, etc. This will avoid the software looking for non-existent objects when moving.

NOTE: the erased areas will only be deleted internally in the software.

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Edit Environment Edit generated environment points Area tool size Size Size General erase tools Erase open areas Erase all but CAD Erase all Erase all	
Finalize Environment tools Finalize all Release Release all	

Fig. 17: Erase unrelevant areas.

1.2.4. Routes and Symbolic Points

Routes and Symbolic points menu are used to configure what routes AGV's are allowed to drive, adding speed limit to specific route segment(s) and defining symbolic points to represent interactable locations.

Rout	es and Symbolic Points
Create	e and edit routes and symbolic points
Rou	te Segments
Creat	e and edit route segments
Sym	bolic Points
Creat	e and edit symbolic points
Rou	te Properties
Edit	oute properties
Rou	te Rules
Edit	oute rule properties

Fig. 18: Route and Simbolic Points.

Route segments

Routes consist of nodes and segments between nodes. Each node may be linked with segments to one or several other nodes. Nodes are defined by two properties, location and direction. When two nodes are linked, a route segment is automatically formed between the nodes.

• Select "Draw Routes" and create a segments





Fig. 19: Route Segments Menu (left), creating a segment (right).

- If no node is selected, clicking empty space creates a new node. A node can be selected by clicking it and deselected by clicking it again.
- When a node is selected its location can be changed by dragging the node. The direction of a selected node can be rotated by dragging the direction vector of the node.



Fig. 20: Rotating a node (left), Moving a node on segment (right).

- Each route segment can be driven in different directions.
- Different route properties and rules can be modify as well in the options.



Fig. 21: Segments with a reverse and a forward direction.

Symbolic Points

Symbolic points are the target points to which vehicles can be driven to and where various actions can be executed.

• A new symbolic point is created by clicking on a route node.



• Symbolic point properties can be changed via the tool menu on the left.



Fig. 22: Segments with simbolic points.

1.2.5. Export /Upload

When the driving area is defined, data needs to be transferred to Navitrol/MAV.

Export / Upload Export or upload environment model and route files	Export Old en Navit	and upload route ar vironment or route fi rol Clients	nd environment files to les will be renamed.	a Navitrol client.		
Export to file		Name	IP	Usemame	Password	Homefolder
Evport Equippement	Þ	AGV	10.10.6.100	navitec	navitrol	navitec
Export Environment Export Routes				navitec	navitrol	navitec
Export machine type parameters	•					
Export Dynamic Mapping Server Data						
Upload environment model and routes						
Upload to Navitrol						
	Uplo	ad to Selected				Close

Fig. 23: Uploading to Navitrol.



1.3. Introducing to Navitrol Monitor

1.3.1. Starting Program and connecting to MAV

Step1: Open the software Navitrol tools: "NavitrolMonitor.exe."



Fig. 24: Navitrol User Interface.

<u>Step2</u>: The login window will show up. Default password for login is ntnavitec.

The password can be reset or changed if needed.

<u>Step3</u>: Set Name and IP for each AGV you want to connect. IP addresses can be added or modified also later.

-12	.11	-10 -9	-8 -7	-6	1.5 1.4
	0	Edit IP Address	es –		\times
		Name	IP	Port	
	•	AGV1	10.10.6.100	1234	
		192.168.0.103	192.168.0.103	3 1234	

Fig. 25: Editing AGV Parameters.

<u>Step4</u>: Connect to MAV. The connection status can be verified in the lower left corner of the window.

F	File Vi	ew C	harts	Navitrol	Languag	e					
IP:	AGV1 -	192.168.	1.178		~	Edit	Connect		Log (Dumps	Set Po
7	-9	-8	-7	-6	-5	-4	-3	3	-2	-1	0
6											

Fig. 26: Connecting to MAV.



<u>Step5:</u> the initial position from the AGV can be set with the "Set Pos" Button.

Pressing the button causes monitor to go into state where machine location can be shown on the map by pressing the right mouse button. Position can be rotated by keeping the right mouse button pressed.



Fig. 27: Setting Position.

Make sure that the installation space according to the robot working space and the size and specification of the electrical control box.

1.3.2. Driving Vehicle

Drive Orders

Step1: with the menu "driving orders" is possible to drive the vehicle.

- Moving the mouse on the map shows whether the route to the mouse location can be found.
- This software can be used to make a production simulation. Stopping points and route points can be selected.
- Wait time at each location can be edited. Drive can be started with Drive button and stopped with Stop button.

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Sanddone Enabled Pelesse Hold O Def Ab1 Ab2 Ab3 Pouse Production Smulation Enabled Task Add new drive Delete selected Add target Delete selected Add target Delete selected Name Loop RetumBack Name Wat Time Sec (1) J J
Endeled Release Rold O Def As1 As2 As3 Release Custom O Pause Production Simulation O Enabled Task It Add new drive Delete selected Add target Delete selected Name Loop RetumBack Name Wat Time Sec (1) 3 (2) 3
Release Hold • Def • At • At
Release Custon 0 Pauce Production Simulation Production Simulation Enabled Task Ist Task Ist Add new drive Delete selected Add target Delete target Ad
Production Simulation
Enabled Task lat Add new drive Delete selected Add target Add target Delete target Add target O before after selected task Name Ucop ReturnBack Name Wat Time Sec (1) 3 (2) 3 (2) 3 (3) (3) (3) (3) (3) (3) (3) (3) (3)
Task lat Task Add new drive Delete selected Add target O before @ after selected task Name Loop ReturnBack Name Wat Time Sec (1) 3 (2) 3 (2) 3 (3) (3) (3) (3) (3) (3) (3) (3) (3) (3)
Add raw drive Delete selected Add target Delete target Add target O before @ after selected task Name Loop ReturnBack Inew drive Image: Color of the selected task Name Wat Time Sec (1) 3 (2) 3
Add target O before (e) efter selected task Name Loop ReturnBack new drive (1) 3 (2) 3
Name Loop RetumBack Name WatTimeSec new dive
new drive (1) 3 (2) 3
(2) 3
(3) 3
Taroet: (1)
State: Auto
Stop Status: drive_to_target
Onse

Fig. 28: Drive Orders options.

Custom Route

Pressing Custom Route opens a separate window where the speed can be selected and with right click on the map to a route can be created.



Fig. 29: Custome Route.

NOTICE

Improper use of the AGV

► This User Guide gives only a small introduction about the use of the software. If more detailed Info is require please consult the Software user guide.

DANGER

Improper handling of the AGV

Improper handling of the device can lead to serious injuries.





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