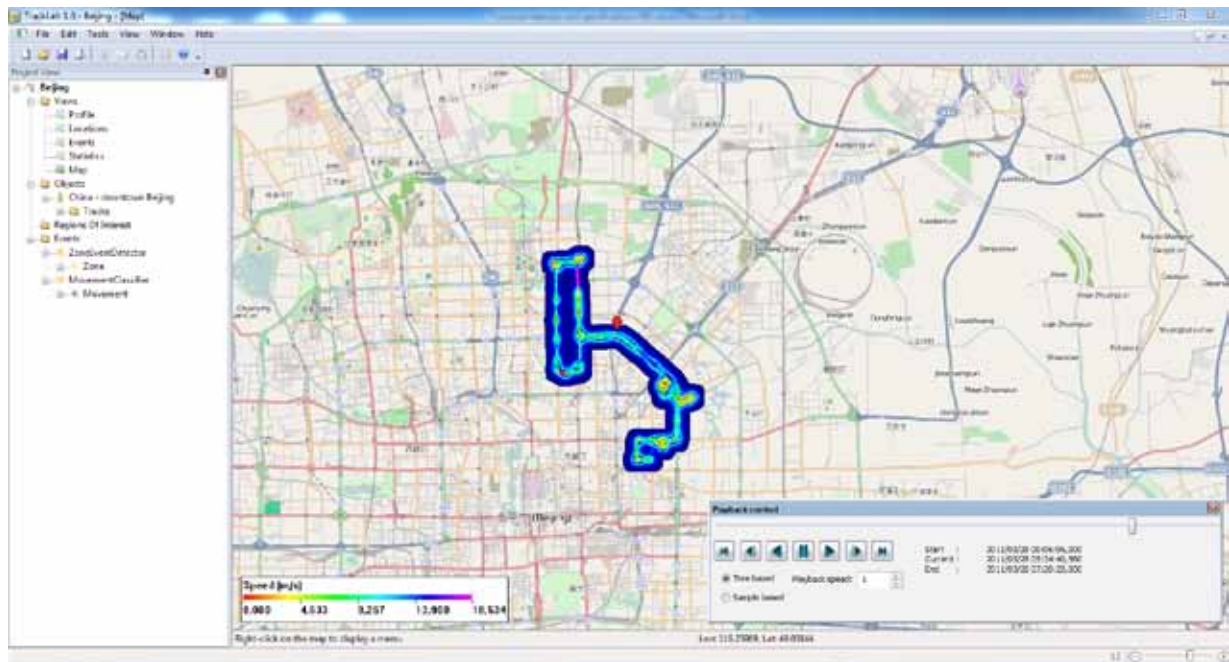# TrackLab
Features and specifications

TrackLab is the software tool for recognition and analysis of spatial behavior and the design of interactive systems. Track-Lab is the versatile workbench for all your studies on movement and location, and the design of location-based systems and services. It will aid you in the complete process of your work on spatial behavior. After you decide on the most suitable tracking technology, TrackLab lets you import the collected tracking data in real-time or offline. The data you collect can be visualized, processed and analyzed. Furthermore, you can create interactive systems that respond in real-time to the location or spatial behavior of subjects being tracked.

1. TRACKING TECHNOLOGY

TrackLab is designed as an open and flexible system, so that the software works with a wide variety of tracking technologies.
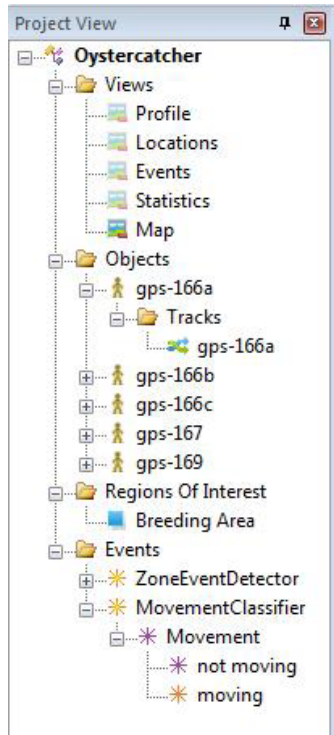- For *Outdoor tracking* you can use GPS data, either real-time or offline and if you want improve the data quality with augmentation services such as EGNOS or WAAS.
- *Indoor tracking* can be applied in settings ranging from a controlled laboratory to a real-life environment, from consumers in a supermarket to cattle in a farm.

TrackLab supports a wide variety of indoor tracking solutions, including Ubisense™ ultra-wideband sensors and tags, EagleEye™ stereo camera sensors, the EthoVision® video tracking system, and our video-based PeopleTracker™ (coming soon). For offline import of tracks, TrackLab supports GPX, CSV and JSON formats. For live import of real-time data, TrackLab incorporates an import engine to enable it to be able to handle a wide variety of formats.

2. DATA PREPARATION

As with all measurement systems, location measured using GPS devices has errors associated with it. The size of the error varies according to atmospheric conditions, the location of the subjects (for example, tall buildings can block satellite reception), and movement of the subject. TrackLab incorporates data processing algorithms to remove outliers and smooth the data which specially designed to improve the quality of GPS track data. Furthermore there is also a powerful function to select and edit individual tracks to improve your data quality.

3. PROJECT NAVIGATION

TrackLab saves data in project files, which contain the objects being tracked, the tracks themselves (longitude/latitude or x-y Cartesian coordinates), zones and points of interest and creating events based on zones and movement which can be used for calculations and integration with other software. TrackLab has an Explorer interface, so that you can easily move between the different components of your project.
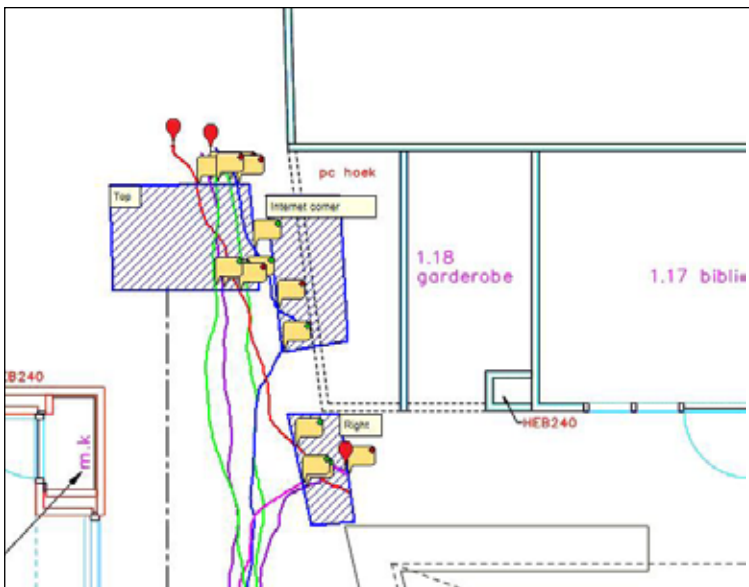
4. VISUALIZATION

You can explore and view your TrackLab data in a variety of ways:

Locations show data for each track point (or GPS fix) including the Y, Y, Z (longitude, latitude, and altitude), speed and acceleration. You can also copy this data to other programs for further analysis and sort and edit the data in this view to remove outliers.

	Sample index	Time (yyyy/MM/dd HH:mm:ss.fff)	Location (Lon)	Location (Lat)	Location (Ele)	Time Difference (HH:mm:ss.fff)	XY Distance (m)	XY Speed (m/s)	XY Accelera (m/s
	1303	2010/02/26 14:53:39,000	5,64781	51,97505	53,00000	00:00:01,000	7,052	7,052	
	1304	2010/02/26 14:53:40,000	5,64791	51,97507	53,00000	00:00:01,000	7,298	7,298	
	1305	2010/02/26 14:53:41,000	5,64804	51,97508	53,00000	00:00:01,000	9,223	9,223	
	1306	2010/02/26 14:53:42,000	5,64820	51,97510	53,00000	00:00:01,000	11,172	11,172	
	1307	2010/02/26 14:53:43,000	5,64837	51,97510	53,00000	00:00:01,000	11,077	11,077	-
	1308	2010/02/26 14:53:44,000	5,64853	51,97511	53,00000	00:00:01,000	11,015	11,015	-
	1309	2010/02/26 14:53:45,000	5,64872	51,97510	52,00000	00:00:01,000	13,068	13,068	
	1310	2010/02/26 14:53:46,000	5,64888	51,97511	52,00000	00:00:01,000	10,153	10,153	-
	1311	2010/02/26 14:53:47,000	5,64899	51,97511	52,00000	00:00:01,000	9,008	9,008	-
	1312	2010/02/26 14:53:48,000	5,64914	51,97513	52,00000	00:00:01,000	10,448	10,448	
	1313	2010/02/26 14:53:49,000	5,64930	51,97517	52,00000	00:00:01,000	12,094	12,094	
	1314	2010/02/26 14:53:50,000	5,64940	51,97519	52,00000	00:00:01,000	7,232	7,232	-
	1315	2010/02/26 14:53:51,000	5,64951	51,97520	52,00000	00:00:01,000	7,298	7,298	
	1316	2010/02/26 14:53:52,000	5,64958	51,97520	52,00000	00:00:01,000	5,021	5,021	-
	1317	2010/02/26 14:53:53,000	5,64967	51,97520	52,00000	00:00:01,000	5,982	5,982	
	1318	2010/02/26 14:53:54,000	5,64971	51,97518	52,00000	00:00:01,000	3,633	3,633	-
	1319	2010/02/26 14:53:55,000	5,64975	51,97514	52,00000	00:00:01,000	4,989	4,989	
	?0	2010/02/26 14:53:56,000	5,64979	51,97510	52,00000	00:00:01,000	5,842	5,842	
		2010/	64982	51,97505	52 000	00:00:01,00			
			983	61					

Maps show your tracks either on OpenStreetMap or on a bitmap that you import (depending on your type of data). You can pan and zoom the map, and draw points and regions of interest. You can plot the tracks as trajectories (in a variety of styles), or show the sample density as a customizable heat map. The tracks can be played back in a variety of ways, so that both short tracks and those acquired over a long time period can be played back conveniently.

Graphs show the value of a measured variable (currently only speed) over time, synchronized with the other views.
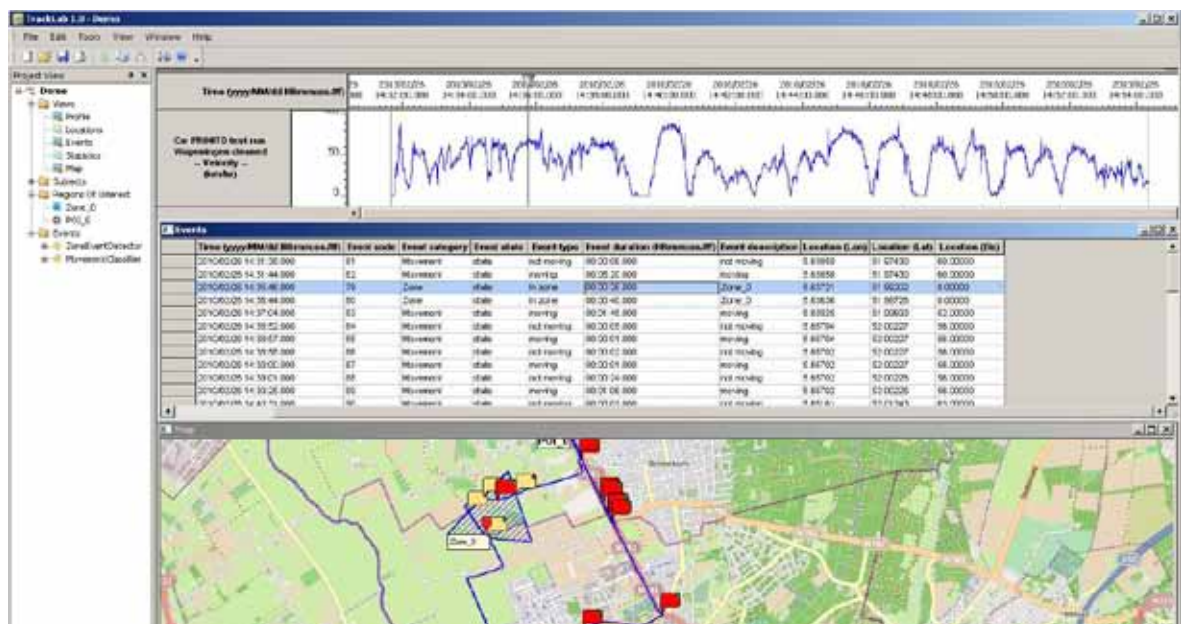

5. STATISTICS

You can use the location of your tracked subjects in relation to zones and also whether or not they are moving to generate *events*. You can create an analysis report showing detailed information about each of these events.
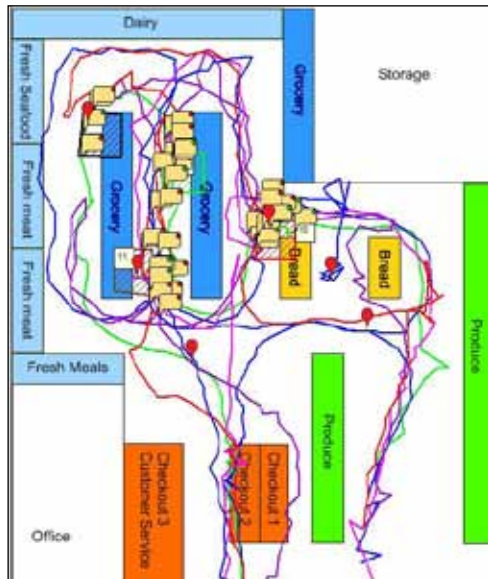
You can also make an analysis report showing a wide range of variables for each of your tracks, with statistics such as duration, average speed, maximum acceleration, movement statistics (according to thresholds you can set yourself), a variety of parameters describing the path shape, and statistics quantifying the zone visits.

Track	Statistics										
		139						144			
Point/Zone/Movement		\<Whole Track\>	Reception	Entrance	Right	Internet corner	Top	\<Whole Track\>	Reception	Entrance	Right
	Number of Tracks	1	-	1	1	-	-	1	-	1	-
	Duration (HH:mm:ss.fff)	00:00:09,844	-	00:00:01,375	00:00:00,813	-	-	00:00:01,438	-	00:00:00,281	-
	Number of Samples	142	-	20	13	-	-	21	-	5	-
	Distance (m)	4,945	-	0,599	0,616	-	-	1,453	-	0,227	-
	Distance from Starting Point (m)	4,344	-	-	-	-	-	1,437	-	-	-
	Maximum Speed (m/s)	1,594	-	0,671	1,223	-	-	1,391	-	0,913	-
	Minimum Speed (m/s)	0,011	-	0,262	0,583	-	-	0,716	-	0,716	-
	Average Speed (m/s)	0,502	-	0,436	0,759	-	-	1,011	-	0,867	-
	Maximum Acceleration (m/s²)	31,406	-	5,262	6,616	-	-	4,618	-	2,579	-
	Minimum Acceleration (m/s²)	-12,971	-	-3,797	-4,691	-	-	-4,500	-	-1,879	-
	Average Acceleration (m/s²)	0,413	-	0,167	1,000	-	-	0,105	-	0,333	-
	Moving Duration (HH:mm:ss.fff)	00:00:00,313	-	00:00:00,000	00:00:00,219	-	-	00:00:00,531	-	00:00:00,000	-
	Moving Distance (m)	0,371	-	0,000	0,231	-	-	0,639	-	0,000	-
	Moving Average Speed (m/s)	1,189	-	0,000	1,060	-	-	1,204	-	0,000	-
Path Shape	Maximum Heading (deg)	170,687	-	-	-	-	-	108,114	-	-	-
	Minimum Heading (deg)	-174,631	-	-	-	-	-	78,724	-	-	-
	Average Heading (deg)	-102,411	-	-	-	-	-	87,550	-	-	-
	Maximum Turn Angle (deg)	42,453	-	-	-	-	-	5,480	-	-	-
	Minimum Turn Angle (deg)	-31,444	-	-	-	-	-	-3,748	-	-	-
	Average Turn Angle (deg)	-0,507	-	-	-	-	-	1,263	-	-	-

The data of all the views are synchronized so that you can explore the interaction between, for instance, velocity and location.

6. real-time integration with other software

TrackLab is able to provide its data real-time to other software. For instance, when a subject enters a zone or starts moving, that generates an event, which can be communicated to another program. In the example below, a consumer entering a location in a supermarket (visualized by the comment markers) is shown a personalized message on a display at that location, dependent on the path they have taken through the shop. TrackLab's real-time integration opens up a whole set of possibilities, and Noldus will be happy to help you configure it to your particular needs.

7. system requirements

Minimum system requirements
- 1 GHz or faster 32-bit (x86) or 64-bit (x64) processor
- 1 GB RAM (32-bit) or 2 GB RAM (64-bit)
- 1 GB free hard disk space
- Internet access
- US-English Windows 7
  (TrackLab can run on Windows XP and Windows 8, but limited testing has been done on these platforms)

Additional recommendations
- TrackLab has been designed to work with multicore processors, which allows the application to run as fast and smoothly as possible.
- For processing large datasets or data with high sampling rates, we recommend to use a workstation with more internal memory.