DRAGONFLY

Dragonfly is a visual positioning system that provides precise location in 3 dimensions to vehicles, forklifts, automated equipment, mobile robots and drones.

Applying our patented simultaneous localization and mapping (**SLAM**) technology, Dragonfly uses an on board camera to deliver highly accurate location. No other sensor is needed. No infrastructure to be deployed in the venue, no “antennas”, “receivers” or “nodes”. Dragonfly performs SLAM, localizing the device while simultaneously mapping the surrounding environment.

Dragonfly helps solve a major problem: GPS does not work indoors, and it may not be accurate enough outdoors. Robots, Drones, Vehicles, AGV cannot rely on GPS for most of the operations.

Dragonfly provides instead a reliable, effective and accurate location, by using only an on board camera. **The camera is the only sensor required to compute location.**

SOLVING THE INDOOR LOCATION PROBLEM

Dragonfly easily solves the problem of locating vehicles, robots and drones indoors.
We all know the limits of other technologies: UWB requires the deployment of a dense infrastructure and while line-of-sight is not needed on paper, it is a requirement in real life; LiDARs work pretty well but are expensive, fragile and subject to damages.

Dragonfly is made to be a “plug and play” technology that immediately works and delivers accurate location. This makes it extremely easy to track and locate forklifts, robots, drones.

FEATURES

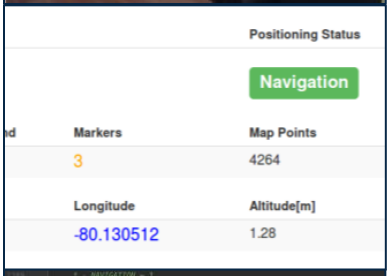
Dragonfly computes the device's location in a venue and makes it available for external applications.

Coordinates

The location is provided as 6-DOF [x,y,z + yaw, pitch, roll] and WSG-84 [latitude, longitude + and altitude off the floor]

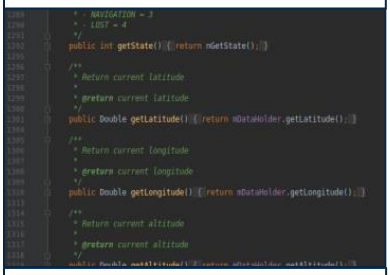
Physical working environment

Dragonfly can work indoors, outdoors or a mix of both.



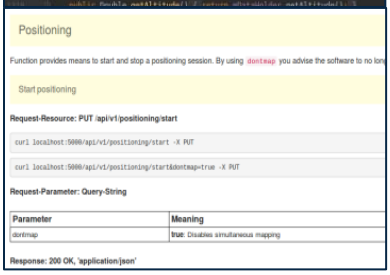
Accuracy

Dragonfly can deliver an average location accuracy of 5 cm, when properly calibrated.



Programming environment

Dragonfly comes as a Java application with full support for Linux and MacOS. Different integrations and environments can be provided upon request.



Integration

Dragonfly provides API for custom integration into external applications.

SYSTEM COMPONENTS

Camera One camera has to be mounted on board the devices. Dragonfly can leverage the existing cameras, if any.	
Computing Unit Dragonfly runs on a computing unit (or on a server) that collects the video streams from the camera. The server can be an on-board machine, or a remote server to which the devices connect over an internet connection.	
Dashboard The dashboard allows the management of the site's data and integrates the visualization of real time positions along with analytics.	

SYSTEM CALIBRATION

Dragonfly must be calibrated prior to using the system, to provide a valid geo-reference. The calibration process establishes the relationship between the map and global coordinates (latitude and longitude, or x, y, z –in meters-), as well as altitude off the floor. No markers or hardware need to be installed in the environment for this process.

The camera has to be calibrated as well, and Dragonfly provides a simple visual tool to perform the calibration.

EQUIPEMENT

1. Monocular or Stereo Cameras

Dragonfly can work with monocular and stereo cameras: there are important differences to consider when choosing the type of camera.

Usually Onit provides the cameras so that our clients don't have to worry about that.

The following table explains the differences between different cameras

Type of Camera	**Monocular Camera**	**Stereo Camera**
Pure rotation movements*	NO	YES
Field of View	120-180°	90-120° (Each camera)
Accuracy	5-10 cm	
Resolution	VGA (640x480 px resolution)	

** Pure Rotation happens when the camera rotates on just one axis. This happens frequently on drones, for example. Dragonfly cannot support this movement on monocular cameras, unless the environment has been previously mapped.*

2. Computing Unit

Dragonfly requires a powerful computing unit (or server), where the location engine runs. Dragonfly can run on board on a Computing Unit or on a Server, local or cloud.
Onit usually provides the computing unit, if there isn't already enough computing power available.

	Monocular Camera	**Stereo Camera**
CPU	Quad-core, at least *AMD Ryzen 3* or *Intel Core i3-8100*	Quad-core, at least *AMD Ryzen 5* or *Intel Core i5-8100*
RAM	16 GB	32 GB
O/S	Ubuntu 16.04, Ubuntu 18.04 or MacOS High Sierra	

SYSTEM ARCHITECTURE

Dragonfly is provided in different configurations to accommodate a variety of needs.

1. Cloud based	The basic system architecture consists of a camera that streams the video to Onit's cloud server, which elaborates the location. This architecture requires a valid internet connection (WiFi, 4G, 5G) and a bandwidth of at least 2 Mbps/device. The cloud server provides the location in real time through a dashboard and API for custom integration.
2. Local Server	The Local Server architecture is similar to the Cloud based one: the camera on board of the device streams the video to a local server, on premise. Dragonfly runs on this server and makes the location available to external applications. It does not require internet connectivity, just a local WLAN
3. On board processing	Dragonfly runs on board of each device. Each device must be equipped with a camera and a computing unit, where Dragonfly runs. Each device is therefore "standalone" and does not require any external connection. Of course, a connection is required if "off board" applications need to access the location data.

The precision and the accuracy of Dragonfly are not affected by the type of architecture.