GUIDE TO THE USE OF “LB UWB MONITORING” AND BEACON FIRMWARE

INSTALLING BEACONS INSIDE THE FLIGHT AREA:

The first part of installing beacons requires placing them in the point of the show area where they are away from metal objects , which can interfere with the transmission and reception signal .
Then , identify the best spots in the room that meet this requirement , the beacons should preferably be placed in the corners of the room , in such a way as to form a flying area , which will be located approximately in the center of the room.
The beacons should be oriented towards the center of the room for better signal transmission.
After having correctly positioned the beacons, the test to check that they are all active and with the correct identification for each of them is carried out with the program: “LB UWB monitoring tool”.

ACTIVE DIFFERENT MODE IN THE beacon:

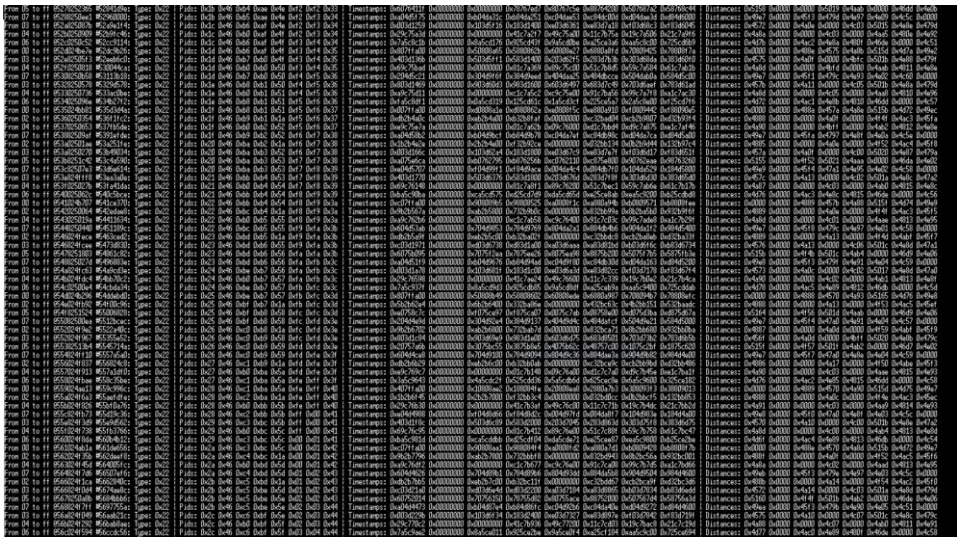
To set the beacon in the different mode it is necessary to have the latest firmware installed. With this firmware it is possible to set the beacon in different modes: (Tdoa, Sniffer). In Tdoa mode, the beacon behaves like a normal node in the beacon network. In sniffer mode, on the other hand, it is possible to use the beacon as a sniffer to receive the information sent by the other beacons. To activate these modes it is possible to connect to the beacon with a Serial Monitor program, such as TeraTerm or RealTerm , preferably with a baud-rate of 115200.
Once connected to the beacon, if it was set up for the first time with the firmware, you should be presented with this screen:

This is the home screen of the beacon, in this screen there will be various information about the beacon:

- System and test: These are self tests made by the beacon if everything is working, "OK" should appear next to the message, otherwise "FAIL" will appear.
- The UWB channel : It can be channel 5 (6.5 GHZ) or channel 9 (8 GHZ).
- The address: It's the address of an beacon inside the network (Tdoa2 = 0 to 7)
- Mode : The mode can be Tdoa beacon and Sniffer . The first time you install the firmware in a new beacon , the firmware should set Tdoa mode as default , actually the Tdoa mode is version 2 .
- Tx Power : This is the power settings of the beacon , transmitting/receiving.

SNIFFER MODE:

To activate the Sniffer mode inside the home screen you have to press the "s" key . After pressing the "s" key you should see a continuous flow of information . These are the packets from the other beacons in the net. These packets indicate that the beacons are transmitting and receiving data in the network.



Once activated in this mode , the beacon will save it in his memory . So when the beacon is restarted it will remain in sniffer mode. This feature is useful because you can use the same beacon as a sniffer every time you need it.

TDOA MODE:

If you want to return the beacon to Tdoa mode, press the "t" key while printing the sniffer information.You should no longer see any information but the home screen again. As the sniffer mode , the tdoa mode is also saved in the memory of the beacon.

CHANGE THE CHANNEL OF THE beacon:

To change the beacon channel which can be 5 or 9, go to the beacon's home screen and then press the "c" key. At this point a submenu will open in which it will be possible to choose between channel 5 or 9, by pressing the "5" or "9" key. This information will be saved in the memory of the beacon.

It is essential that the sniffer beacon is of the same channel as the beacons in the network to allow the reception of packets.

CHANGE THE ADDRESS OF THE beacon:

To change the beacon address which can be between 0 and 7 ,while you are in the home screen simply press the number on the keyboard that corresponds to the address which you want to insert in the beacon. The beacon will automatically save this information in his memory.
For the sniffer mode there is no need to set a specific address. The address will be used to identify the beacon when it is in Tdoa Mode

CHANGE THE POWER OF THE beacon:

The power of the beacon is equivalent to its transmit and receive power of the DWM3000. This value depends on several factors such as:

- The size of the room inside which the beacon net is located
- The distance between the beacons, both vertical and horizontal
- By the presence of obstacles in the room , solid obstacles or metallic

During our tests at the lab of Luminous Bees , we set the power of the beacons at their maximum value inside of a space where the beacons are widely spaced , and we had satisfying results . The size of the room affects the power of the beacons , in fact the more the beacons are spaced apart , the more it will be necessary to increase the transmission and reception power to allow optimal communication.

To change the power in the beacon it is necessary to press the "p" key on the home screen, once pressed, a submenu will appear.In this menu there will be various combinations of fine and coarse. By pressing a key between 0 and 9 it will be possible to decide between one of them. Subsequently the power value will be saved in memory.

THE PROGRAM:

The UWB Monitoring program will be used in two stages of testing:

1) Functional test of all beacons and identification of the flight area(V 1.0)

2) Improvement of the signal between the beacons themselves(V 2.0)

*In both programs, the information may not show up immediately. To remedy this it is necessary to disconnect the beacon from the USB port and close the program. Then connect the beacon and restart the program.This should fix the problem.

LB UWB monitoring tool:

This tool is used to evaluate the signal quality of the beacons within the area where the drone show will be held. The tool uses a beacon which is called "sniffer" which is connected to the PC by usb cable. The task of this beacon is to sniff the information coming from the beacons that are activated at that moment in the flight area.
From this information we can first understand if a certain beacon is on or off, and then establish in a general way his quality .

THE PROCEDURE:

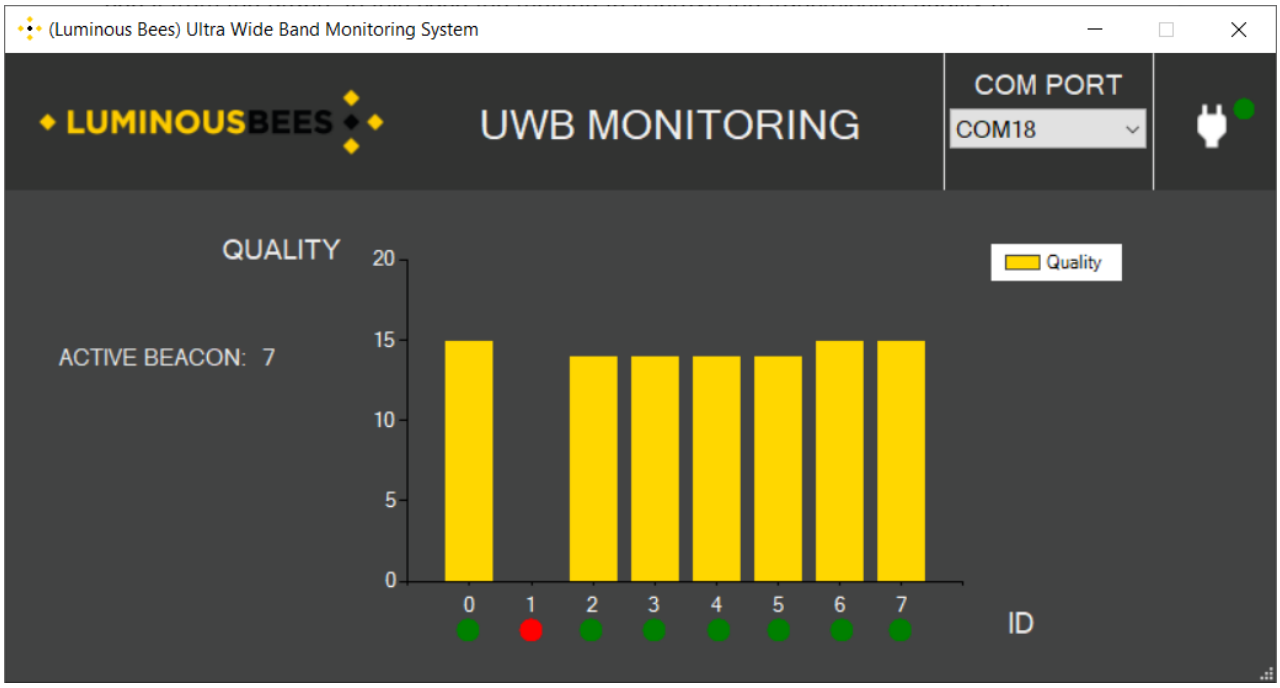
The procedure to determine the maximum reception point of the signal coming from the beacons using this tool is to position yourself in the center of the room. After that you start the program , you can connect to the beacon through a serial connection. By selecting the right COM port (corresponding to the beacon sniffer) and clicking on the "CONNECT" button , the program will connect to the beacon and will start to receive information from it.

The information will be displayed on a bar graph which will have the address of the beacons on the X axis and the general quality of the same beacon on the Y axis.
At the left of the GUI you can see the current active beacon.

The led under each address on the X axis, on the other hand, indicates whether the beacon is active or deactivated. If the LED is green it indicates that the beacon is

active and is transmitting information, otherwise if the LED is red it means that the beacon is deactivated or that it has an unstable signal.

To determine the best reception point, the signal quality of all the active beacons will form a graph with bars of linear height, this indicates precisely that the reception of the signal from all active beacons is stable and linear.
For a better estimate of the reception of the beacons you should walk the perimeter of an imaginary square in the center of the room and make sure that in the perimeter of this square the signal quality of all the beacons remains stable.
If one of the beacons should have a lower quality than the others it will be possible to see it from the graph. Otherwise the optimal situation (excluding beacon 1) would be like the one in the image below.



Thanks for your attention from Luminous Bees