myVibrometer (HD) - Quick User Guide

CONTENTS

1. Introduction to myVibrometer

"myVibrometer" is a tool for measuring and recording vibrations/accelerations in realtime. Activating the "recording" the instrument will records:

- the instantaneous values of the accelerations along the X, Y, Z axes (using the accelerometer inside the device)
- the instantaneous values of orientation (using the internal compass of the device)
- navigation data (such as course, speed, velocity, altitude, latitude, longitude, using the satellite positioning system "GPS")
- the timestamp for each measure (using the internal clock of the device)
- automatically calculates the minimum and maximum values for the recorded vibrations
- calculates the vibrations energy for unit mass (m = 1 kg) for the recorded vibrations

The recorded data are graphically displayed by the instrument with the possibility of filtering components of the axes that are not desired. The graph of the vibrations can be saved in the "Photo Album" of the device, can be sent by e-mail, can be printed or shared with other apps installed on the device such as DROPBOX.

The instrument stores the numerical data recorded on a text file (.csv file format) formatted with characters semicolon (";") data delimiter. The .csv file with the recorded data can be:

- sent with an email (email attachment)
- shared with Dropbox (to share/send the recorded data with colleagues or friends)
- shared with other applications installed on Your device like Numbers, iNotePad, megaDownloader Web Browser, Pages, etc... for a future analysis
- copied on Your Mac or PC using "iTunes File Sharing"
- imported and used in a common analysis software for MAC or PC like Numbers, Excel, Text Editor, etc...

Using the zoom (by dragging two fingers on the screen – pinch gesture) and pan function (dragging a finger across the screen), you can view, save, send with an email or print only a detail of interest of the diagrams of the vibrations/accelerations (double touch with a finger to restore the initial conditions of the zoom and pan).

The instrument can also be used (for example leaving it active during the night) to monitor and alert you with an alarm in the event of earthquakes, tornadoes or undesired human presence; setting the minimum alarm threshold value the measuring instrument (ambient monitoring feature) will be able to perceive the oscillations of the floor caused by one or more people that are walking nearby (also 4/5 meters away – it depends by the ground materials) or by an initial earthquake vibrations / tornado and alert you with an alarm sound. The instrument is able to perceive the structural vibrations imperceptible by the human being. All will be recorded on file with all information related to location, time, navigation data, etc... as described in this document.

2. Recorded accelerations graphs window

Labels for displayed accelerations diagram, along the axes x (red), y (green), z (blue)

Scale for the accelerations diagram (expressed in g: gravity acceleration)

Controls

Displayed accelerations diagrams page info: current page / total pages

Vibrations energy, minimum and maximum values of the recorded accelerations

VIBRATIONS ENERGY (J , m=1Kg)
3.016434
X-AXIS ACCELERATION MAX-/MAX+ (g)
(Xmin=-0.263587 , Xmax=0.290917)
Y-AXIS ACCELERATION MAX-/MAX+ (g)
(Ymin=-0.298862 , Ymax=0.373604)
Z-AXIS ACCELERATION MAX-/MAX+ (g)
(Zmin=-0.429100 , Zmax=0.434878)

Figure 1
(iPad version)

Controls

Labels for displayed accelerations diagram, along the axes x (red), y (green), z (blue)

Scale for the accelerations diagram (expressed in g: gravity acceleration)

Controls
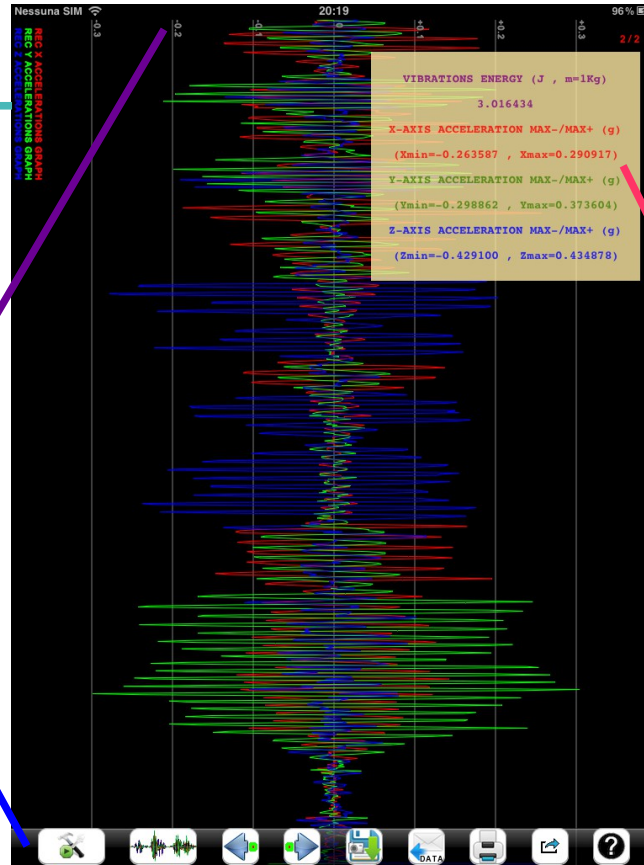
Displayed accelerations diagrams page info: current page / total pages

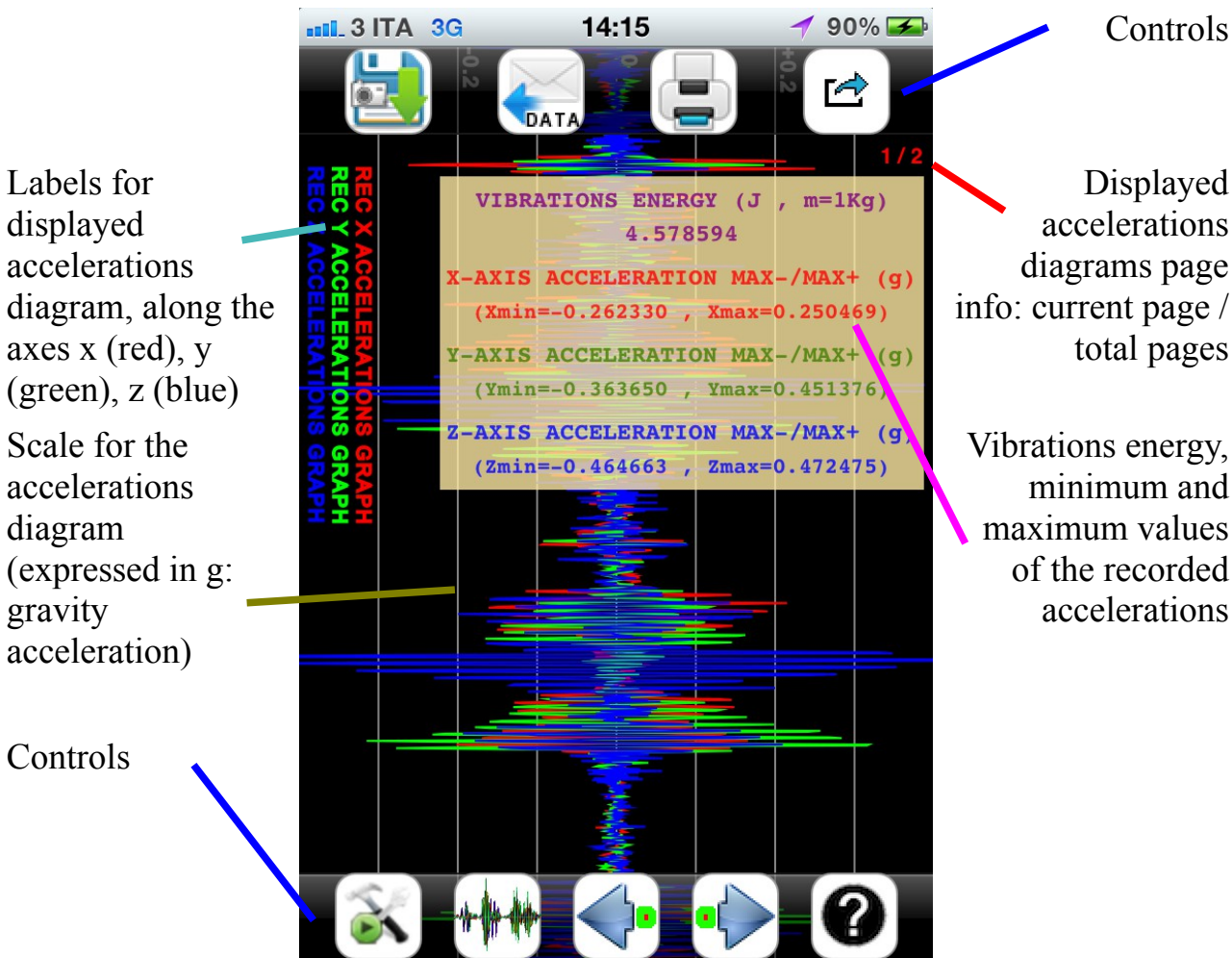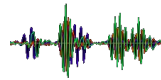Vibrations energy, minimum and maximum values of the recorded accelerations

Figure 2
(iPhone / iTouch version)

Press this button to manage the type of information that will be displayed by the instrument and the graph zoom scale for the accelerations diagrams:

" X-AXIS ACCELERATIONS GRAPH "

Filter settings for the accelerations graph along the X axis: enable:ON or disable:OFF the visualization of the diagram of the accelerations along the X axis

" Y-AXIS ACCELERATIONS GRAPH "

Filter settings for the accelerations graph along the Y axis: enable:ON or disable:OFF the visualization of the diagram of the accelerations along the Y axis

" Z-AXIS ACCELERATIONS GRAPH "

Filter settings for the accelerations graph along the Z axis: enable:ON or disable:OFF the visualization of the diagram of the accelerations along the Z axis

" ACCELERATIONS GRAPH ZOOM "

Adjust the zoom scale for the recorded accelerations/vibrations graphs visualization:
- High accelerations/vibrations: [-3g .. +3 G]
- Medium accelerations/vibrations: [-0.3g .. +0.3 G]
- Low accelerations/vibrations: [-0.03g .. +0.03 G]

the display zoom scale can be changed in realtime during recording and after the recording (analysis phase)

" NOTES "

Shows or hides the recorded values of the energy of vibrations per unit mass (m=1Kg) and the minimum (max negative value – negative axis) and maximum (max positive value – positive axis) values of the recorded accelerations

previous page   next page

It changes the current displayed page diagram for the recorded accelerations (the graph visualization is split into many pages, the current visualized page is indicated by the page info label at the top right of the screen)

Press this button to save the accelerations diagram currently displayed in the photo album of the device

Press this button to send the recorded data with an e-mail using a text files (.csv file format) attached to the email. This .csv file can be loaded and visualized using text editors or using analysis programs such as Numbers, Excel, OpenOffice Calc, Pages, Word, PowerPoint, Keynotes, Matlab, etc... The .csv file contains (recorded data):
- Accelerations along the three axes X, Y, Z
- Heading (device internal compass), for each recorded acceleration value
- Course, speed, altitude, latitude, longitude (GPS – satellite data), for each recorded acceleration value
- Timestamp (device internal watch), for each recorded acceleration value

Press this button to print the displayed diagram of the vibrations or a detail of that diagram (You can use zoom, pan or filters to highlight and print only a detail of interest of the acceleration diagram)

"Open In": use this button to share .csv file containing the data recorded with DROPBOX or other applications installed on the device (compatible with "Open In" like for example "megaDownloader Web Browser" app)

It opens the documentation URL: http://www.ngcybit.it where you can read / download the "myVibrometer" documentation

Display the instrument recording / monitoring window (windows for data recording, monitoring, settings and for the calibration of the measuring instrument)

3. Data recording / monitoring / settings window

Come back to the "Recorded acceleration graphs window" (it closes the recording windows)

Save in the photo album of the device an image of the measuring instrument (instantaneous values shown)

Real time accelerations values (along the X,Y,Z axes) and current value for the vibration energy for unit mass (m=1Kg)

Instantaneous accelerations diagram along the three axes X,Y,Z

Calibration for the measuring instrument

Instant values for compass and navigation data window

Start / Stop the measuring instrument: data recording

Measuring instrument settings

Figure 3
(iPad version)

Come back to the "Recorded acceleration graphs window" (it closes the recording windows)

Save in the photo album of the device an image of the measuring instrument (instantaneous values shown)

Real time accelerations values (along the X,Y,Z axes) and current value for the vibration energy for unit mass (m=1Kg)

Instant values for compass and navigation data window

Calibration for the measuring instrument

Instantaneous accelerations diagram along the three axes X,Y,Z

Start / Stop the measuring instrument: data recording
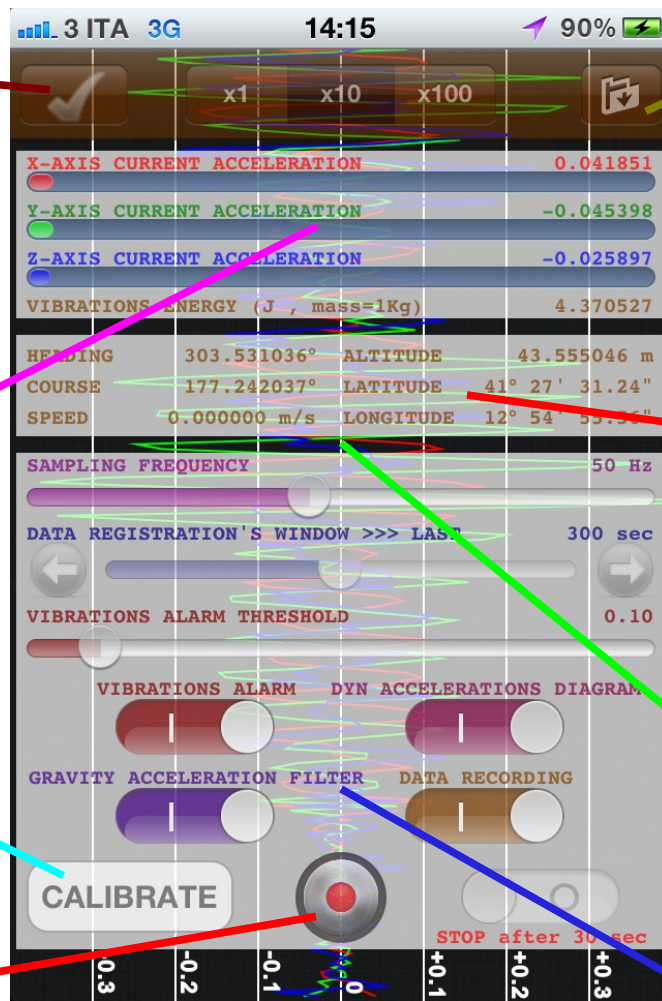
Measuring instrument settings

Figure 4
(iPhone / iTouch version)

SETTINGS WINDOW FOR MEASURING INSTRUMENT

" **SAMPLING FREQUENCY** "
Sampling frequency for the accelerations recording: it specifies the number of accelerations recorded per second by the system along the X,Y,Z axes

" **DATA REGISTRATION'S WINDOW >>> RECORD THE LAST:** "
Time window for recording: the system retains the measured accelerations of the last n seconds (from 5 seconds to 30 minutes for the iPad version, from 5 seconds to 10 minutes for the version iPhone / iTouch); the previous values will be automatically removed from memory (and removed from the .csv recorded file). This features allows You to leave the instrument running for an infinite time.
This control can be set only before start the accelerations recording; to change the values of this control, you must first stop the recording

" **GRAVITY ACCELERATION FILTER** "
Filter for the gravity acceleration: when the recording system is running it will filter the gravity acceleration - the measurement of the "vibration energy" can be altered if this control is disabled

" **DATA RECORDING: ACCELERATION, COMPASS, NAVIGATION, TIMESTAMP**"
Enable or disable the recording of accelerations, compass data, GPS navigation data, timestamp data: disable it if You need to see only the instantaneous values of accelerations or to use the instrument like a monitoring system. If this value is turned OFF the instrument will not save the recorded data in the .csv file and the graphics and / or recorded data will not be available for future analysis, when the recording session will be stopped.

" **VIBRATION ALARM** "

Enable or disable the alarm on vibration: when an acceleration exceeds the threshold specified by the control "VIBRATION ALARM THRESHOLD "(expressed in g - acceleration of gravity) the system will emit an alarm sound (monitoring and alert feature). If the control "VIBRATION ALARM THRESHOLD" is set around the minimum value, the instrument will be able to record vibrations imperceptible by humans such as the oscillations of the floor caused by a person that is walking (also at 4/5 meters of distance – it depends by the ground floor materials). Use the minimum value of this control (you will see the label "EARTHQUAKE") during the night and leave the measuring instrument active (recording on) to transform the device in an earthquake / tornado monitoring, prediction and alarm system (this allows You to have more seconds to save Your life when an earthquake or a tornado is near You) or to check undesired human presence in Your bedroom (for example when You are sleeping). If the value "EARTHQUAKE" is displayed, the instrument will be able to perceive any small vibration of the structure where it is resting. If desired, the device can also be connected to an Hi-Fi stereo (using the Apple AV cable or with a bluetooth connection), to obtaining a monitoring and alarm system for vibrations in your home

" **CALIBRATE** "

Press this button for the instrument calibration: place the instrument in an stable flat surface, with the display facing up, gently press CALIBRATE button to start the automatic calibration routines and to calibrate the measuring instrument

" **STOP MEASUREMENT after 30 sec** "

Set this control to ON if you must measure and compare multiple structures (vibration and vibration energy): the instrument will measure/record exactly 30 seconds for each structure and at the end it will be possible to compare the various structures measured using an equal intervals of recording time: So, You can compare the minimum and maximum values of acceleration registered and the vibration energy ("VIBRATIONS ENERGY") of the measured structures.
The structures more "motionless" will have for example the VIBRATIONS ENERGY lowest while the structure with an higher "max accelerations" value will be more stressed, etc...

Measuring instrument active: ON   Measuring instrument stopped: OFF

Start or stop the measuring instrument: after calibrating the instrument, use this button to start (or stop) the measuring instrument and the data recording/logging or to start the monitoring system for earthquakes, tornadoes, undesired human presences near You

" DYN ACCELERATIONS DIAGRAM "

Enable or disable the visualization of the dynamic accelerations diagram (realtime diagrams) along the three axes X, Y, Z (only iPhone / iTouch – for the iPad version it is always enabled:ON). Disable it if the device's processor is too slow (old devices).

4. Send the recorded accelerations with an e-mail, recorded data sharing

The data recorded by myVibrometer can be sent via e-mail using the myVibrometer email client (you must first have set up an email account using the default software "Mail").
The system attach to the email the text file "ACCDATA.csv" containing:
- the values of the recorded accelerations along the axes X, Y, Z
- the values measured by the internal compass (orientations) of the device
- the values of navigation: course, speed, altitude, latitude, longitude
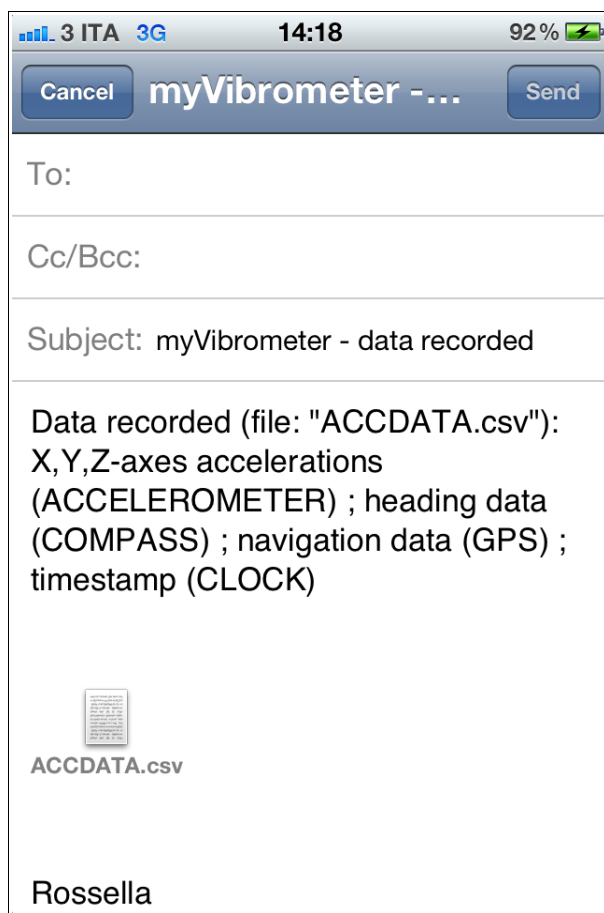- the time of recording (timestamp)

Figure 5

<p align="center">*"ACCDATA.csv" FILE FORMAT*</p>

Each line of this file will contain 10 string values ("semicolon" character delimited - each value is separated from the other by a ";") in the following format:

X(g);Y(g);Z(g);Heading(degrees);Course(degrees);Speed(m/s);Altitude(m);Latitude(degrees);Longitude(degrees);Date/Time

X(g);Y(g);Z(g);Heading(degrees);Course(degrees);Speed(m/s);Altitude(m);Latitude(degrees);Longitude(degrees);Date/Time

X(g);Y(g);Z(g);Heading(degrees);Course(degrees);Speed(m/s);Altitude(m);Latitude(degrees);Longitude(degrees);Date/Time

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Note: the first line of the file ACCDATA.csv shows the meaning of each column and the labels are separated by ";" (fields delimited), the first line of the file will not contain the numeric data recorded but only the column labels

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The file "*ACCDATA.csv*" can then be imported into any program for numerical analysis for MAC or PC like Numbers, Excel, OpenOffice Calc, text editors like TextEdit for Mac, etc...

To display and store locally (in the device memory) the numerical data recorded (all the .csv recorded files), you can use the **"megaDownloader Web Browser "** app available on iTunes App Store.

If you want to import, load and display the .csv file manually (using text) in a external application like for example Numbers, specify that the .csv file is ";" character delimited.

Press the "Open In" button to share the text file "ACCDATA.csv" (containing the recorded data) with DROPBOX or with other applications installed on Your device such as Numbers, iNotePad, megaDownloader, Pages, etc...
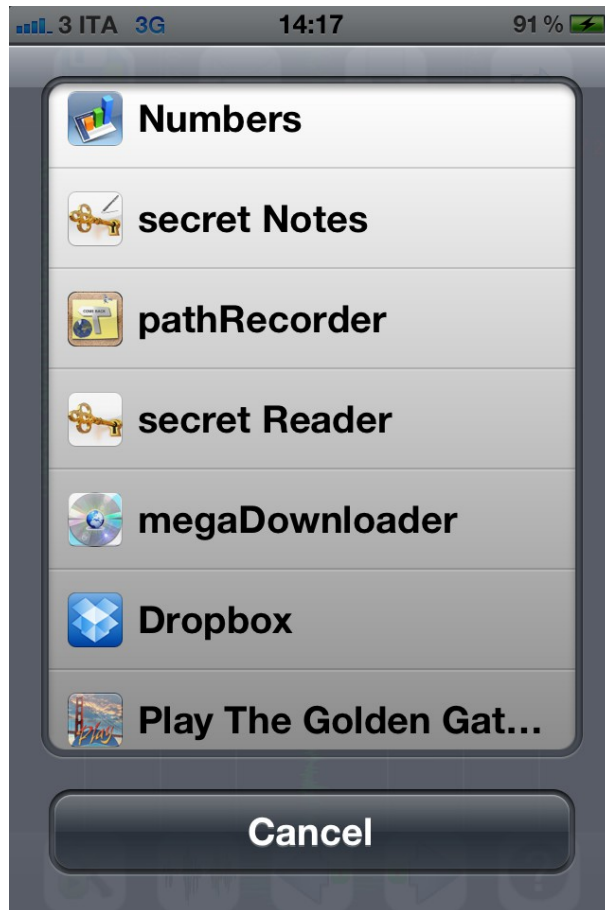

Figure 6

For more details about the recorded data (eg units of measurement), notions of physics (eg. vibration / acceleration), energy of vibration recorded, earthquakes (eg. calculating magnitude, conversion from maximum accelerations recorded to richter scale, etc...), for tricks, tips and examples of use of "myVibrometer" application read the FAQ available URL:

http://www.ngcybit.it/iTunesApp/myvibrometer/myvibrometer-faq.html

myVibrometer (HD) "Quick User Guide" ends here.

Thanks you all for your attention.

For additional informations or to report bugs send an e-mail to:
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NGCYBIT Robotics URL:
www.ngcybit.it