AGROID GUIDE

Quick Start

1. This app **requires GPS**: remember to **enable it** before using the app (Home, Menu, Settings, Location, check "**Use GPS satellites**")

2. **Select the required function** (Distance, Perimeter, Area, Position) on the app start page (see the Start Page section for more information)

3. If you get the **message** "**Activate GPS to get automatic coordinates!**" you should **activate the GPS (step 1)**

4. Go where you want to make the survey (see the next section for **accuracy hints** to achieve the best results)

5. Click the **toolbar + button** and select the **source** (GPS to add 1 point, use TRACKING if you want to collect points just walking around); **if you add only 1 GPS point you can also use the ADD Button** (see the Point Page section for more information).

6. If you get the message "**SAT FIXING IN PROGRESS, WAIT**" and the previous steps where ok, **just wait some seconds (when ready the ADD button is red) and retry** (the mobile is trying to establish a good GPS connection: do not confuse WPS, wifi positioning, with GPS: the accuracy of GPS is a must for outdoor measurements!)

7. If you get the message "**BAD GPS ACCURACY**, xx meters x fix", the app is not accepting the GPS data because it does not have the

required accuracy: waiting some seconds can solve the problem (**the default required accuracy can be changed, see the settings section**)

8. To **remove a specific point**, make a long press on the point row and select the Delete action

9. When finished (if you are using the Tracking source, press STOP) save the survey with the **MENU/SAVE** button (**a name of the survey is required**)

10. To view the **calculation** data just make a **short press** on the **View Button** or a click on the **toolbar = button**

11. **To change the calculation formula** touch on the **toolbar** the required function (Distance, Perimeter, Area, Position)

12. To view the points on a **map** just make a **long press** on the **View Button** (you can also select a different map view using the **MENU/MAP** button)

13. On the map you can **reposition manually the GPS markers** (for more information see the Map section)

14. To **retrieve** a saved survey just use the **MENU/OPEN** button in the Points Page

Accuracy

Agroid relies on GPS data. To achieve the best results consider the following:

1. **GPS satellite accuracy**: at least <30 m in order to achieve good results (by default all GPS data with a higher value are not accepted by the app).

2. **Land surveying conditions**: a clear view of the sky with no obstructions from about 5° elevation and up; keep the smartphone in vertical position and away from your body as much as you can.

3. **Check the best time to make the survey in your area:** sat position influence the precision of GPS (see the daily charts available on http://satpredictor.navcomtech.com or http://www.trimble.com/gnssplanningonline), lowest DOP best precision.

4. **Marker repositioning**: using visible references in OSM maps (suitable for urban areas) or Google satellite view (suitable for country areas) you can reposition manually the GPS markers

5. **Position dispersion**: with this function you can evaluate random and systematic error (using a reference point)

Start Page

Button functions:

1. **Distance**: it calculates the distance between the acquired GPS coordinates; it is required to have more then 1 coordinate point and it is possible to measure the length of any **open polyline**

2. **Perimeter**: it calculates the length of the perimeter of the **polygon** having for **vertices** the acquired GPS coordinates; it is required to have more then 2 vertices and it is possible to measure the length of any **closed polyline**

3. **Area** : it calculates the area of the of the **polygon** having for **vertices** the acquired GPS coordinates; it is required to have more then 2 vertices and it is possible to measure the area of any **closed polyline**

4. **Position dispersion:** it calculates the expected value of all the GPS coordinates acquired in a specified time interval (minimum 1 minute, best results for >5 minutes);

Icon functions

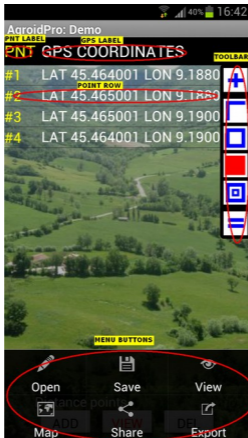1. **EMAIL US**: loads an email app with our address in order to contact us

Menu functions:

1. **HELP**: shows the app help
2. **SETTINGS**: app settings
3. **HELP US**: loads an email app with our address in order to contact us

Survey Page
This page displays the list of all the acquired
GPS coordinates of a survey.
The **active elements** of the page are the
following: PNT label, GPS label, Toolbar,
Point row, Buttons, Menu buttons.

Button functions:

1. **ADD**: adds a new point reading the current GPS coordinates
2. **DEL**: a click deletes the last point, a long click deletes all points or a selected project
3. **VIEW**: a click shows the **calculation data** according to the current formula. A long click displays the **Google Map view.**

Toolbar :

1. **+** : a click to add points from different sources (from **GPS, Reference or Tracking)**
2. **Distance, Perimeter, Area, Position**: a click changes the current calculation formula
3. **=** : a click shows the calculation data according to the current formula

Point actions :

(To display these actions it is necessary a long click on the point row)

1. **DELETE**: deleted the selected point
2. **EDIT LATITUDE**: edits the latitude of the selected point
3. **EDIT LONGITUDE**: edits the longitude of the selected point
4. **MOVE**: moves the selected point to a specified position

Label functions:

1. **PNT LABEL**: a long click opens the list of different point source
2. **GPS LABEL:** a long click opens the satellite view (a detailed report of the current available satellites)

Menu functions:
(To display the menu it is necessary to press the mobile menu button)

1. **OPEN**: opens a saved project
2. **SAVE**: saves the current project
3. **VIEW**: shows the calculation view
4. **MAP**: shows a list of map views (Google Map, OSM street Map)
5. **SHARE**: shares the current coordinates (GPS Lat/Lon) and measurements with other apps (such as Email, DropBox, SMS, Cloud print, HP eprint,)
6. **EXPORT**: file KML creation on SD

GPS REFERENCE source

This source adds to your survey a reference point (the reference point coordinates can be changed in the settings menu).

Triggering:
1. **With a click on the toolbar button (+)** (or a **long click on the PNT** yellow label) you can add the Reference point: this method is useful to add a specific point without using the GPS data (the default value can be personalized in the settings page)
2. **Editing: with a long click on the point row** you can change the reference point coordinates
3. **MAPS:** before making a survey it is possible to view and **download the maps** of a specific area just adding a reference point of that area and displaying the maps (in this way you can display the maps during the survey without an internet connection)
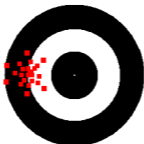
GPS TRACKING source

This spurce can collect points according to a specified rate and distance interval (useful for path measurements).
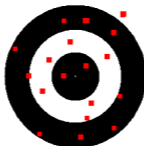
Triggering:

1. **With a click on the toolbar button (+)** (or a **long click on the PNT** yellow label) you can start the Tracking GPS source: it collects points according to the specified minimum rate and distance interval (default is 5 sec and 10 meters and it can be personalized in the settings page).
2. **Button STOP:** a click stops the tracking point collection

Position Dispersion function

With the Position dispersion function (in a significant period of time) it is possible to have an idea of the GPS error components. Start the function in a location that can be recognized from a satellite view (such as crossroads). The distance between the expected value and your target will represent the systematic error.

Systematic Error

Random Error

Google Map

This map view is embedded in the app. The map can also be downloaded before the survey in order to avoid any internet connection during the survey (to download a map just insert manually a reference point and move/zoom to the area where you want to make the survey)

A **click** on a marker changes the marker color from green to red and **shows the arrows panel and the balloon note**. High accuracy in the marker positioning. A click on the map hides the arrows panel. Zooming can be done with the zoom panel or the pitch function.

Menu functions:

1. **ZOOM EXTENTS**: displays the extents of the all the collected points
2. **MAP TYPE**: selection of different map types (Satellite, Street, Hybrid, Terrain)
3. **SELECT POINT**: shows the list of the markers in order to select and move them with the arrows panel

OSM street map

This map view is embedded : the map can also be downloaded before the survey in order to avoid any internet connection during the survey (to download a map just insert manually a reference point and move/zoom to the area where you want to make the survey). A **click** on a marker displays a balloon with the point coordinate data.
A **long click** on a marker changes the marker color from green to red and **shows the arrows panel** . High accuracy in the marker positioning. A click on the map hides the arrows panel.
Zooming can be done with the zoom panel or the pitch function.

Menu functions:
1. **EXTENTS**: fits the zoom in order to display all the markers
2. **SCREENSHOT**: saves the current map on SD (from android 2.2)
3. **SHARE**: shares the map with other apps (such as Email, DropBox, SMS, Catch, Cloud print, HP eprint)
4. **SELECT POINT**: shows the list of the markers in order to select and move them with the arrows panel

Map Marker Repositioning function

With this function you can improve the accuracy of measurements repositioning the point markers directly on the displayed map.

Triggering:

1. **VIEW**: a long click on this button displays the a satellite **map view**: using visible references you can reposition any point marker using a special control panel that is visible after a click on the marker. This function is suitable for **country areas**, where references can be taken from field boundaries, rivers and paths.

2. **MAP:** selecting the Map option after a click on the menu button displays **a map view**: using visible references you can reposition any point marker using a special control panel that is visible after a long click on the marker. This function with the OSM Street Map (or the Google Street Map) is suitable for **urban areas**, where references can be taken from crossroads, buildings and streets.

Settings Page

Possible to show/edit the user's settings:

1. **Average rate**: the sampling rate in seconds of the Average GPS function (default: 5 seconds)
2. **Accuracy**: the minimum GPS accuracy (default 30 m): remember that if it is too low you may not be able to get any good info from GPS and if it is too high you may get a bad accuracy in measures.
3. **GPS**: a check keeps the GPS fix on, good if you are checking maps while measuring, bad for battery duration (default: unchecked)
4. **Latitude**: reference point latitude used in manual input
5. **Longitude**: reference point longitude used in manual input
6. **Tracking rate**: minimum period in seconds (default 5 seconds)
7. **Tracking distance interval**: minimum distance in meters (default 10 meters)
8. **Brightness**: a check ensures maximum brightness while collecting position points (default: unchecked)

9. **Alive**: a check keeps the app active while collecting position points (def.: checked)
10. **Pics in App Google Maps**: selection of the miniatures behavior in google maps (hide)
11. Points page: Row bebavior (coords)
12. **Project**: new project name (def: New)
13. **AVG Hints**: a check ensures automatic hints for Average GPS triggering
14. **Font size**: a check ensures big fonts in the GPS list
15. **Toolbar**: a check displays the toolbar in the GPS list
16. **Length unit**: the default length unit (m, feet)
17. **Area unit**: the default area unit (m2, ha, ft2, acres)

Appendix 1: Precision and Accuracy

Precision: is the degree of closeness to the mean of observations (the smaller is the area of the GPS dispersion points, the higher is the precision). With the Position dispersion function you get the mean and the DRMS (distance root mean squared: the radius of a circle in which 65% of the values occur) of your observations.

Accuracy: is the degree of closeness to the truth of an estimate (the smaller is the distance between your real position and your GPS measurement, the higher is the accuracy). With the Position dispersion function and visualizing the Google map (where you can identify your real position using some visible references) you can have an idea of the current accuracy (distance between the mean value of the dispersion points and your real position)

Appendix 2: Common measures of accuracy

CEP: is the circular error probability of your GPS (the radius of a circle in which 50% of the values occur). That means that you have 50% of probabilities to be outside of that circle (the current radius is specified by the GPS): if you want to have 95% of probabilities (R95), you have to expand your circle (R95= 2.1*CEP). For example if your GPS states that you have a CEP of 1 m (circle of 1 meter of diameter around the GPS point), if you want 95% of probabilities the radius will have to be 2.1 m.

DRMS: is the distance root mean squared of your observations (the radius of a circle in which 65% of the values occur). It is a bigger circle of the CEP measure (DRMS= 1.2* CEP)

Approximate conversions (std conditions)

From/To	DRMS PR 65%	R95 PR 95%	2DRMS PR 95%
CEP PR 50%	1.2	2.1	2.4

Appendix 3: Geographic coordinates system

The GPS coordinates are based on the WGS 84 datum (ellipsoid with semi-major axis 6378127.0 m , semi-minor axis 6356752.314245 m, inverse flattering 298.257233563). The GPS coordinates are most commonly expressed in latitude and longitude (app. default).

The **altitude** is also collected by the **GPS system** and it can be averaged and displayed with the **position dispersion function**. Be careful in evaluating the GPS altitude because it can be effected by high inaccuracy: averaging is a must and for a MSL value you need the Geoid heigth for correction .

Remember that the **GPS altitude is referred to the WGS84 ellipsoid**, and if you need the MSL height you have to subtract to the GPS height the Geoid height. This height correction can be done on a proper internet site such as

http://geographiclib.sourceforge.net/cgi-bin/GeoidEval

http://earth-info.nga.mil/GandG/wgs84/gravitymod/egm96/intpt.html