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TACLOCATE (TL120212d)
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LOCATION BAR

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The area at the top of each screen, referred to as the location bar, shows data related to a single location point. The upper text line in the bar describes the location type and units, and the lower line contains the numerical coordinate values. Tapping the location bar will change the displayed measurement units for the location coordinates; available units are Longitude and Latitude (LONLAT) in decimal degrees, or in degrees, minutes and seconds, Universal Transverse Mercator (UTM), and the Military Grid Reference System (MGRS). Computed and displayed data is generally in keeping with the WGS 84 geodetic standard.

PLOT MODE

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The Plot Mode is enabled by selecting the PLOT button in the tab bar at the bottom of the screen. The main functions of this mode are to provide a relative plot of the running or "Live" history of location measurements, to indicate the average and spread in the data, and to allow drawing of vectors related to the data. (We use the term "Live" here and later below to distinguish automatically acquired locations from those "Stored" by the user.) The red dot markers indicate separate Live measurements of location, where each is based on a combination of data available from the Global Positioning System (GPS), cell-phone service "towers", and WiFi access points, depending what location capability is engaged on the mobile device. The number of Live location point markers will increase over time, especially when moving, to a maximum of 25, 50, or 100, after which the oldest location marker will be removed with the plotting of each new location. The maximum setting will be discussed later.

The Current, or in other words most recent, location in the Live history data is plotted with an additional yellow circle around a red marker, and the coordinates of the Current location are shown in the location bar whenever the indicator there says "Current". The time elapsed since receiving the displayed Current location is shown (min:sec) in the upper right corner of the plot. If it appears that the Current location has not been updated for an extended period of time, then the mobile device has likely not recently been able to receive location data, or it has determined internally that it does not have a better or significantly different location to offer.

CENTROID & ERROR CIRCLE

The addition of each new location to the Live history results in the re-computation of a number of statistics, including the centroid of the location history. The plotting of the location points is continually adjusted so that the centroid of the plotted data is aligned with the origin of the plot axes. In addition, the scale of the plot area is adjusted to keep all Live history locations within the display area. The dashed circle, which is centered on the plot, indicates an estimate of the area in which approximately 95% of locations tend to lie, assuming the spread in the data is due to random error. This error circle characterizes the distribution of the plotted location data. The circle's radius is shown at its bottom right edge.

The centroid location may be shown using the Centroid button at the left in the toolbar. When in Centroid display mode, the origin of the plot axes is highlighted with a small circle around it, the location bar shows "CENTROID", and the coordinate values for the centroid are shown in the location bar. The centroid (which is an "average" location) may in some cases be a better estimate of a true location in the presence of error. Alternatively, the centroid may simply be used as a better single representation of the location of an area in and around which one has been moving.

VECTOR

Repeated pressing of the Vector button, located at the centre of the toolbar, will switch the display among three different direction vectors, which are computed from the plotted location points. The numerical bearing for the displayed vector, in degrees relative to true north, is shown in the upper left corner of the plot area. The type of vector is indicated by the text on the Vector button. The "FIT ALL" vector lies along a total-least-squares line that is fit through all of the plotted data. This vector mode is handy when trying to determine straight-line direction along a path of location points that show random deviation from a straight line. This mode is of course also useful when the average direction of an intentionally crooked path is desired. The "1ST-to-LAST" vector mode simply connects the oldest to the newest point in the plotted history of locations, and is in some cases more sensible to use than the line fit through all of the plotted points. When 1ST-to-LAST vector mode is engaged, the distance between the two locations is displayed in the lower left corner of the plot area. Finally, the "HEADING" vector mode display is based on data received directly from internal data processing by the mobile device, and is typically valid only when the device is in motion. It should be noted that the displayed bearing value for the heading vector is for the Current location, whereas the displayed values for "FIT ALL" and "1ST-to-LAST" vectors are associated with the midpoint, or average direction, of the vector lines.

SETTINGS

Pressing the Settings button, located on the right side of the toolbar, will display four additional temporary toolbars above it. The lowest of the temporary toolbars enables the deletion of location points from the running Live history, the bar above it sets the maximum number of recent Live location points displayed in the plot, the third bar enables changing numerical precision of displayed values, and the top bar allows one to switch between plotting Live data and Stored data.

In the lower temporary bar, the "Clear OUTER" button will delete all Live history locations that fall outside of the displayed error circle. (A new error circle is immediately computed and displayed whenever locations are deleted.) This is useful for quickly removing apparent outliers that may have been distorting results of the centroid and vector computations. It should be noted that this operation could remove valid new locations as well, and also that location points beyond the displayed error circle are typically still valid data that should be Not be deleted in statistical sense. Tapping the "Clear OLD" button will delete the oldest third (approximately) of the Live history data. This is generally handy for quickly discarding data unrelated to the current centroid or vector measurement, and for "cleaning-up" initial measurements at the start of a run. The "Clear ALL" button will delete all data in the running Live history, and various display elements may therefore remain blank until new Live location measurement data is acquired.

The second temporary toolbar, from the bottom, contains three buttons that allow for setting of the maximum number of recent locations shown in the plot. The value can be one of 25, 50, or 100 points. This is the maximum number of points in the running history of data from which the Centroid and Vectors are computed. A lower value allows for quicker system response over a short operating distance in vector calculations. A higher value will capture a trend over a longer distance and/or reduce the effects of random error.

The "NORMAL Precision" and "EXTENDED Precision" buttons, in the third temporary bar from the bottom, allow for switching between two general modes of display precision, which affect various displays throughout the App. In Normal Precision, for instance, displayed LONLAT coordinates, in decimal degrees, are rounded to 5 decimal places, UTM coordinates are rounded to the nearest 1m, and vector bearings are rounded to the nearest 1 degree. In Extended Precision, LONLAT is rounded to 6 decimal places, UTM to 0.1m, and vector bearings to 0.1 degrees. The precision shown for each type of location unit is set to roughly match that of the other unit types. Location coordinates in MGRS units are displayed at 1m precision at all times, and the numerical values are always rounded down (truncated), as per the standard for these units. (Note that coordinates and statistics are maintained at higher precision internally for calculations and storage.)

The topmost temporary toolbar allows one to switch between plotting LIVE data or STORED data. The ideas related to plotting Live data are captured in the discussion above. Selection of "Plot STORED Data" will change the Plot Mode such that it processes the user-stored locations in a similar fashion to how it does Live data. Most functions described above can be used on the stored data. It should be noted that while showing stored data in the Plot mode, the location bar will use an "inverted" shade of text, the word "STORED" will appear in the upper right of the plot area, and the latest stored location will be treated as the "Current" location.

MAP MODE

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The Map Mode is enabled by selecting the MAP button in the centre of the tab bar at the bottom of the screen. The map can be used to view the Live location data (red dots), user-Stored locations (blue squares), and the automatic waypoint history (black/blue dots with yellow centres). The left-most toolbar button toggles between topographic and photographic map views, as indicated by the text on the button face ("TOPO" or "PHOTO"). It should be noted that the image quality, registration error, and available scales of the map views vary from place to place.

AUTO VIEW

The second button from the left in the toolbar toggles an Auto View mode on and off. When the button label shows "AUTO ON", the map is essentially locked such that it stays approximately centered on the Live location history centroid, and will auto-scale to maintain all Live data (red circles) in view. When the button is touched to show "Auto Off", the map is free to be panned to other locations by dragging it with a single finger. When Auto View is off, additional buttons appear over the map that assist in zooming in and out while staying centered on the same location. Alternatively, one may double-tap on the map to zoom-in to the tapped location. The Current (latest) location in the Live data is displayed in the location bar at the top of the screen, regardless of whether Auto View is On or Off, except when the Reticle is engaged, as discussed next.

RETICLE

The third button on the toolbar toggles the Reticle mode on and off. When this mode is engaged, a reticle appears centered on the map. If the Auto View mode is engaged ("AUTO ON") while the reticle is engaged, the location bar shows the coordinates of the Centroid of the Live history data, to which the map remains locked. If the Auto View is off ("Auto Off") while the reticle is engaged, then the location bar displays the coordinates of the reticle centre, and the map will be free, such that it may be panned, and the reticle location read in the location bar. (It should be noted that similar to the Plot Mode, tapping the location bar will change the

displayed units. In addition, the displayed numerical precision will be the same as that set in the Plot Mode.)

When the map is zoomed-in to a relatively small area (with Auto View off and the reticle showing) an additional "Fine" button will appear on the map. Tapping this button will display four more buttons on the map, which allow for stepping the reticle location in the cardinal directions. The step size is automatically adjusted to allow incremental changes to the least significant digits in the location bar coordinates. This fine adjustment is handy for both placing the reticle onto a specific map feature, and for setting particular numerical coordinates of a location that is entered strictly for the purpose of performing conversion from one unit type to another.

SET / STORE

Pressing the "Set/Store" button, on the far right of the toolbar, displays three additional temporary toolbars above it. The left and middle buttons, labelled "HIDE Stored" and "SHOW Stored", on the lower temporary toolbar, are used to control the plotting of User-Stored locations on the map. The "STORE Loc" button, on the right side of the toolbar, is used to record the displayed location point, be it Current, Centroid, or Reticle, into the non-volatile list of stored locations, for immediate display on the map, and for later review, conversion, or transmission via email (discussed later).

The second temporary toolbar has two buttons, labelled "HIDE Crumbs" and "SHOW Crumbs", which are used to control the plotting of the internal waypoint history. The App keeps an automatic running history of waypoints, often referred to as a "trail of breadcrumbs", up to a maximum of 10,000 locations. The oldest waypoint is discarded with the addition of each new point after the maximum is reached.

The topmost temporary toolbar is used to set a delay in the activation of the automatic sleep (auto-lock) function of the mobile device, to allow for continual collection of data for an extended period. The four settings are: Off, 30 minutes, 90 minutes, and Maximum time. This delay capability is disabled when the device battery is very low (15-20%). The Maximum time setting will delay the automatic sleep until this point as well.

DATA MODE

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The Data Mode is enabled by selecting the DATA button on the right side of the tab bar at the bottom of the screen. This mode presents a list of all the stored locations, sorted by entry date and time (newest at the top), with an indicator for the stored location type (Current, Centroid and Reticle) that was displayed at the time of storage. Tapping a specific stored location will

highlight it, and its associated coordinate values will be displayed in the location bar. Tapping the location bar will change the displayed units of measurement, as usual, and the displayed numerical precision will be that set in the Plot Mode. The list may be scrolled to reveal more stored locations, if necessary, by dragging a single finger vertically on the list. (Note, the entire list of stored locations is plotted in the Map mode.)

SEND EMAIL

User-stored locations and the internal waypoint history ("breadcrumbs") may be converted to formatted text files and sent elsewhere via email. Pressing the "Send Email" button, located at the left in the toolbar, will display a temporary toolbar above it. Pressing the "Send STORED" button in the temporary toolbar will prepare an email (if there are user-stored points and if an email facility is detected), ready for selection of an addressee. The automatically-attached TXT, CSV and KML files contain the stored data, in columnar form, that may be read using a text viewer or imported into a spreadsheet or other tools. Each location (row) in the TXT and CSV files is shown in all four (LONLAT-Deg, LONLAT-DegMinSec, UTM, MGRS) display units. The numerical precision used for the coordinate values in these files corresponds to the precision setting in the Plot Mode.

Pressing the "Send CRUMBS" button, in the temporary toolbar, will start a similar process as above, but for the internal waypoint history data. The waypoint history can be large (up to 10,000 locations), and the preparation of the file (into a KML format) for email transmission can take much longer than for sending user-stored locations. The size of the email attachment itself can be over 1 MB.

DELETE

Pressing the "Delete" button, in the centre of the toolbar, will display two temporary toolbars above it. The lower temporary toolbar has two buttons, labeled "Delete SELECTED" and "Delete ALL STORED". If a location has been previously selected (highlighted) in the list, then pressing the "Delete SELECTED" button will delete the selected location from the stored data memory. Pressing the "Delete ALL STORED" button will delete all stored locations from memory, regardless of any pre-selection. The top toolbar contains a single button, labelled "Delete ALL CRUMBS", which will delete all internal waypoints. (Automatic internal waypoint collection continues immediately after deletion of the history.)

INFO

Tapping the "Info" button, at the right side of the toolbar, toggles the display of the information presented in this dialog.