Carlson Scan 3D (Windows based)

Target setup and measurement

- Set AprilTags
- Minimum 3 AprilTags. Recommended 5 or more, place 2-3 AprilTags in the area that will be the start of the scan as these are used to close the scan loop. Place the others sparsely through the area to be scanned. Ideally place that AprilTags at corners (plane intersections).
- Start SurvPC project and configure the projection and geoid correction for the job.
- Setup the total station (CRx) or GNSS receiver (BRx7/RTK5).
- Measure the coordinates at the red center of the AprilTags with total station or GNSS.
- The point number used must match the AprilTag number. Please note that the AprilTag can be set on the ground or on a wall. Also, when tape measured distances are valid to use for the AprilTags, for example, if working on a building interior.

Export coordinates from SurvPC

- In SurvPC, export the AprilTags coordinates in PENZ comma delimited format, you may use the Scan3D Control Point format (.scp) to do this.
- By default, the file will be saved in your SurvPC job folder.

Scan

- Snap the RealSense D455 camera to the back of the tablet and connect the USB cable to the port on the side.
- Open **Scan3D** app on the device.
- Tap the **New Scan** icon.
- Move close to the corner where you placed the AprilTags, note that the button on the right has a green circle that will fill in as the program detects the corner. Try to fill the green circle as much as possible.
- Push the button to start scanning.
- Move laterally to capture the geometry. The program will track geometry automatically.
- Move back/forth, up/down to increase density. This also helps if you get a message that it lost geometry as you can back track to a last position. Note that you can tap on "select relocation position" and it will present pictures of an identifiable location from which you can restart.
- Loop back to the AprilTags at the beginning of the area. On the loop back, the AprilTags may be slightly offset, this is normal.
- Click the circle button on the right to finish the scan. Same button to start the scan.
- The un-optimized scan is displayed.

Optimize the scan

- Tap the **Targets** icon.
- Tap **Load Control File**.
- Set the units to match the SurvPC job, for example, **US Survey Feet**.
- Tap **Open Control File**.
- This will open *Files*. Browse and select the coordinate file from the folder you copied the file into earlier or select the cloud file sharing directory if using that method.
- The selected file name will be displayed and the number of *Control Targets* will be highlighted in blue. The number should match the number of AprilTags laid out.
- Tap **Import.**
- Make sure **Right-Handed** is **on**. This option matches the PENZ comma delimited files (.scp files). If you were working with coordinates in PNEZ format, use *Left-Handed*.
- Note that you can double-tap on any of the targets to display their coordinate information and apply changes if necessary.
- Tap **Fit Control Targets**.
- Tap **Optimize**. *Use constraints from Targeting* and *Apply Color* Leveling will be defaulted on. Other settings will also be set, for example, *Use AprilTags for Loop Closure*.
- Tap **Optimize Scene**. The process will start and the results will be displayed momentarily.

Display, Measure and Edit in Scan3D

Once the optimization is complete, you can export the resulting point cloud data back to your desktop/laptop for CAD work in Point Cloud Advanced for feature extraction. This said, in Scan3D you can also take a moment to review the job.

- Display
  - Tap **View Options**.
  - Notice you can select from *Top-Down View, Front View, Side View, and Ortho View.* Tap **Ortho View** and then select a preset view for simple navigation.
  - You can pinch zoom and pan using two fingers. Or rotate the view with a one finger.

- Measure
  - Tap **Measure**.
  - Tap **Add new annotation**.
  - Tap **Distance.**
  - Long-tap (and keep pressed to move) on a first point to set the beginning end.
  - Long-tap (and keep pressed to move) on a second point to set the end point.
  - The measurement will be annotated.
  - Use the *slider-up* to expand the annotations list. You can edit/delete the annotations.
  - Tap the **up-arrow** to return to the menu.

- Annotate
  - Tap **Annotate**
  - Tap **Add new annotation**.
  - Long-tap to select the label point.
  - Type the label.
  - Use the *slider-up* to expand the annotations list. You can edit/delete the annotations.

- Edit
  - Tap **Edit**
  - Tap **Cropping** if you would like to crop the scene to the intended work area.
  - Use the **up-arrow** to return to the menu.

Save

- Save the scene by tapping on **File** then **Save**. Note that *Control Targets* should be defaulted on. The scene will be save in a compressed/optimized .dp format.

Export Point Cloud in LAS Format

- Tap the **Share** icon.
- Tap **Share**.
- Tap **As Other File.**
- Select **LAS 1.2 (*.las)** from the list. Note that other common formats including .laz and .e57 are also available.
- Tap on the file name field and adjust the name if you like. Tap **Next**.
- Make sure the *Units* match your job. For example, **US survey feet.**
- Tap **Export Scene.**
- You will be prompted for the new file location.

You are ready to take the point cloud file into Carlson Point Cloud Advanced and Survey/Civil to complete the map or design.

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