



Scanning with AC Scanner

by Augmented City

Scanning with AC Scanner is fast and easy. Achieving high quality scans can take a bit of practice. But once you become familiar with best practices you can easily scan any location.

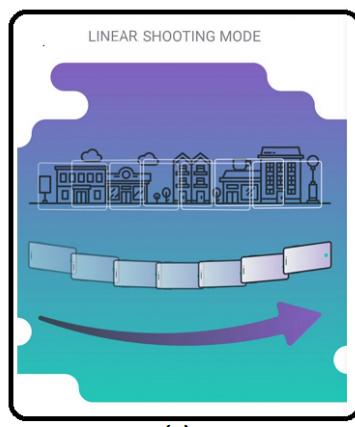
Scan modes

LINEAR: the user walks in a straight or semi-circular line by the surface or object they wish to scan. The linear mode is used for calibration passes and for scanning flat or singular objects such as a single wall, pictures, murals and signage.

CIRCULAR: the user stands at a single point and spins in a circle to scan the area around them. The circular mode is the most commonly used scanning mode. It is best used for scanning three dimensional areas and objects such as streets, plazas and buildings.

AUTO: a user assisted mode in which pictures are taken automatically at predetermined intervals while the user takes a scan. The Auto mode is best for users that are unfamiliar with the principles of scanning or augmented reality.

PRO (a.k.a. Manual): an unassisted scanning mode activated from within the user's profile settings. The manual mode allows for maximum speed and flexibility while scanning. It is best for users that have some familiarity with the principles of scanning and augmented reality.



Linear Scan Mode



Circular Scan Mode



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Terms and Concepts

Term	Meaning
Location	The area you will be scanning such as a street, plaza or building. A location is made up of multiple points and at least one passage.
Point	The spot where a user stands and turns in a circle to capture a scan. A point consists of a minimum of 10 pictures taken in a circular motion.
Passage	A collection of points taken at a similar distance from the object or surface being scanned. Example: a collection of 6 circular scans taken along the length of a building all at a distance of 5 meters from the building's facade. A minimum of two passages taken at different distances from the object or surface are usually required for a high quality scan.
Calibration passage	A scan taken at the beginning of each Location scan using the Linear Mode. The Calibration Pass is used to calibrate the AR Cloud with the phone's native measurement system.
Lateral step	The distance between two points
Visual Overlap	The amount of overlap required between two pictures for a high quality scan. Each new picture should capture at least 50% of the area of the previous frame.



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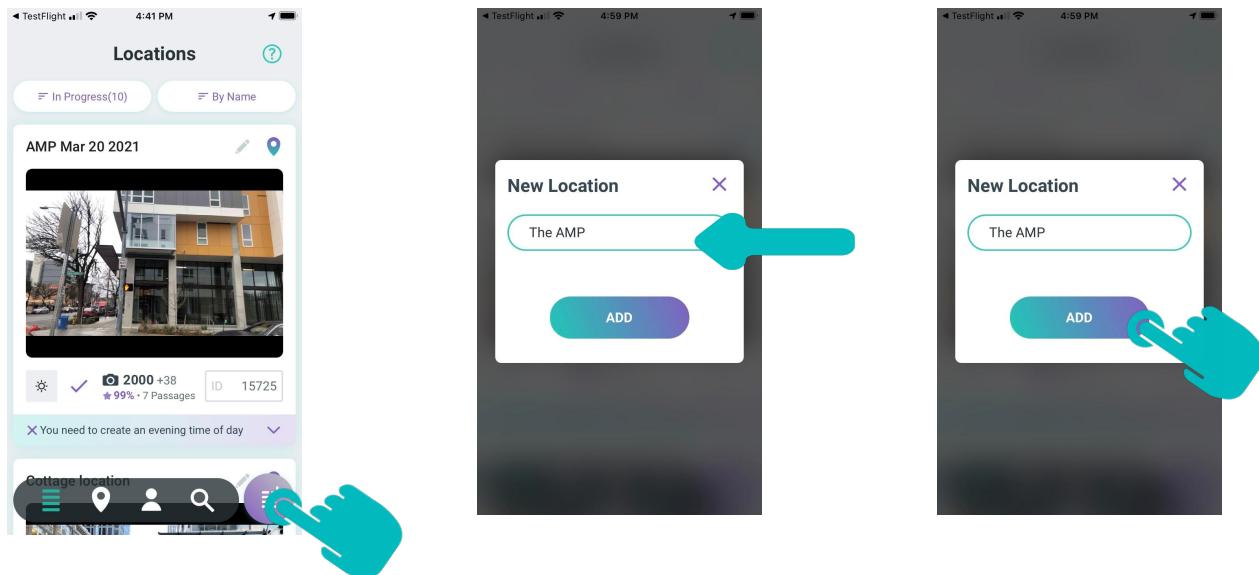
How to Scan

Step 1: Download the free AC Scanner app by obtaining a Test Flight invitation from Augmented City.

Step 2: Go to the location you wish to scan (Example: a room, street, plaza or building).

Step 3: Review the Location to determine a scanning strategy. (You may wish to prepare by reviewing a map in advance).

Step 4: To begin scanning, add a new scan Location by tapping on the plus sign in the lower right corner of the screen. Name your scan. Click the “Add” button to return to the home screen.





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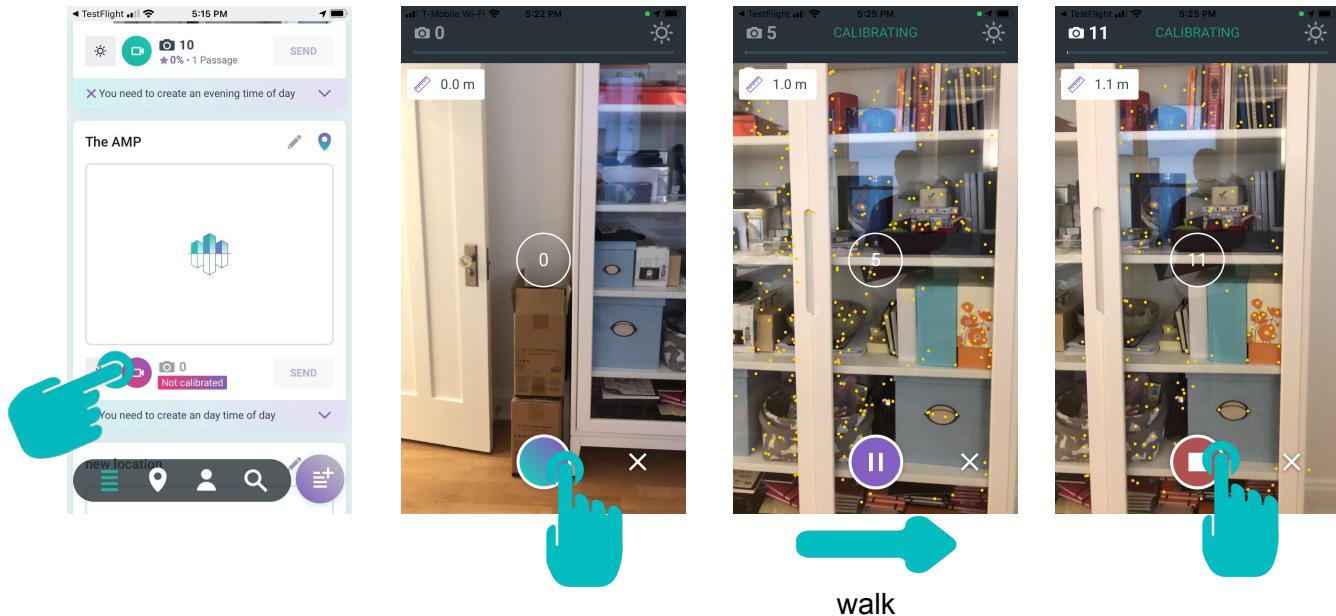
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Step 5: Calibrate your scan. To calibrate your scan, stand approximately 5 meters from a flat surface such as a wall or building. Click on the video icon

- a. Hold your camera parallel to the flat surface.
- b. Click on the button at the bottom of the screen to start the calibration video capture.
- c. Slowly walk parallel to the surface in a straight line as the calibration video automatically captures pictures. A pause button will appear at the bottom of the screen in case you need to pause during the process.
- d. When sufficient video has been captured and calibration is achieved, a stop button will appear at the bottom of the screen.
- e. Click the stop button when you are doing calibrating. A calibration complete confirmation message will be displayed.

Calibration TIPS:

1. Be sure the calibration surface is flat, has some detail and contrast, and does NOT contain highly reflective surfaces.
2. The calibration pass will usually require a minimum 10 pictures and for you to move a minimum of 6 ft. It's OK if you capture more pictures and travel further during the calibration pass.
3. If you plan to take multiple scans for different times of days, you will need to do a calibration pass for each.





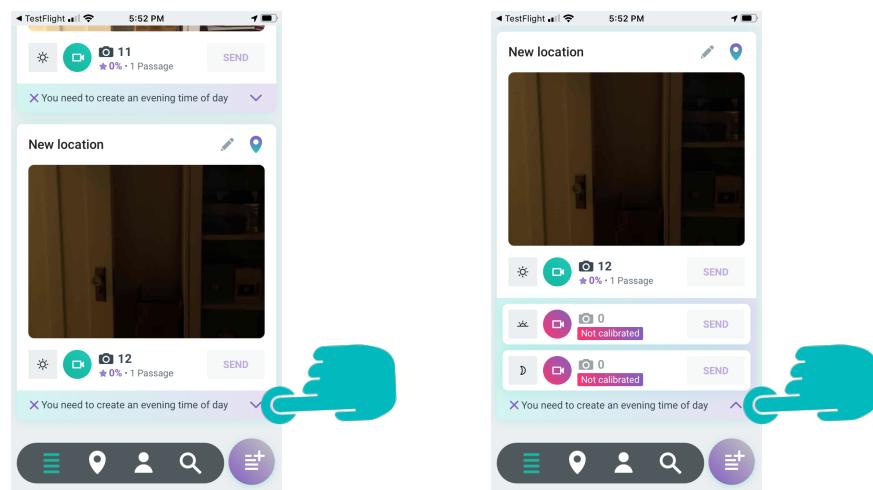
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Step 6: Select the correct Time of Day Mode as appropriate to your situation.

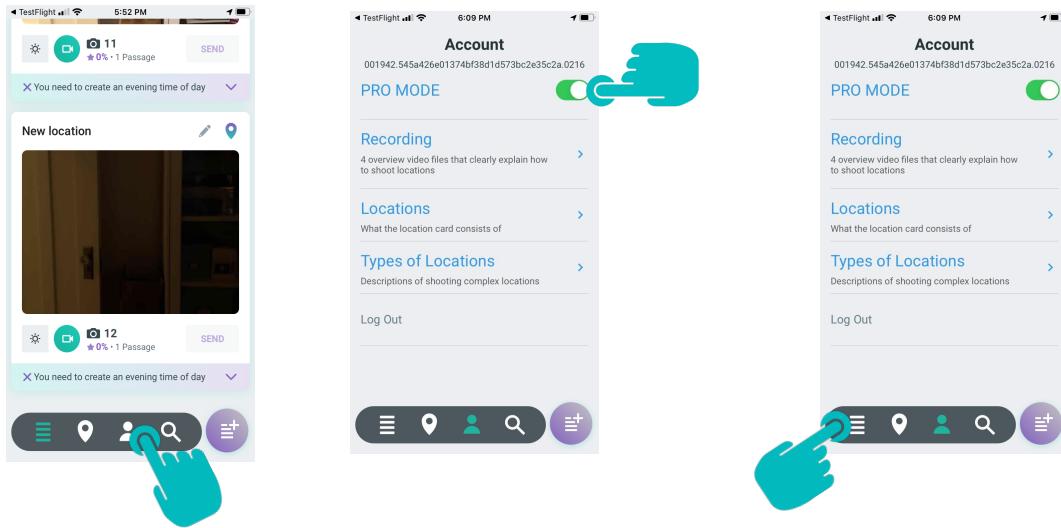
TIPS:

1. The app will default to the day mode for scanning. The day mode is sufficient for most scanning situations. Select the evening or night modes only when the overall ambient illumination level is significantly lower.
2. You do NOT need to scan a day, evening and night mode for each location. One mode is enough to create a 3D scan.
3. If you need to select the evening or night modes for scanning, click/toggle the down arrow on the far right side of the screen to reveal/hide the evening and night mode options.



Step 7: Select your preferred scanning mode: Auto or Pro (Manual). The app will default to the Auto mode. To enable Pro (Manual) mode, click on your profile icon and toggle the Pro Mode on/off switch. To return to the home screen, click the stack menu in the lower left corner.

Scan Mode TIP: Some people find the Pro Mode to be more intuitive and easier to use.

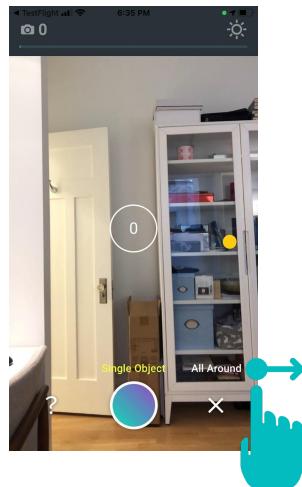
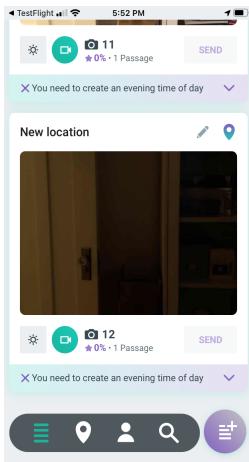




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Step 9: To begin scanning click on the video icon on the Home screen. Select the appropriate scan mode (Linear or Circular) for your situation and preferred method (Pro or Auto). Toggle between the various modes by scrolling to the right/left.



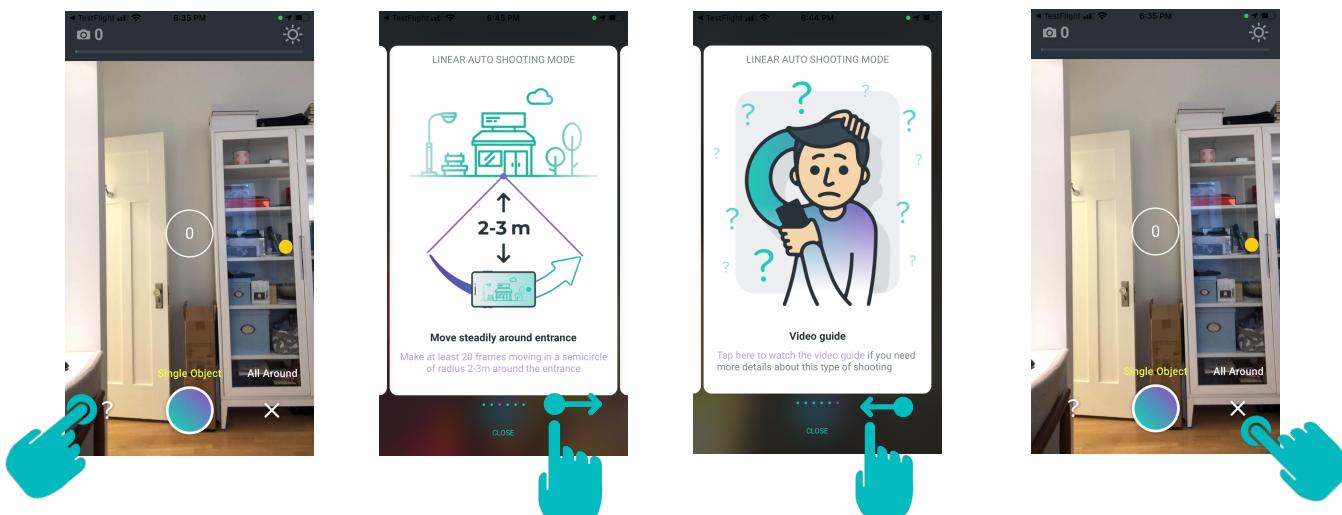
Auto Mode Options



Pro (Manual) Mode Options

TIPS:

1. You can access instruction diagrams, help screens and help videos by tapping on the question mark in the bottom left corner. Scroll to the right/left to move between these help options.
2. You cancel or return to the Home screen any time by tapping the “X” in the lower right corner. If you tap the “X” before finishing a Point’s scan or finishing a Passage, the photos associated with that point/passage will NOT be saved.





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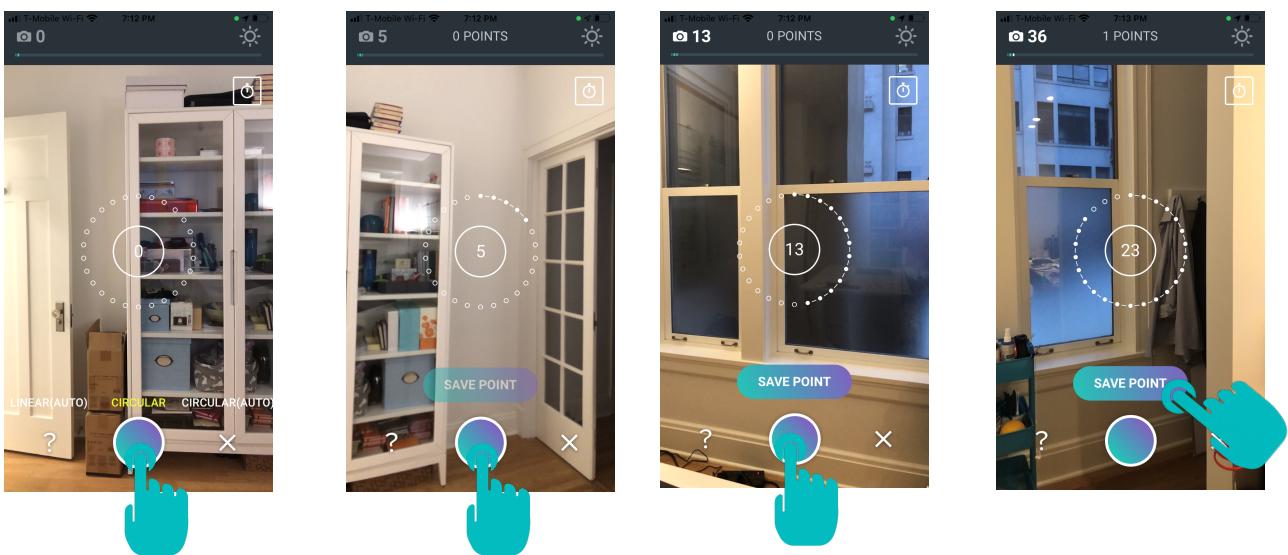
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Step 10: Scan your FIRST Point

Circular Pro Mode: To scan a point in the Circular Pro Mode, stand in a single spot and turn around in a circle while taking pictures using the button at the bottom of the screen. The circle of dots in the middle of the screen will help you gage how far to turn and where to aim your camera. The cumulative number of pictures you have taken for this Point will be displayed in the center of the circle guide. A minimum of 10 photos are required for each Point. When you are done taking your pictures, tap Save Point.

TIPS:

1. Do your best to minimize the amount of floor or ground you capture in each picture by keeping the bottom of your phone screen at or close to the floor-wall or ground-building intersection as possible.
2. Turn slowly, being mindful of keeping the camera still when taking each photo so as to avoid capturing blurred pictures that can cause inferior scans.
3. You can skip sections within a given circular scan to avoid capturing highly reflective or other surfaces that may cause problems during processing.





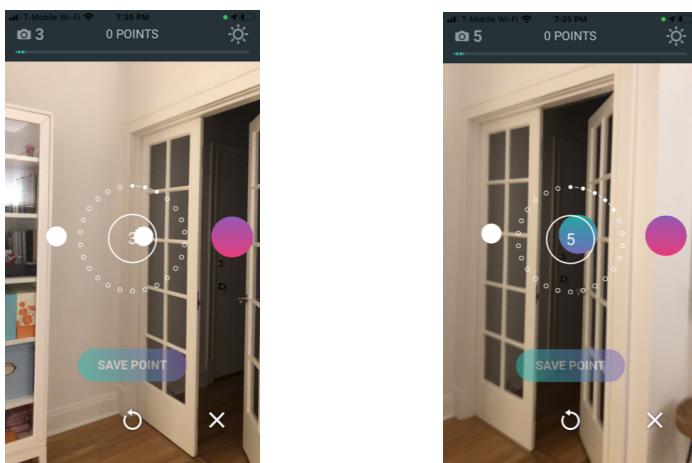
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Circular Auto Mode: Follow the same method as for Circular Manual Mode, however, colored circles will appear on the screen as you turn. The app will automatically take pictures at these locations as your turn. Align the circle in the middle of your screen with the colored dot for the pictures to be taken. If the picture is taken successfully, the colored dot will turn white and shrink in size.

TIPS:

1. The app will not let you progress to the next colored dot if the previous picture was not taken successfully. If this happens, turn backwards to the previous point to enable the app to take the previous picture successfully.
2. The Auto Mode requires you to keep your camera at a constant height as you turn. If the horizon line changes significantly in your scene, consider using the Circular Pro Mode to avoid capture too much floor/ground in each picture.



Linear Manual Mode: Follow the same method as for Circular Manual Mode; however, travel in a straight path parallel to the surface you are scanning. If you are scanning a single object like a door or painting, travel in a semi-circular path.

Linear Auto Mode: Follow the same method and recommendations as for the Linear Manual Mode; however the app will automatically take pictures for you as you travel.



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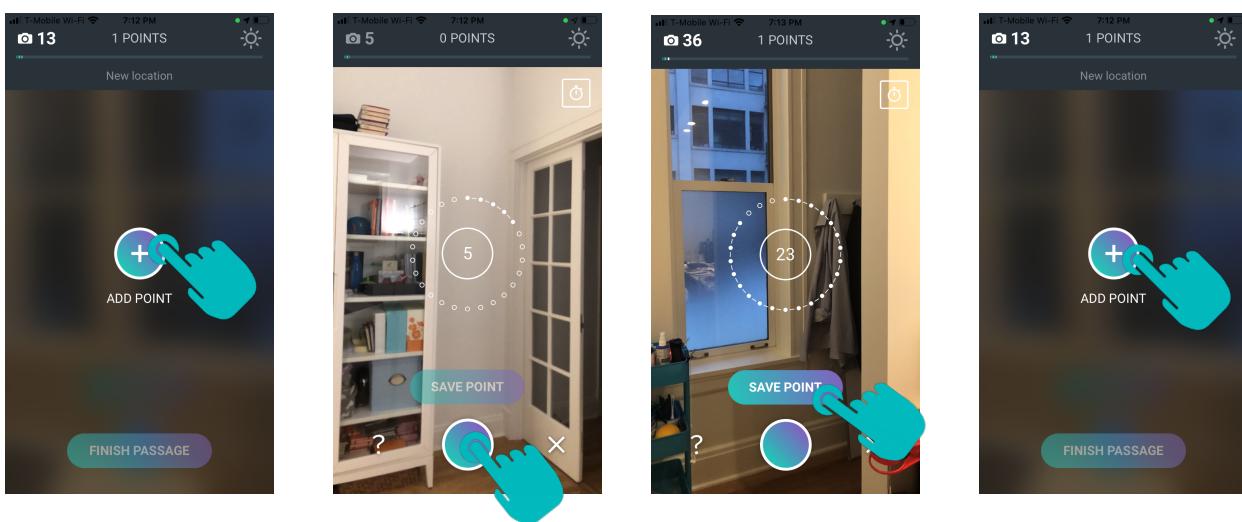
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Step 11: Scan your SECOND (or additional) Point

Circular Pro Mode: To scan your second (or subsequent) point in the Circular Pro Mode, move to a spot 6 to 10 ft away from your previous point. This point should be the same distance from your scanned object as the previous Point. Click “Add Point”. Follow the same procedures and recommendations for scanning as you did for the first Point. When you are done scanning this point click save. You can continue adding and scanning points as needed to capture the object as needed.

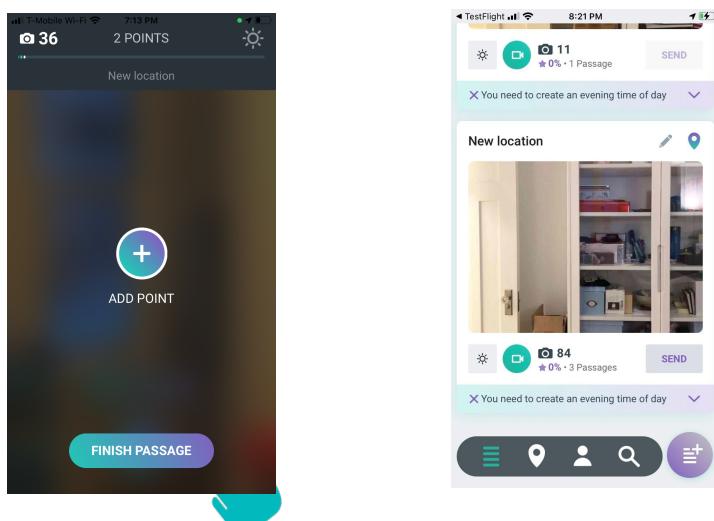
TIPs:

1. The help screens in the app can be accessed via the Question Mark in the lower left corner. You can find diagrams and videos here to help you determine the amount of distance you should maintain between Points and from your scanned object.



Step 12: Finish your FIRST Passage: A Passage is a collection of points that are equidistant from your object. A minimum of two points is required per Passage. A minimum of one Passage is required per Location. A minimum of two Passages per Location is recommended for a high quality scan.

When you have completed scanning your desired Points, click “Finish Passage” to compile them into a Passage. On the Home Screen you will see the total number of photos you have taken and the number of Passages you have completed.





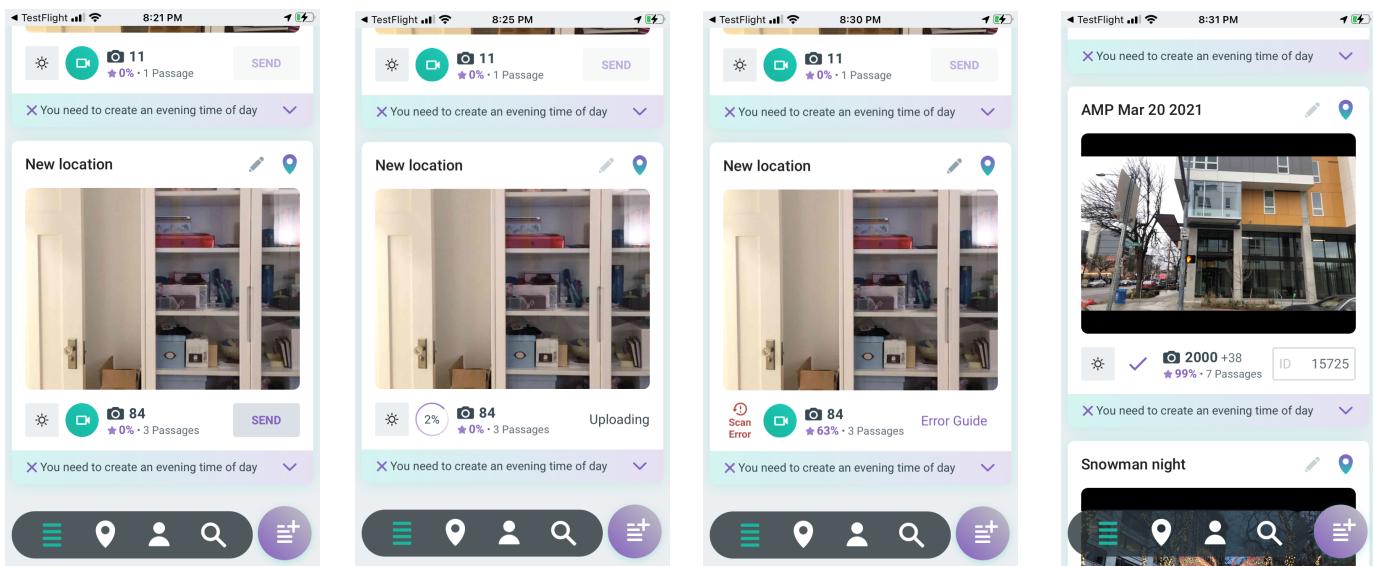
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Step 13: Send your scans to the server: When you have completed scanning your area you can send your scan to the cloud for processing into a point cloud by clicking “Send”. You will see an Uploading confirmation along with the percentage complete. If the scan was successful, you will receive a percent success rate and an ID number after the scan is finished processing on the server. If the scan was UNsuccessful, you will receive an error message after processing. A scan needs a minimum of 75% of the photos taken to be of good quality inorder to be considered a successful scan capable of being converted into a Point Cloud.

TIPS

1. The maximum number of photos a Location can contain is 2000. Sending more photos than this within a given location will cause uploading problems and processing errors.
2. If your Location is large and needs more than 2000 photos, divide the Location up into multiple smaller Locations for scanning. Be sure to capture overlapping areas in each Location scan so that they can be combined into a single point cloud on the server. In general, you should capture approximately 100 photos of the same area in order for the Locations to be compiled into the same point cloud on the server.





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Scanning Tips

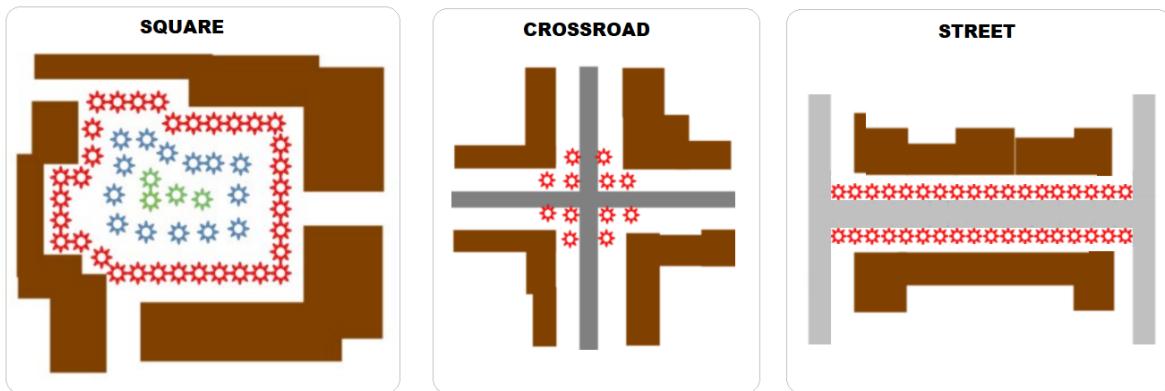
- If you shoot Typical, Wide streets, Crossroads or Squares - you should acquire photos with the horizontal orientation of the device (LANDSCAPE) (15..16 photos at the one point), making a complete rotation at a point in at least 15 seconds at a constant speed.
- If you acquire photos with a vertical orientation of the device (PORTRAIT) for “narrow streets” – you should capture about 20..25 photos at the one point, making a complete rotation at a point in at least 25 seconds.
- If the distance from the central line of the street to the facade is closer than 2 meters, you should use a half-star approach (described in “[Narrow street](#)” scenario), which is used for shooting very narrow pedestrian streets.
- You should try to get as less ground\sky on the photo as possible.
- You should try to take a photo so that the bottom border of the frame matches the base of the facade.
- If at any point a foreign object (pillar, road sign, public transport stop, trees etc.) blocks the frame, try to change your position to capture a large area of the facade of the building.
- The visual overlap between adjacent frames must be at least 50%
- Do not try to capture images where there are no facades of buildings or many trees (forest, parks etc.).



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Scanning Strategies



- ✖ - point at 5 meters from the facade
- ✖ - point at 10-15 meters from the facade
- ✖ - point at more than 15 meters from the facade

1. Typical street

2. Wide street

You should make as many passages as required (3 and more) by using horizontal device orientation: first passage at the distance from 5 meters from the building facade (at the border of sidewalk), second – from 7-10 meters (near the road), third and other – from doubling distance in relation to the previous passage, if there is wide area before the road. The distance from the facades to the road might be 10-15 meters and more.

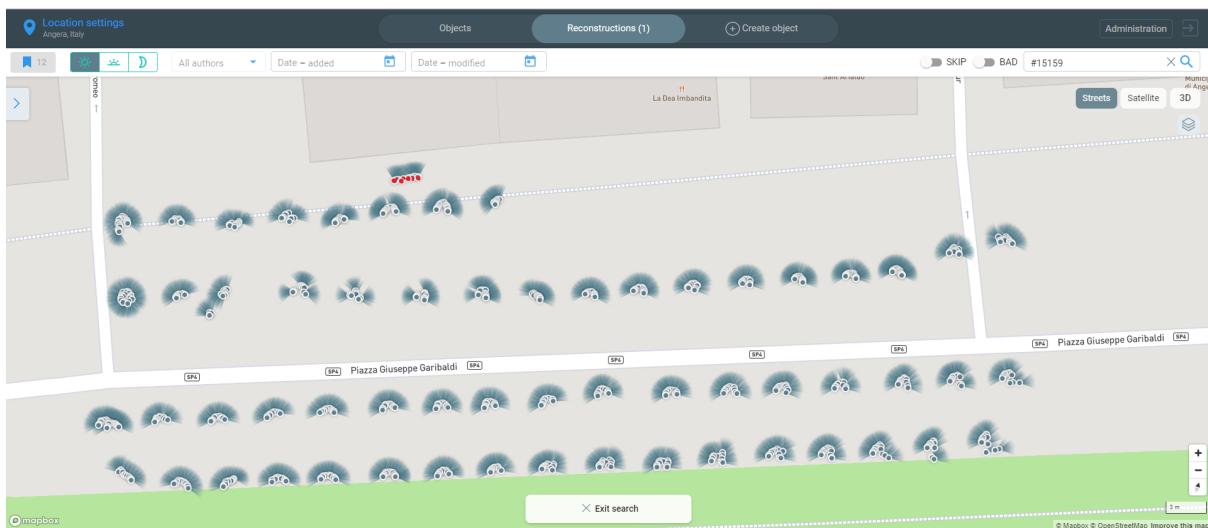


Fig.2: Scanning of a wide street in Angera. The calibration passage is highlighted in the red color.



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3. Narrow street

If the street width is less than 4 meters, you have to use a half-star approach, by making two passages as close as possible with your back to each facade, rotating, but not capturing frames in the area that is directly behind you. Starting and ending shooting at a point with frames that capture both facades of a narrow street (including the one closest to you).

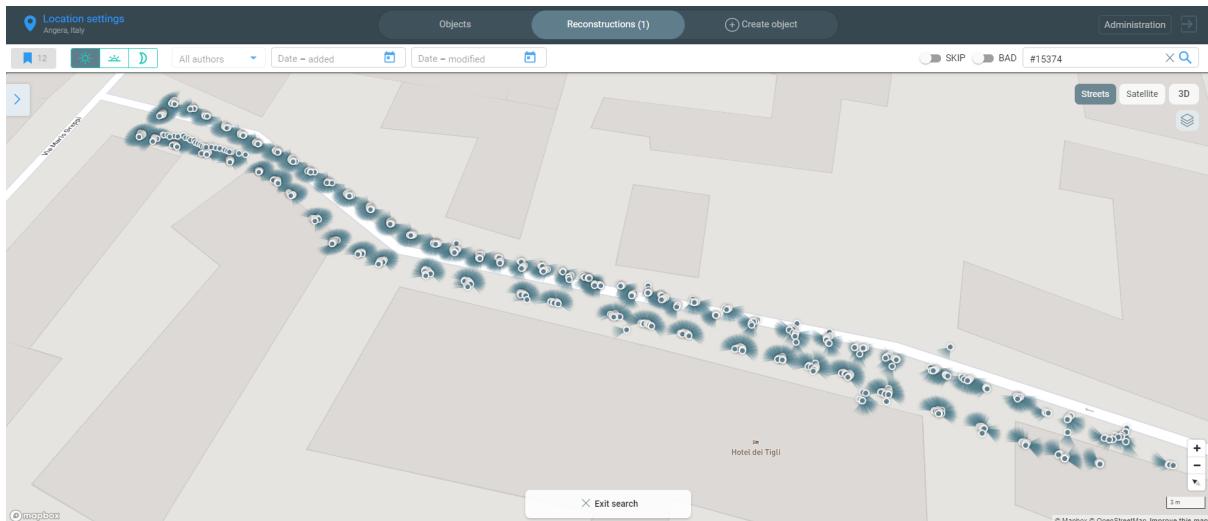


Fig.3: Scanning of the narrow street in Angera with a half-star approach.

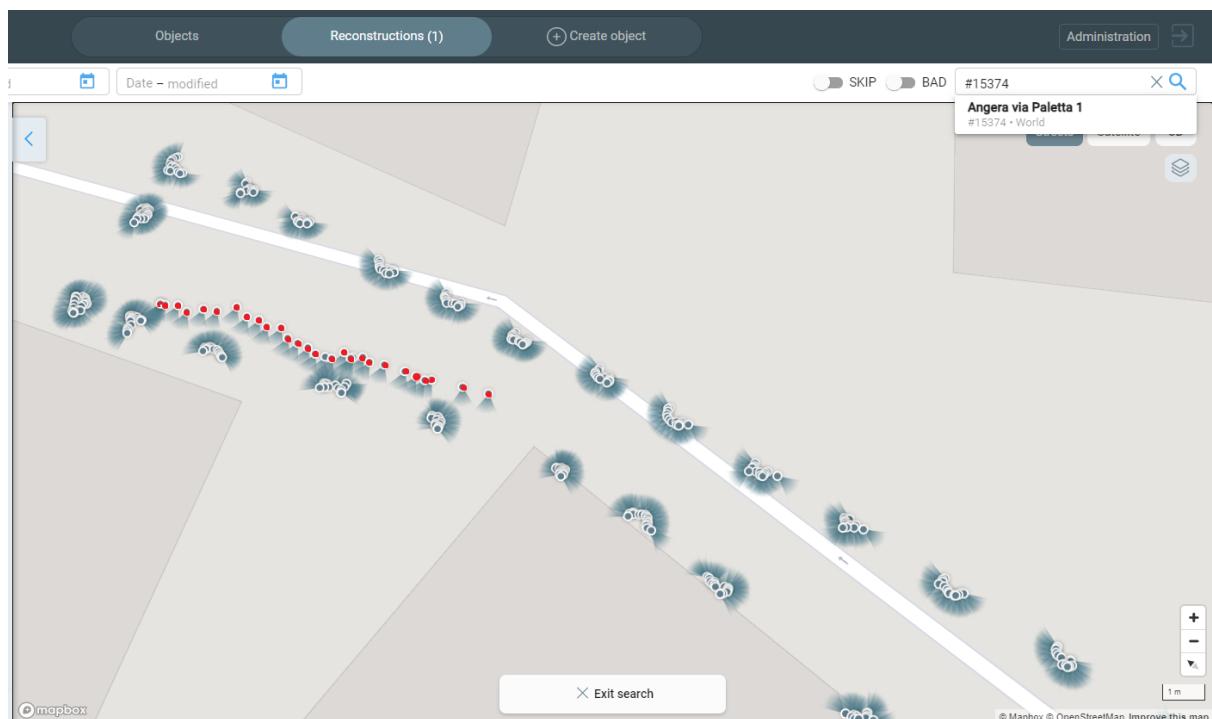


Fig.3a: Zooming of [Fig.3](#). The calibration passage is highlighted in the red color.



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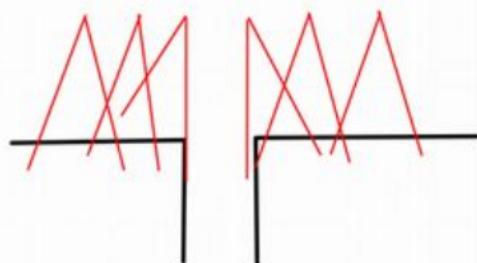
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4. Crossroad

For each corner of the crossroad, you should acquire photos at least from 3 points near the road. Besides, for the crossroad, you should try to capture the facades of both sides of the crossing street. In addition, you have to capture photos of buildings in the corners of the crossroad as if you were shooting a street. In the case of acquiring frames of the crossroad, it is necessary to take into account recommendations for acquiring building facades on the street (if the crossroad is wide – you should make as many passages as needed).

Besides, for the crossroad, you should try to acquire both facades (of both sides of the crossing street). On the left image below – the bad example, because we have no photos with both facades. You must take photos in such a way as to capture the facades on both sides of the crossing street (right image below).

BAD EXAMPLE



GOOD EXAMPLE

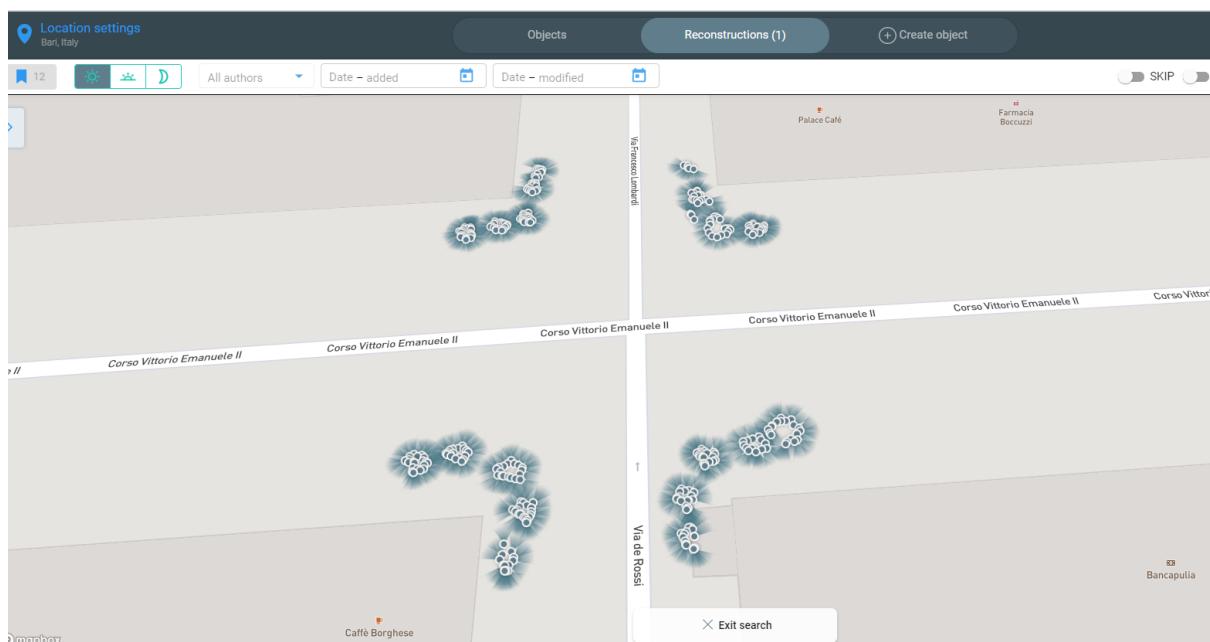
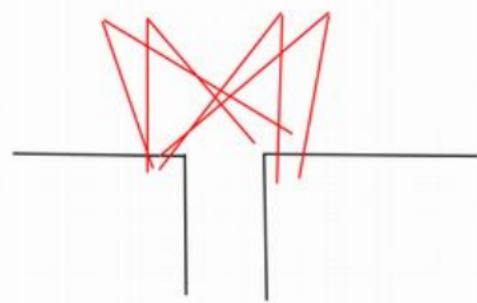


Fig.4: Scanning of a wide crossroad: each corner is scanned with a full star approach.



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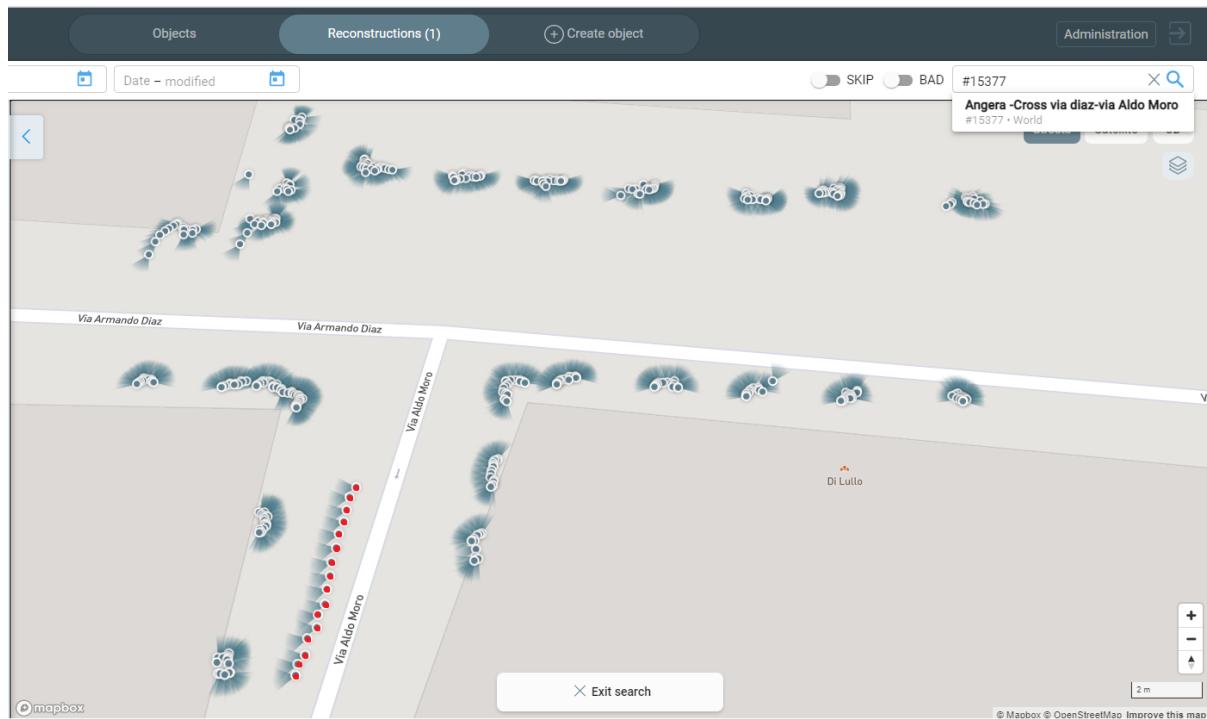


Fig.4a: Scanning of the narrow crossroad: each corner is scanned with a half-star approach. The calibration passage is highlighted in the red color.

5. Square

In the first passage, acquiring photos is carried out at a distance of 5 meters from the facade of all buildings around the area. The next passage is 10-15 meters from the facades. For every next passage, the distance to the facades doubling. The distance between adjacent points in the second and all next passages can be increased by 3-5 meters.



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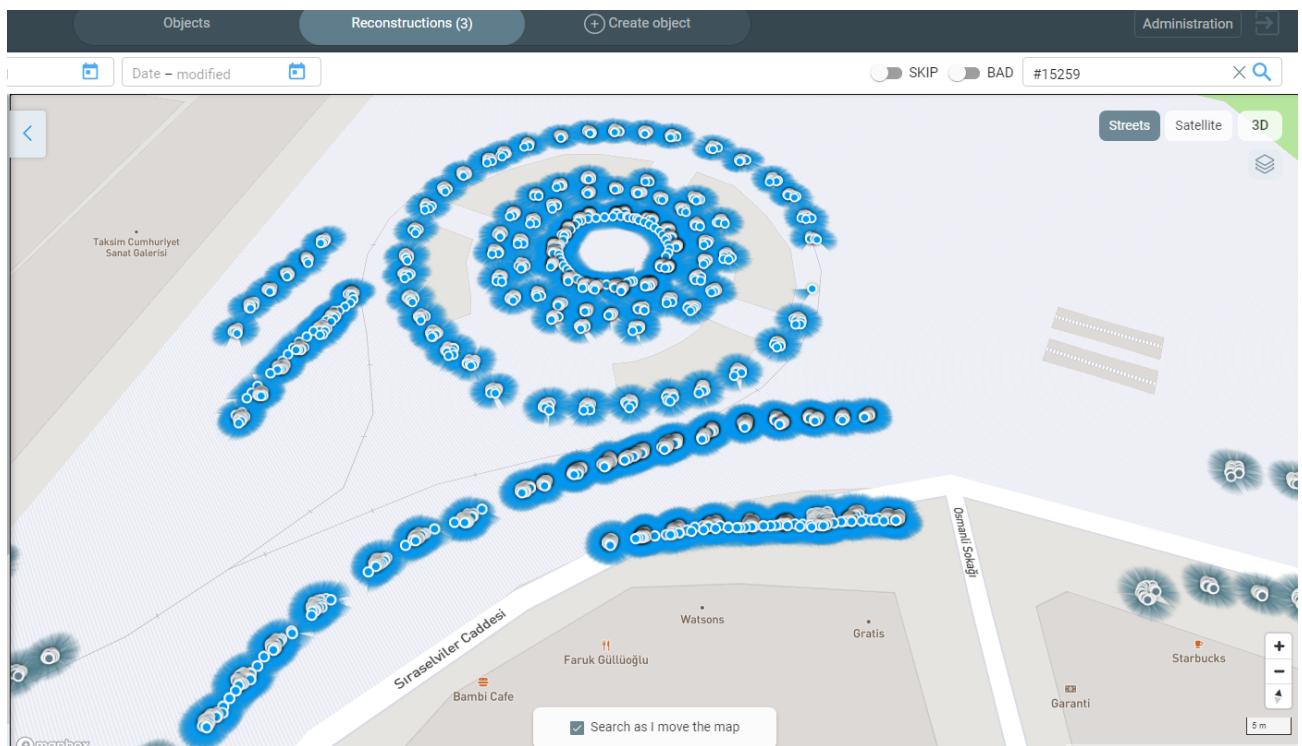


Fig.5: Taksim square in Turkey. In the blue color the camera poses.

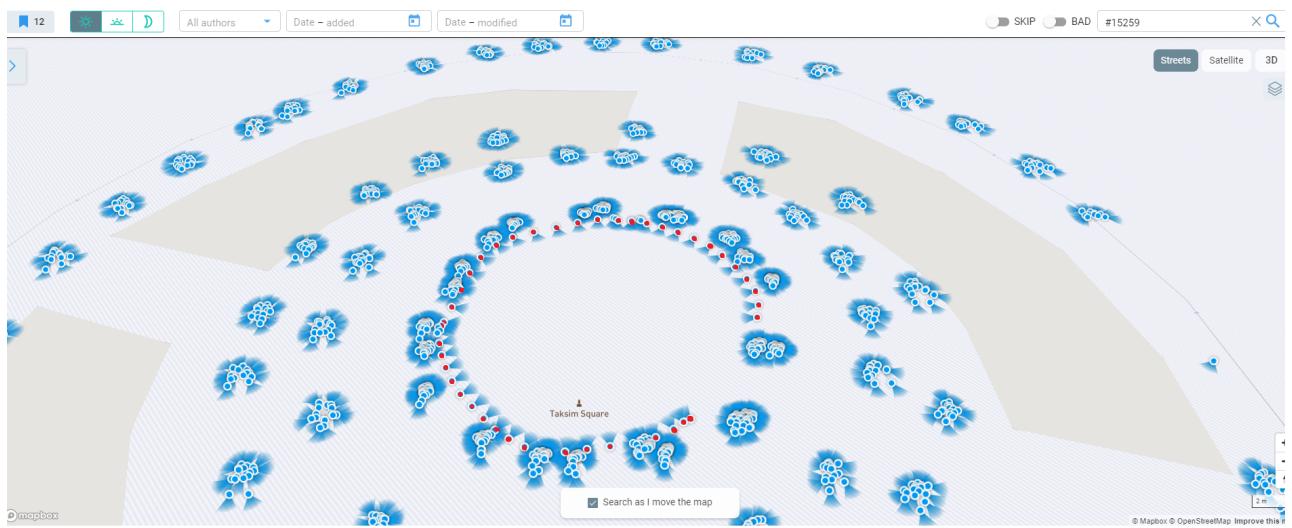


Fig.5a: Zooming of Fig.5 with the calibration passage highlighted in the red color.