How to Create 3D Digital Cities Using Drones

Khaled Abdelgawad
Director, Business Development
FalconViz LLC
Speakers

Khaled Abdelgawad
FalconViz LLC
Director, Business Development

Mohamed Shalaby
FalconViz LLC
Co-Founder
VP Business Dev.

Neil Smith
FalconViz LLC
Co-Founder
CEO
How to Create 3D Digital Cities Using Drones
3D Digital City Definition

A three dimensional representation (3D) of a city or an urban environment.

Every city model consists of a digital elevation model (ground height) and 3D building data (building heights)
3D Digital City Applications

Valuation of Buildings
Determination of the floors pace
3D Digital City Applications

useful for applications such as:

• Insurance
• Disaster management

Flood Simulations

https://doi.org/10.4233/uuid:f12931b7-5113-47ef-bfd4-688aae3be248
3D Digital City Applications

This is an illustration of noise from a planned tram track.

Noise impact analysis

Estimating noise pollution
Estimation of solar energy of rooftops

Finding optimal locations to place solar panels
3D Digital City **Applications**

Predicting the view from an apartment

Applications such as:
- Security
- Mass valuation of real estate

Visibility analysis
3D Digital City **Applications**

**Evacuation Planning**
Emergency response planning on city, building, floor or interior space level.
3D Digital City Applications

City Strategic Plans

- Testing different urban design alternatives
- Analyze each design implication virtually, to select the best socio-economical alternative for the city.
- visualizing city growth and experiencing different growth strategies for the city
3D Digital City Types

https://ars.els-cdn.com/content/image/1-s2.0-S0198971516300436-gr1_lrg.jpg
3D Digital City Types

LOD1
LOD2
LOD3
LOD4
## 3D Digital City Types

### LOD1

- **Berlin**, Germany, 2013, LOD2, Building, true, 2.0
- **Brussels**, Belgium, 2014, LOD2, Building, false, 1.0
- **Dresden**, Germany, 2009, LOD1/LOD2/LOD3, Partially, 1.0

### LOD2

- **Dutch Cities**, Netherlands, 2016, LOD1, Terrain and many other, false, 2.0
- **Hamburg**, Germany, 2017, LOD1 and LOD2, Cadastre footprints + 3D LiDAR, 2.0
- **Helsinki**, Finland, 2016, LOD2, true, 2.0
- **Linz**, Austria, 2011, LOD2, false, 1.0
- **Lyon**, France, 2012, LOD2, Terrain, water, 2.0

### LOD3

- **Montréal**, Canada, 2009, LOD2, terrain (114 in CityGML format), true, Photogrammetry, 1.0

[https://www.citygml.org/3dcities/](https://www.citygml.org/3dcities/)
3D Digital City **Types – LOD 1 – New York**

- LOD1
- LOD2
- LOD3
- LOD4

[Link to related content]
3D Digital City Types – LOD 2 – Helsinki

LOD1
LOD2
LOD3
LOD4

https://kartta.hel.fi/3d/
3D Digital City – Drone Based

1. Scanning
2. Processing
3. Modeling
Falconviz Drones Fleet

SURVEY HEXA-COPTER
HIGH PRECISION

HEAVY LIFT QUAD-COPTER
THERMAL & MULTISPECTRAL

FIXED WING PLANE
HIGH PRECISION

FIXED WING PLANE
HIGH PRECISION

SURVEY QUAD-COPTER
HIGH PRECISION

CINEMATOGRAPHY
EPIC SHOTS/VIDEOS

CINEMATOGRAPHY
HIGH RESOLUTION

FIXED WING PLANE
HIGH PRECISION
+120 Scanning and Visualization Projects
Our Clients
Case Studies
Case Study 01

Al-Balad Historical District

Location: Jeddah, KSA
Area: 2.600,000 Sqr foot
LOD: LOD 3
Capturing Technique: Drone nadir/oblique
Purpose: Cultural Documentation
Al-Balad Historical District: Workflow
Al-Balad Historical District: Workflow

- Studying the area of interest
- Determine the best ground control points (GCP) distribution
- Stake them out using our high accuracy GPS device
- Unlike traditional aerial survey we use our own proprietary FV GCP markers that allow sub-pixel precision measurement and reduce sun reflectivity
Al-Balad Historical District: **Workflow**

- Design the best effective flight path
- Ensure covering the whole area in less time with the maximum number of aerial images
Al-Balad Historical District: **Workflow**

- Pre-scanning
- Scanning
- Processing
- Modeling
- Visualization

**DJI M600**

Nadir and oblique captures
Al-Balad Historical District: **Workflow**

1. **Pre-scanning**
2. **Scanning**
3. **Processing**
4. **Modeling**
5. **Visualization**

**DJI M600**

Nadir and oblique captures
Al-Balad Historical District: **Workflow**

**DJI M600**

Nadir and oblique captures

8 Oblique flights – 4,397 images
2 Nadir flights – 1,119 images

Total images: 5,516
Al-Balad Historical District: **Workflow**

- Pre-scanning
- Scanning
- Processing
- Modeling
- Visualization

**500 M points**

**50 GB data**

Sample Point Cloud – Al-Balad
Al-Balad Historical District: **Workflow**

- Pre-scanning
- Scanning
- Processing
- Modeling
- Visualization

Satellite image +/- 30 cm

FalconViz drone image +/- 2 cm
Al-Balad Historical District: Workflow

2 Nadir Flights
1,119 images

Orthophoto
True colored – Geo-referenced – High resolution

8 Oblique Flights
4,397 images

3D Mesh Model
Textured – High detailed
Al-Balad Historical District: **Workflow**

1. Automatically generated 3D textured mesh
2. 3D solid models of selected buildings

Diagram:
- Pre-scanning
- Scanning
- Processing
- Modeling
- Visualization
Al-Balad Historical District: **Workflow**

**Bait Al-Batarjy**

Modeling Progress *(2 Working Weeks)*
Al-Balad Historical District: **Workflow**

**Bait Al-Batarjy**

Modeling Progress (2 Working Weeks)
Al-Balad Historical District: **Workflow**

Bait Al-Batarjy
Al-Balad Historical District: **Workflow**

Bab Jadeed

As-built 3D solid model
Al-Balad Historical District: Workflow

Bab Jadeed

As-built 2D plan and elevations
Al-Balad Historical District: **Workflow**

**Bab Jadeed**
Al-Balad Historical District: **Workflow**
Al-Balad Historical District: **Workflow**

**Existing Features**
- Interactive Application
- 3d Full Detailed Video
- 3d Full Detailed Images
- Historical Background Info
- 360 3d Panorama

**Upcoming Features**
- Multi-language
- Gigapixel Panorama Walkthrough
- Interactive Historical Timeline
Saudi Virtual Reality Platform

Madaen Saleh
Al-Masjid Al-Nabawi
Jeddah Al-balad
Al-Masjid Al-Haram
Ad’Diriyah
Farasan Islands

Saudi Arabia Map

Locations:
- Madaen Saleh
- Al-Masjid Al-Nabawi
- Jeddah Al-balad
- Al-Masjid Al-Haram
- Ad’Diriyah
- Farasan Islands

Important Destinations:
- Madaen Saleh
- Al-Masjid Al-Nabawi
- Jeddah Al-balad
- Al-Masjid Al-Haram
- Ad’Diriyah
- Farasan Islands
بيت الترجمي

بيت الترجمي هو بيت عائلات العربي التي عاشت في منطقة جدة التاريخية في جزيرة جدة ويعتبر أحد البيوت المشهورة. حيث كان من أكثر البيوت مساحة للأسرة أو العائلة، حيث كان مساحة كبيرة لسكن العائلة وتلك البيوت تحولت إلى متحف بموقعها حيث يحتوي هذا المبنى على العديد من التراث الشعبي والثقافة العربية مع الساحة العامة ومقهى المكالمة المسجلة وفقية العامة، لاسماح بالطيران وأعمال أخرى تحتوي.
Case Study 02

King Abdullah Economic City

Location: Rabigh, KSA
Area: 26,400,000 Sqr foot
LOD: LOD 2
Capturing Technique: Drone nadir/oblique
Purpose: Interactive Visualization
Workflow

Pre-Capturing ➔ Capturing ➔ 3D Modeling ➔ Texturing ➔ Geo-referencing ➔ Visualization
King Abdullah Economic City: **Workflow**

- Total number of buildings 70
- Unique building (21 buildings)
King Abdullah Economic City: **Workflow**

1. Pre-Capturing
2. Capturing (Highlighted in orange)
3. 3D Modeling
4. Texturing
5. Geo-referencing
6. Visualization

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**DJI Inspire 2**

**Zenmuse X7**

- Inspire 2 Compatibility
- Super 35 Sensor
- 6K CinemaDNG
- 5.2K Apple ProRes
- 14 Stops of Dynamic Range
- 24 MP Stills
King Abdullah Economic City: Workflow

- Pre-Capturing
- Capturing
- 3D Modeling
- Texturing
- Geo-referencing
- Visualization
King Abdullah Economic City: Workflow

1. Pre-Capturing
2. Capturing
3. 3D Modeling
4. Texturing
5. Geo-referencing
6. Visualization
King Abdullah Economic City: **Workflow**

1. Pre-Capturing
2. Capturing
3. 3D Modeling
4. Texturing
5. Geo-referencing
6. Visualization
King Abdullah Economic City: Workflow

Pre-Capturing → Capturing → 3D Modeling → Texturing → Geo-referencing → Visualization

AUTODESK 3DS MAX

Ps
Workflow

Pre-Capturing → Capturing → 3D Modeling → Texturing → Geo-referencing → Visualization

SimLabSoft

→ Buy
→ Get Free Trial
→ Activate
→ Help (Step By Step instructions)

SketchUp → SimLabSoft → MAX
King Abdullah Economic City: **Workflow**

1. Pre-Capturing
2. Capturing
3. 3D Modeling
4. Texturing
5. Geo-referencing
6. Visualization

Add geo-location
King Abdullah Economic City: **Workflow**

- Pre-Capturing
- Capturing
- 3D Modeling
- Texturing
- Geo-referencing
- Visualization
King Abdullah Economic City: **Workflow**

1. Pre-Capturing
2. Capturing
3. 3D Modeling
4. Texturing
5. Geo-referencing
6. Visualization
King Abdullah Economic City: Workflow

Upload Asset

File: B5_pt1.kmz, Size: 2.61 MB

KML/COLLADA Tiling Settings
- Clamp to terrain
- WGS84 Ellipsoid: Terrain, Date Added: 10/18/2016
- Cesium World Terrain: Terrain, Date Added: 10/18/2016

Asset name: B5_pt1
What kind of asset do you want to create?
- Imagery
- Terrain
- 3D Tiles

Upload Cancel
King Abdullah Economic City: **Workflow**
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Thank You

KHALED ABD EL-GAWAD
Business Development Director
Acting Operations Manager

+966 (0) 505799810
khaled.abdelgawad@falconviz.com
Thuwal, Saudi Arabia

FalconViz.com