



IN THE ARAB COUNTRIES

UNDER THE THEME "MANAGING MAINTENANCE WITHIN INDUSTRY 4.0" CONICIDE WITH THE 16TH ARAB MAINTENANCE EXHIBITION

UNMANNED AERIAL VEHICLES (UAVS) FOR INSPECTION IN CONSTRUCTION AND BUILDING INDUSTRY

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This presentation:

- 1. Introduction
- 2. UAV technology
- 3. Technology used with UAV
- 4. UAV in construction and building industry
- 5. UAV operational problems
- 6. UAV and BIM
- 7. Conclusions

Industry 4.0 and UAVs





Industry 4.0: Building the digital enterprise (Engineering and construction) (2016 PwC)

UAV for construction surveying



UAV for construction surveying





UAV image, Golden 1 Centre construction Source: CIOB



Overlay of UAV captured data and architectural plans. Source: CIOB

UAV and traffic





Image, taken from a drone, of traffic passing through a busy junction (Drone U, 2017)

UAV for bridge inspection





"Roving host", drone outfitted with an antenna, wireless data exchange card and a camera for piloting (Mascareñas et al., 2008)



The "Roving host" in operation

UAV and BIM



UAV derived data and its implementation into BIM:

- Progress monitoring
- Site surveying
- Building inspection
- Equipment and material tracking
- Safety inspection
- Facility management

Defining UAV routes





Routes for multiple UAVs (Jun & D'Andrea, 2003).



Drone navigation using perimeter approach (Irizarry, 2012)

BIM and intelligent UAV



BIM and intelligent UAV



Step 1 Create the BIM model of the building
Step 2 Establish geo-referencing of the BIM model of the building
Step 3 Extract the location of objects
Step 4 Create cameras and photo-realistic images
Step 5 Sequence of automatic routing of the inspection flight
Step 6 Evaluate the routing by digital simulation
Step 7 Execution of the drone flight and collection of information
Step 8 Recognition of objects using Computer Vision (CV)



Thank you

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UAV and BIM



Project	Period	Number of visits/ number of flights	Number of pictures collected	Number of pictures used for safety checklist	Time of video recording	Total flight duration (h)
Α	Oct/15 to Mar/16	4/14	579	23	39:02	2:07:43
В	Nov/15 to Mar/16	4/12	935	23	16:37	1:47:34

UAV Data Collection (Rodriguez Santos de Melo, 2017)

Snapshot types	1st inspection (Oct/15)		2nd inspection (Nov/15)		3rd inspection (Dec/15)		4th inspection (Feb/16)	
	Items inspected	% NC						
Overview (12*)	12	8%	12	8%	11	9%	11	9%
Medium View (6*)	6	17%	6	33%	5	20%	8	37%
Close Up View (16*)	14	21%	13	15%	16	6%	19	16%
Snapshot types	1st inspection (Nov/2015)		2nd inspection (Dec/2015)		3rd inspection (Feb/2016)		4th inspection (Apr/2016)	
	Items inspected	% NC						
Overview (7*)	7	57%	7	57%	7	57%	7	57%
Medium view (4*)	5	60%	6	67%	5	60%	4	75%
Close up view (12*)	10	50%	12	50%	9	56%	9	86%

Non- compliances of Site 1 & 2 (Rodriguez Santos de Melo, 2017)