CAD/BIM/GIS
Floor Plan Integration at the University of Washington
Presented by Aaron Cheuvront, UW Capital Projects Office
Showcase the UW CAD to GIS translation process. Teach others that CAD floor plans can still be maintained for a CAD audience while still meeting the needs of automated GIS translation.

Goal

Key points:
- Standardization
- Automation
- CAD Focused Authoring
- Error Checking
In the past...

Not georeferenced
Not standardized
Manual GIS translation

Current Stats
1300+ Floor Plans
20+ Million Sq.Ft.
1 CAD Drafter
Why CAD and GIS?

What about BIM?

The “Holy Grail” for interior space...
Fundamental Differences Between GIS & CAD

- Coordinate system
- Data Organization (Structure)
  - layers
  - files vs. database
- Data (Information)
Traditional CAD Floor Plan to GIS Translation

- Georeferencing
- Room boundaries as polygons
- Room numbers as annotation
- Spatial intersection between room boundaries and room numbers
Traditional CAD Floor Plan to GIS Translation

Spatial intersection problems
Room 102B & 1ST1

Coordinate system
0,0 at lower left of building
Results from Traditional CAD to GIS Translation

- Errors found in GIS need to be fixed in CAD
- Cannot be fixed in CAD and must be re-fixed every time the drawing is translated
- Manual editing or verification required
The UW’s Solution

*Everything is done in CAD, from a CAD perspective*

- Georeferencing while maintaining traditional CAD coordinate system
- Associate room boundaries and room numbers
- Data error checking
- Create GIS feature classes in CAD
World Files

CAD/BIM/GIS Floor Plan Integration at the University of Washington

[Image of a floor plan and software interface]
World Files

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Assign Data
Assign Data
Assign Data

```lisp
(setq alldatafields (list "FACNUM" "FLOOR" "ROOM_NUMBER" "FACFLOOR" "FACNUM" "ROOM_AREA"))
(setq data_values nil)
(setq block (entnext (ssname datablocks datablockcnt)))
;;; create a list of attribute tag name / value combinations for each block
(while (/= "SEQEND" (cdr (assoc 0 (setq d (entget block))))))

;;; if the tag is OBJECT, store this entity name as that is what provides the link back to the asset
(if (or (eq "ROOM AREA" (strcase (cdr (assoc 2 d)))) (eq "OBJECT" (strcase (cdr (assoc 2 d)))))
true, trim off S# and just store the number and save the asset ID as link
(progn
  (setq assetID Block)
  (setq data_values (cons (cons (cdr (assoc 2 d)) (substr (cdr (assoc 1 d)) 1 (wl-string-search "-" (cdr (assoc 1 d))))) data_values))
)

not true, just store the whole value
(setq data_values (cons (cons (cdr (assoc 2 d)) (cdr (assoc 1 d))) data_values))
(setq block (entnext block))
)
(reverse data_values)

;;; convert the listed values to the field text code which includes the object id for the asset
(setq fieldcode (fieldtotext assetID))

(if (and fieldcode (wl-string-search "ObjId" fieldcode))
  (setq objid (substr fieldcode (+ 1 (wl-string-search "ObjId" fieldcode))))
  (setq pline (vla-objectidtoobject (vla-get-activatedocument (vla-get-acad-object) objid)))
  (setq pline_name (vla-get-objattributestr pline))
)

;;; set field (car alldatafields))
;;; (entget pline_name)
;;; for each field of data assign the value to the asset per feature class field
;; (foreach field alldatafields
  ;; (esri_getattribute pline_name field length 0 (vla_force_field_data_value))
```
ArcGIS for AutoCAD
Room Featureclass
CAD Error Checking

Command: re REGEN Regenerating model.
Command: vaultcheck
regen Regenerating model.

Command: 
***ERROR*** There are 1 room blocks That have more than 1 pline attached. The following is a list of pline handle and room number where errors were found:
("Pline ID" "Pline Handle" "Room Number")
("8796082793984" "4180" "102B")
("8796082793984" "4180" "1003") nil

Command:
GIS Error Checking/Logs

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GIS Translation

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System Diagram

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Conclusion

Features

• Data Driven Pages for printing floor plans in GIS
• 2D and schematic 3D floor plans
• Link to any data containing room ID
• Foundation for other systems to build on
  • Space Inventory
  • Asset Management
  • Way-Finding
  • Life Safety
Way-Finding
2D & Schematic 3D