ANSYS Graphical User Interface Programming with UIDL

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Introduction What is UIDL?

- UIDL is the ANSYS “User Interface Design Language”.
  - UIDL is specifically designed as a Graphical User Interface (GUI) for the ANSYS command structure.
  - Ability to create Menus, Dialog boxes, and Picking Controls.
- Implemented by ANSYS at revision 5.1
- Until ANSYS 6.1 the ANSYS Main Menu and most Dialog Boxes were generated using UIDL
Introduction Advantages of UIDL

- **Usability**
  - Specially designed as a GUI for ANSYS for ease in assembling ANSYS Commands
  - Easy to incorporate User Programmed GUI with ANSYS GUI
  - Interpreted (not compiled) so effects of modifications are immediately realizable.
  - Can add features on corporate level and individual user level

- **Compatibility:**
  - Cross-platform compatible.
Introduction: Disadvantages of UIDL

- **Limited Flexibility:**
  - Difficult to use UIDL to do anything except fill in ANSYS command fields or create menus.
  - Cannot customize “look and feel”, by adding graphics or custom buttons.
  - Limits on Text String/Prompt lengths

- **Nonstandard Language:**
  - Since UIDL was written specifically for ANSYS there are not many people that know how to program it.
  - Error trapping is not robust.
  - Requires write privileges on control file for the initial indexing.

- **Limited Technical Support:**
  - Considered “Non-standard” use of the program
UIDL in ANSYS Basic Structure

- UIDL is programmed using a control file (or Granule file)
- The Granule File contains header information and a series of “Building Blocks”
- “Building Blocks” are either:
  - Menu Blocks: Define menu entries
  - Function Blocks: Define dialog and pick boxes

---

```plaintext
:ID DEMO.GRN
:ID Demo Granule for Seminar
:ID 367, 90955, 100155
!:N Men Keypoint
:IS 177, 74, 96
!:T Menu
!:A Keypoints
!:D Keypoints
Fnc_Kp
Fnc_K
Fnc_KL
Fnc_KLD
Fnc_KNODE
Fnc_KTBET
Fnc_KFILL
Men_KCEN
Sep
Men_HARDPTL
Men_HARDPTA
!:E End
!:N Fnc_K
:IS 341, 143, 191
!:T Command
!:C )! Fnc_K
!:A In Active CS
!:D Create Keypoints in Active Coordinate System
!:K #(PREP7)
!:H Hlp_C_K
Cmd_K
Fld_0
Typ_Lab
Prtm[K] Create Keypoints in Active Coordinate System
Fld_2
Prtm_NPT
Typ_INT
Def_Blank
Fld_3
Prtm_X,Y,Z Location in active CS
Typ_REAL3
!:E End
```
UIDL in ANSYS Control Files

- Control files (or Granule Files) are simply ASCII files that contain some header information and then the “building blocks” for the menus and dialogs. Usually has a .GRN extension.
  - Required header consists of:
    :F DEMO.GRN - File Name
    :D Demo Granule for Seminar - Description
    :I 0, 0, 0 - Index line (0’s required)
  - Index line will be overwritten by ANSYS the first time the file is parsed
    • Write privileges are required

- The control file must be referenced in the menulist60.ans file. ANSYS searches for this file in the following locations in order:
  - Working Directory
  - Home Directory
  - ANSYS DOCU directory
The menulist file contains a list of all of the .GRN files that the GUI will use

- The list of files are parsed in order so later files can overwrite earlier files
- Useful because there is no need to edit the ANSYS supplied .GRN files. Simply redefine the desired menu or function and then list the user Granule file after the ANSYS files.

Example menulist60.ans

```
C:\Program Files\Ansys Inc\ANSYS61\DOCU\english\uidl\UIMENU.GRN
C:\Program Files\Ansys Inc\ANSYS61\DOCU\english\uidl\UIFUNC1.GRN
C:\Program Files\Ansys Inc\ANSYS61\DOCU\english\uidl\UIFUNC2.GRN
C:\Program Files\Ansys Inc\ANSYS61\DOCU\english\uidl\MECHTOOL.AUI
C:\Program Files\Ansys Inc\ANSYS61\DOCU\english\uidl\CAEG.GRN
DEMO.GRN
```
As we have seen there are 2 basic building blocks in UIDL:
- Menu Block
- Function Block

Each block consists of 2 sections:
- Header Section: All lines start with a “:”
- Control Section

The Header section is basically the same for each building block. Required header fields are:
- :N Men\_menuname or :N Fnc\_functionname
- :S 0, 0, 0 - Index line (will be modified by ANSYS)
- :T type (Menu, Cmd, Cmd\_P)
- :A name - To appear in a menu
- :D description - To appear in window title bar
● There are also optional header lines available
  - :H Hlp_helpentry - Designates the help section to access when help button is pressed
  - :C ansys command – Executes an APDL command when this block is called
    • Example: :C /POST1 in the header section of the General Postprocessor menu will switch the processor to POST1 before displaying the menu.
    • Very useful for defining variables or executing commands before a Menu or Dialog box is displayed.
    • Note: For dialog boxes these commands are executed as soon as the box is displayed (they are not affected by the CANCEL button)
  - :K KEYWORD – Keyword logic to determine whether Fnc or Men is visible in a menu
UIDL in ANSYS Menu Blocks

- **Menu Blocks**
  - **Headers**
    - :N Men_menuuname
    - :T Menu
  - **Control Section**
    - Simply a list of Sub Menus or Functions that should be in this menu, referenced by their :N names.
    - Also allows **Sep_** - Creates a separator line.
    - A plain text string will appear as a menu header line
  - **Example**

```plaintext
:N Men_Keypoint
:S 0, 0, 0
:T Menu
:A Keypoints
:D Keypoints
:Fnc_K_p
:Fnc_K
:Fnc_KL
:Fnc_KLD

Fnc_KLD
Fnc_KNODE
Fnc_KBET
Fnc_KFILL
Men_KCEN
Sep_
Men_HARDPTL
Men_HARDPTA
:E End
```

Example Keypoints Menu Block:
- On Working Plane
- In Active CS...
- On Line
- On Line w/Ratio
- On Node
- KP between KPs
- Fill between KPs
- KP at center
- Hard PT on line
- Hard PT on area
UIDL in ANSYS Function Blocks

- Function Blocks
  - Headers
    - :N Fnc_functionname
    - :T Cmd or :T Cmd_P – Merely determines whether, when displayed in a menu, it is followed by ... or +
  - Control Section
    - Can start with Inp_P to designate a Picking Control Box or Inp_NoApply to designate that the APPLY button is not visible (Only OK, CANCEL and possibly HELP). If neither appears then the standard dialog box with OK, APPLY, CANCEL and optionally HELP is created.
    - Usually contains one or more Cmd_lines, optionally followed by Fld_lines. These lines designate an ANSYS Command and fill in the fields of that command.
    - Example:
      - Cmd_*DIM,newarray,ARRAY,3
    - Up to 50 Cmd_can be contained in on Function Block
The **Fld_** controls determine which fields of the **Cmd_** will be filled in by the user.

- The format is **Fld_#**. The lines following this **Fld_** control will affect that field number.
- Each **Fld_#** line should be followed by at least one **Typ_** line which dictates the type of data that will go into that field.
- Other available lines to follow the **Fld_** are:
  - **Prm_** - Displays a test prompt in the dialog box
  - **Def_** - Defines a default value to display in the field
  - **K_FL** – Defines Keyword logic that determines whether the entry box for field should be displayed
- There are over 20 different available Typ_ lines in UIDL, to define different types of entries.

  Typ_Int
  Typ_Int2
  Typ_Int3
  Typ_Real
  Typ_Real2
  Typ_Real3
  Typ_Char

  Typ_Logi
  Typ_Lis_OptionB
  Typ_Mlis
  Typ_Lis_RadioB
  Typ_Idx
  Typ_File
  Typ_File_Inline

  Typ_Node
  TypElem
  Typ_XYZ
  Typ_XYZ_WP
  Typ_Resu
  Typ_Color
  Typ_Def
  +More

- We will look at a few of these types. Please refer to the UIDL Programmers Guide for information on the other types.
Let's look at a simple example of how to generate this dialog box in ANSYS:

```
:N Fnc_K
:S 341, 143, 191
:T Command
:C )! Fnc_K
:A In Active CS
:D Create Keypoints in Active Coordinate System
:K #(PREP7)
:H H1p_C_K
_Cmd_K
Fld_0
 Typ_Lab
 Prm_[K] Create Keypoints in Activ Coordinate System
Fld_2
 Prm_NPT Keypoint number
 Typ_INT
 Def_Blank
Fld_3
 Prm_X,Y,Z Location in active CS
 Typ_REAL3
:E End
```
• Other useful Function block commands:
  
  — Use Cnt_, Min_, Max_, Sel_Rub_, Pdp_, etc. to control how many entities, what types of entities, what type of picking, etc. the user can choose when a pick box is opened.
  
  — Use the Cal_ just before the end (:E End) of a function to call another function
    
    • Cal_Fnc_Demo1 – Will call function Demo1 after the users chooses OK or Apply
    • The Cal_ comand can also be a conditional call
      
      — Ex. Cal_Fnc_Name, Fld #, Oper, Value, Cmd #
      — Cal_Fnc_Demo2, 2, EQ, 1, 3
        
        • Will call Function Demo2 if field 2 of the 3rd command equals 1
  
  — Cal_REFRESH – Will refresh the currently open submenu. Useful if this Function Block has modified a Keyword so that an entry is no longer grayed out.
  
  — Use *PAR(var) to retrieve the value of a variable
Let's look at a more detailed example in which we create a GUI for the SXYZ macro that was presented in the APDL section.

- The sxyz macro requires X,Y,Z positions and an averaging key as input. Use UIDL to create a GUI that allows the user to pick an arbitrary point in space at which to obtain the Stress.
- After picking we will bring up a dialog box with the coordinates that the user chose so they can be modified if necessary. Also prompt for type of stress to list.
- Add this function to the PostProcessor under List Results.
First add our function to a pre-existing ANSYS menu

Automatically parsed into Tcl/Tk menu for new GUI in ANSYS 6.1
UIDL in ANSYS Detailed Example

:N Fnc_sxyz
:S 0, 0, 0
:T Cmd_P
:C )! Fnc_sxyz
:A Stress at XYZ location
:D Evaluate Stress at XYZ location
:H Hlp_EFIX

Inp_P
Cmd_\_\_/NOPR
Cmd_\_\_*DEL,\_z
Cmd_\_\_*DIM,\_z,,,3
Cmd_\_\_*SET,\_z(1)
Fld_2

Prm_Pick location or enter coordinates for stress evaluation
Typ_XYZ
Min_1
Cnt_1
PFM_2
!
Cmd_\_\_/GO
Cal_Fnc_sxyz2
:E END
:

Then generate a picking tool and prompt the user to pick an arbitrary location. Store the point coordinates and then call the next function
UIDL in ANSYS Detailed Example cont.

:N  Fnc_sxyz2
:S  0, 0, 0
:T  Command
:C )! Fnc_sxyz2
:A  Stress at XYZ location
:D  Evaluate Stress at XYZ location

Cmd_SXYZ
Fld_0
Typ_Lab
Prm_Evaluate Stress at Specified Location
! Fld_2
Typ_REAL3
Prm_X,Y,Z Coordinates for stress evaluation
Def_*PAR(_z(1)),*PAR(_z(2)),*PAR(_z(3))
!
Fld_5
Prm_Item, Stress to be printed
Typ_IDX
IDX_Stress  ,X-direction  SX,'X'
IDX_Stress  ,Y-direction  SY,'Y'
IDX_Stress  ,Z-direction  SZ,'Z'
IDX_Stress  ,XY-shear  SXY,'XY'
IDX_Stress  ,YZ-shear  SYZ,'YZ'
IDX_Stress  ,XZ-shear  SXZ,'XZ'
IDX_Stress  ,1st principal S1,'1'
IDX_Stress  ,2nd principal S2,'2'
IDX_Stress  ,3rd principal S3,'3'
IDX_Stress  ,Intensity
   SINT,'INT'
IDX_Stress  ,von Mises
   SEQV,'EQV'
:E  END

Finally, bring up a dialog to display the coordinates of the picked point (with the ability to modify them) and prompt for the stress type.
All of the ANSYS Menus and Dialog boxes are found in the directory: ANSYS61/docu/english/UIDL. The files are UIMENU.GRN, UIFUNC1.GRN, and UIFUNC2.GRN.

Start by finding a Menu or Dialog box in ANSYS that resembles the one that you wish to create. Find the UIDL code for that block in one of the ANSYS files and copy it to a new file.

Remember to reset all index lines to 0’s.

Save a copy of your granule file with the 0 indices, because ANSYS will overwrite them the first time it is accessed.

Watch your CASE. UIDL is case sensitive, unlike APDL.
• Demonstration of a Fully customized ANSYS GUI for a Window Manufacturer