



USER'S MANUAL

Modi Yacht Application

**A Framework to Perform Parametric and Adjective
Based Modeling of Displacement, Semi-Displacement
and Planning Yacht Hulls.**

April, 2017

USER'S MANUAL

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1.0 GENERAL INFORMATION

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General Information section explains in general terms the application and the purpose for which it is intended.

1.1 System Overview

Modi Yacht is a CAD modeler which is developed to perform parametric and adjective based modeling of yacht hull design. Modi Yacht consists of two different modules; parametric based modeler and adjective based modeler.

1.1.1 Parametric Based Modeler

Parametric Based Modeler helps its end user to perform instantaneous design modification in their yacht hull designs. User can create wide variety of designs for yacht hull and user can transform one type of hull to a complete different hull type. For parametric modeling, Modi Yacht uses the combination of traditional and custom made design parameters. This helps its user to fully integrate with the design and helps to modify both minor and major features of yacht hull such as, width (Beam), Depth, Length, Chine positions, entrance angle, station concavities, etc.

1.1.2 Adjective Based Modeler

Adjective based modeler enables the designers to create desired number of designs based on the predefined adjective in the Modi Yacht. User can select single or multiple adjectives to create their adjective based designs. The generation of these are autonomous, user has to define N number of design and select desired adjectives. This modeler performs uniform sampling in the defined design space and automatically generate designs.

1.2 Organization of the Manual

This user's manual consists of five sections: General Information, Application Summary, Getting Started, Using The Application, and Reporting.

General Information section explains in general terms the application and the purpose for which it is intended.

Application Summary section provides a general overview of the system. The summary outlines the uses of the Application requirements, application's configuration and user access levels.

Getting Started section explains how to get Modi Yacht and install it on the device. The section presents briefly system menu.

Using The Application section provides a detailed description of application functions.

Reporting section describes in what way information collected by the application are presented and how to access the information.

2.0 APPLICATION SUMMARY

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Application Summary section provides a general overview of the system. The summary outlines the uses of the application's requirements, application's configuration and user access levels.

2.1 Application Configuration

Modi Yacht Application operates on computer with 64 or 32 bit windows operating system. This application requires Microsoft .NET Framework 4.5. Input yacht models are already stored in the systems. User can access these models by clicking relevant tabs.

2.2 Application Installation

Application can be easily installed using the Modi Yacht installation setup file. During the installation user can locate the desired installation location.

2.3 User Access Levels

For Modi Yacht application there are free and paid licenses. Anyone related to naval architecture or ocean engineering can take tremendous benefits from this application. Free version has limited features. However, paid version contains the all the features.

2.4 Contingencies

In case of power outage data are not saved in internal memory of the operating device unless user already exported his/her design from Modi Yacht application to a specific location.

3.0 GETTING STARTED

3.0 GETTING STARTED

Getting Started section explains how to get Modi Yacht Application and install it on the device. The section presents briefly system menu.

3.1 Installation

Application can be easily installed using the Modi Yacht installation setup file. During the installation user can locate the desired installation location. The newest installation version currently available can be downloaded from <http://scad.itu.edu.tr/>, which should be installed on the device. The Microsoft .NET framework can be downloaded from <https://www.microsoft.com/en-us/download/details.aspx?id=30653>. For specific instruction on how to install application on specific device refer to device's manual.

3.2 System Menu

Modi Yacht is a CAD (Computer Aided Design) application for the parametric and adjective based modeling of diverse types of yacht hulls. The main GUI (Graphic User Interface)/view window is shown in the Figure 1.

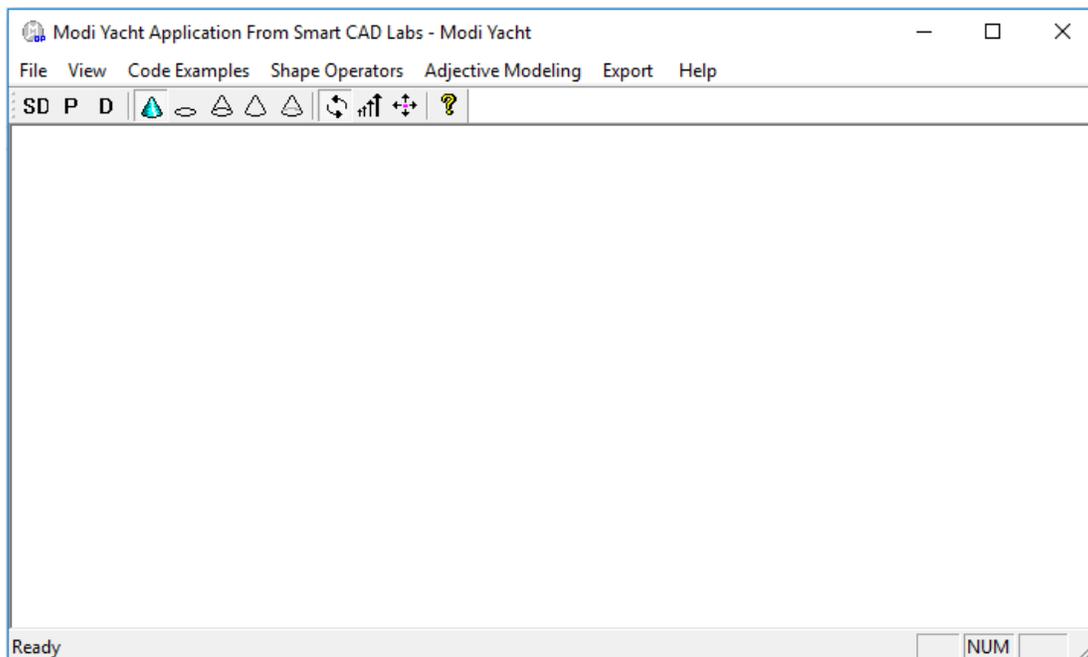


Figure 1: GUI/view window of Modi Yacht

In the main interface there are three different types of bars (bar positions are shown in Figure 2):

- 1: Operation bar
- 2: Tool bar
- 3: Status bar

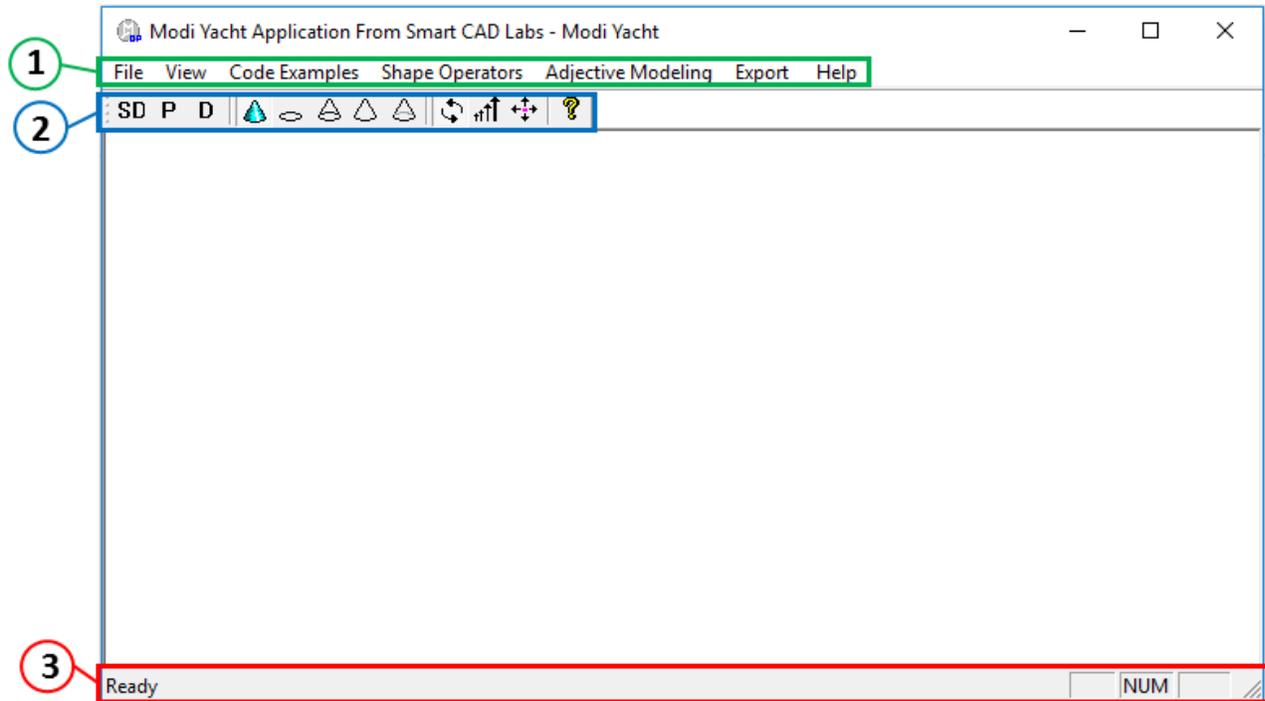


Figure 2: Descriptions of tabs.

3.2.1 Operation bar



This bar provides access to five main tabs such as; File, View, Shape Operators, Shape Operators, Adjective Modeling, Export and Help tabs.

3.2.1.1 Shape operator tab

The Shape Operators tab provide access to the parametric modeler of Modi Yacht Application. This tab opens a drop down menu to further access two more tabs: Group 1 tab and Group 2 tab (as shown in Figure 3). Through these tabs user can open dialogs to implement group-1 and group-2 shape operators.

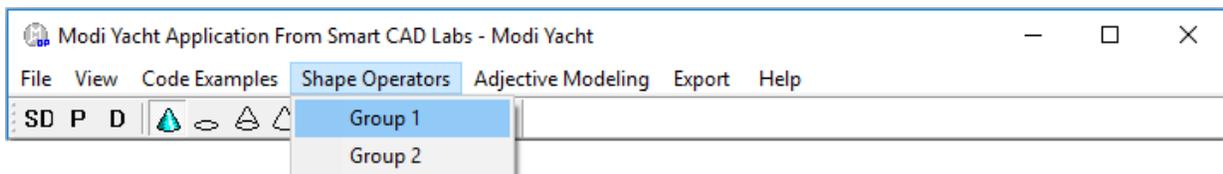


Figure 4: Drop down menu on clicking Shape Operators tab.

The dialogs for implementing the group-1 and group-2 shape operators can be opened on clicking the Group 1 and Group 2 tabs, respectively. These dialogs are shown in Figure 5 and 6. Description of parameters mentioned in both dialogs is given in the Table 1 and 2.

Dialog For Implimenting Group-1 Shape Operators

ELONGATION
 L_e = Entrance Length
 L_m = Middle Length
 L_r = Run Length

WIDENING
 W_e = Entrance Width
 W_m = Middle Width
 W_r = Run Width

DEEPENING
 D_e = Entrance Deep
 D_m = Middle Deep
 D_r = Run Deep

CHINE POSITION
 F_e = Position at Station 1
 F_m = Position at Station 2
 F_r = Postion at Station 3

CHINE THICKNESS
 C_e = Thickness at Station 1
 C_m = Thickness at Station 2
 C_r = Thickness at Station 3

CHINE INSERTER/REMOVER
 Double Chine Single Chine
 No Chine

KEEL THICKNESS BOW ANGLE ENTRANCE ANGLE SHEAR ANGLE BOW VERTICAL LENGTH

DRAW

Figure 5: Dialog opens on clicking Group 1 tab.

Dialog For Implimenting Group-2 Shape Operators

STATION CONCAVITY

Station 1
 Upper Line
 Concave
 Convex
 Lower Line
 Concave
 Convex

Station 2
 Upper Line
 Concave
 Convex
 Lower Line
 Concave
 Convex

Station 2
 Upper Line
 Concave
 Convex
 Lower Line
 Concave
 Convex

MINIMUM RADIUS OF CURVATURE
 R_{ek} = Keel Line in Entrance

Station 1
 R_{es1} = Upper Line of Station 1 R_{es2} = Lower Line of Station 1

Station 2
 R_{ms1} = Upper Line of Station 2 R_{ms2} = Lower Line of Station 2

Station 3
 R_{rs1} = Upper Line of Station 3 R_{rs2} = Lower Line of Station 3

DRAW

Figure 6: Dialog opens on clicking Group 2 tab.

Table 1: Discription of design parameters in Group 1 dialog.

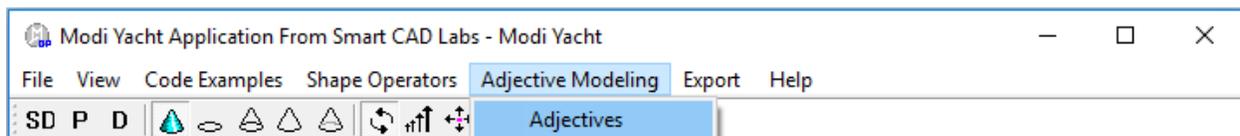
Name	Description	Name	Description
L_e	Length of Entrance Region (ER)	F_m	Vertical chine position at station-2
L_m	Length of Middle Region (MR)	F_r	Vertical chine position at station-3
L_r	Length of Run Region (RR)	C_e	Chine thickness at station-1
B_e	Width(Beam) of ER	C_m	Chine thickness at station-2
B_m	Width(Beam) of MR	C_r	Chine thickness at station-3
B_r	Width(Beam) of RR	K	Keel thickness
D_e	Depth of ER	H	Vertical length of bow line
D_m	Depth of MR	α	Sheer angle
D_r	Depth of RR	β	Bow angle
F_b	Vertical chine position at bow	θ	Entrance angle
F_e	Vertical chine position at station-1		

Table 2: Discription of design parameters in Group 2 dialog.

Name	Description	Name	Description
R_{ek}	Minimum radius of curvature of keel line(s) in ER	R_{ms2}	Minimum radius of curvature for lower line of station-2
R_{es1}	Minimum radius of curvature for upper line of station-1	R_{rs1}	Minimum radius of curvature for upper line of station-3
R_{es2}	Minimum radius of curvature for lower line of station-1	R_{rs2}	Minimum radius of curvature for lower line of station-3
R_{ms1}	Minimum radius of curvature for upper line of station-2		

3.2.1.2 Adjective modeling tab

The Adjective Modeling tab provides access to the adjective modeler of Modi Yacht Application. The Adjective modeling tab opens a drop down menu to further access Adjective tab as shown in Figure 7. Through these tabs user can open dialog to perform adjective based modeling. The dialog to perform adjective based modeling opens on clicking the Adjective tab and this dialog is shown in Figure 8.

**Figure 7:** Drop down menu on clicking Adjective Modeling tab.

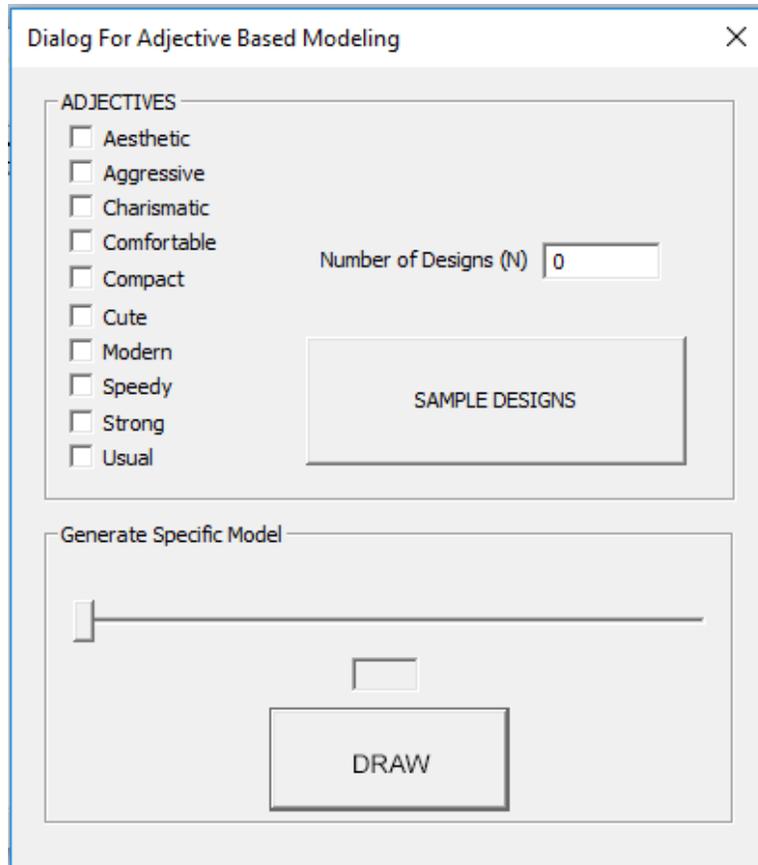


Figure 8: Dialog opens on clicking Adjective tab.

3.2.1.3 Export tab

This tab opens a drop down menu which contains Export Model tab (see Figure 9). The Export Model Tab **Exports** the current model on the screen to the documents library of the system.

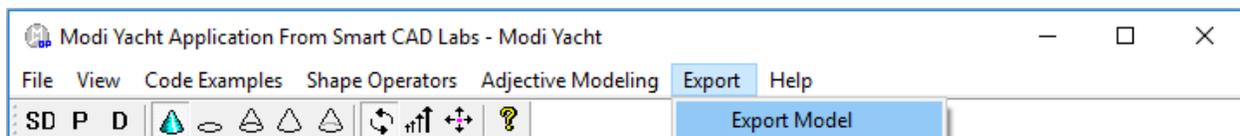


Figure 9: Drop down menu on clicking Export tab.

3.2.1.4 Help tab

Help tab opens the drop down menu, which contains “About Application” tab. The application tab opens the dialog shown in Figure 10. The dialog presents the information about the current version and developers web page.

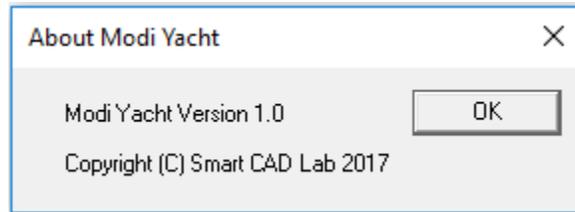


Figure 10: Dialog opens on clicking About Application tab.

3.2.2 Tool bar



Tool bar contains tabs to load initial yacht models, to change surface model into different wireframe styles. This tool bar also contains tabs to rotate, zoom and pan the model on the view window. Description of each tab on tool bar is given below:

-  This tab loads initial **semi-displacement** yacht hull.
-  This tab loads initial **planing** yacht hull.
-  This tab loads initial **displacement** yacht hull.
-  This tab draws the **shaded** model in view window.
-  This tab draws the **wireframe** model in view window.
-  This tab draws the **wireframe** model **with silhouettes** in view window.
-  This tab draws the **hidden line view** of the model in view window.
-  This tab draws the **hidden line** of the model in view window in gray color.
-  This tab **rotates** the model in view window.
-  This tab **zoom** the model in view window.
-  This tab **moves** the model in view window.
-  This is **about** tab and work similar as About Application tab.

3.2.3 Status bar



The description of each tab can be seen in status bar on putting the mouse cursor on any tab. A status of any modification or modeling process can be seen on the status bar. Some examples of status bar are shown in the Figure 11 and 12.

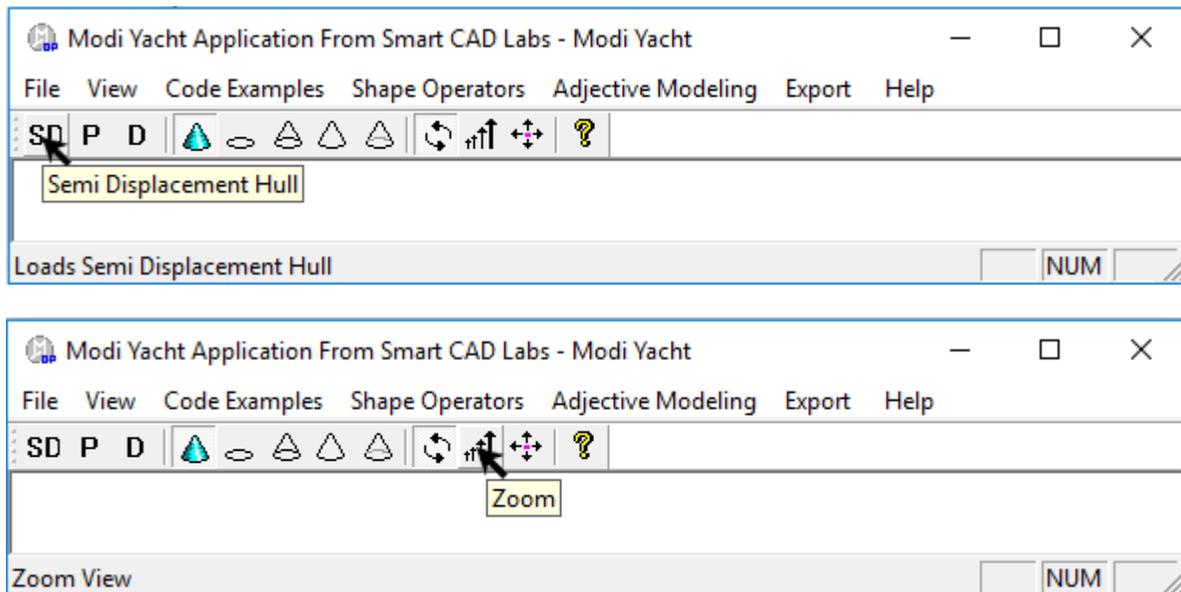


Figure 11: Examples of status bar.

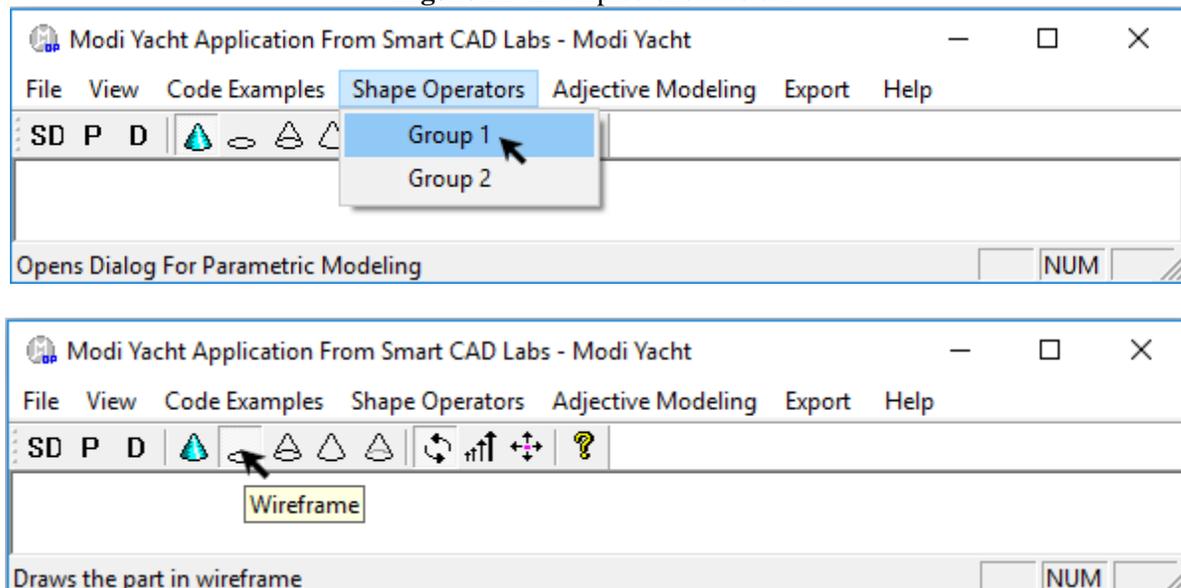


Figure 12: Examples of status bar.

3.4 Exit Application

Modi Yacht application can be closed by clicking Exit tab from the operation bar or from the X tab on the top right corner of the application. Both ways to close the application are shown in Figure 13.

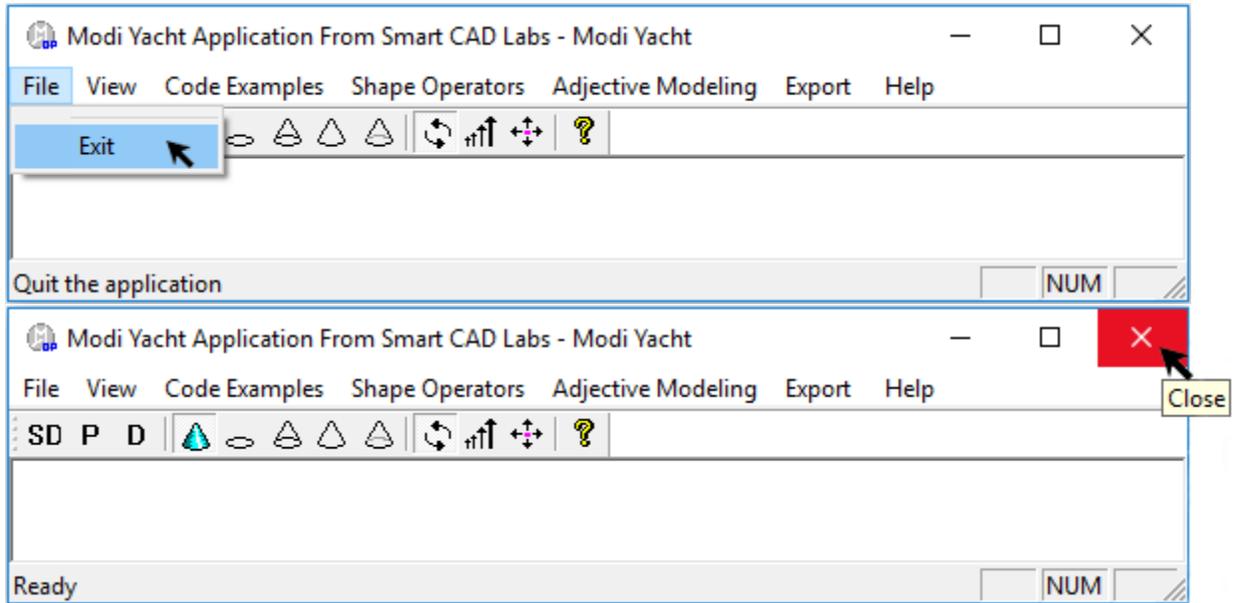


Figure 12: Ways to exist the Modi Yacht application.

4.0 USING THE APLLCATION

4.0 USING THE APPLICATION

This section provides a detailed description of application's functionality.

4.1 Application Functionality

Modi Yacht application has two main functionalities which is; to perform parametric design modification and to do adjective based modeling. The detailed description of both functionalities is given below.

4.1.1 Parametric Based Modeler

Parametric modeler helps to perform parametric design modification on initial yacht hull. Figure 13 shows hierarchical hull structure for the proposed design framework. Three different initial yacht hulls (planing, semi-displacement and displacement hull) are stored in the application's data based which can be access from **SD P D** tabs. Users can retrieve the hulls that they like and then modify them using the introduced shape modifiers. If they like to generate a different hull type for a given hull, a sequence of shape operators can also be used.

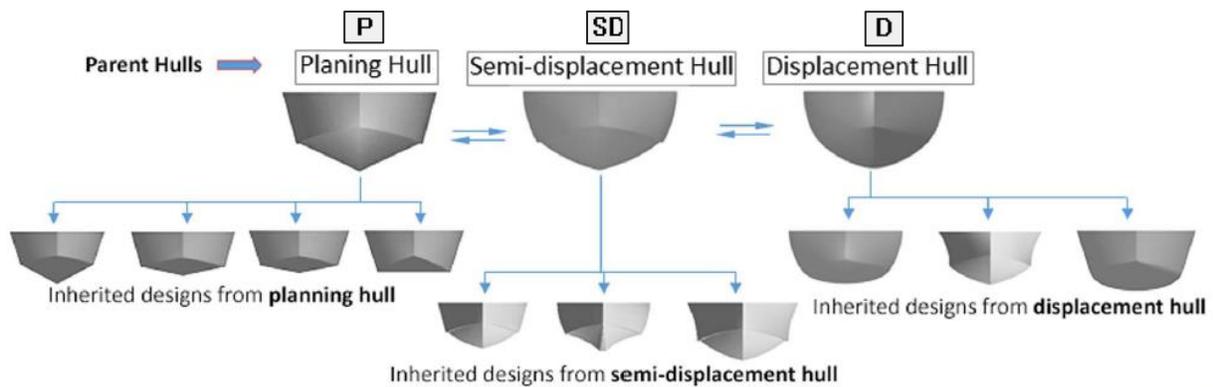


Figure 13: Hulls can be classified according to their hull types. Desired hull can be retrieved and used for the further modification.

To access any of the two dialogs for the parametric design modification of yacht hull user has to load the initial model otherwise a message shown in Figure 14 will appear.

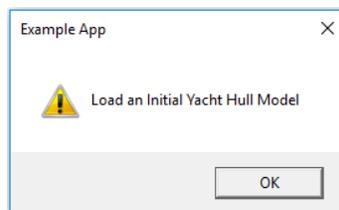


Figure 14: Warning message.

After loading the initial model, a message about type of model loaded in view window will appear on the status bar (see Figure 15). After loading the initial model user can open either dialog for group-1 or group-2 shape operators. The values of design parameters will already appear in the dialog as shown in Figure 15.

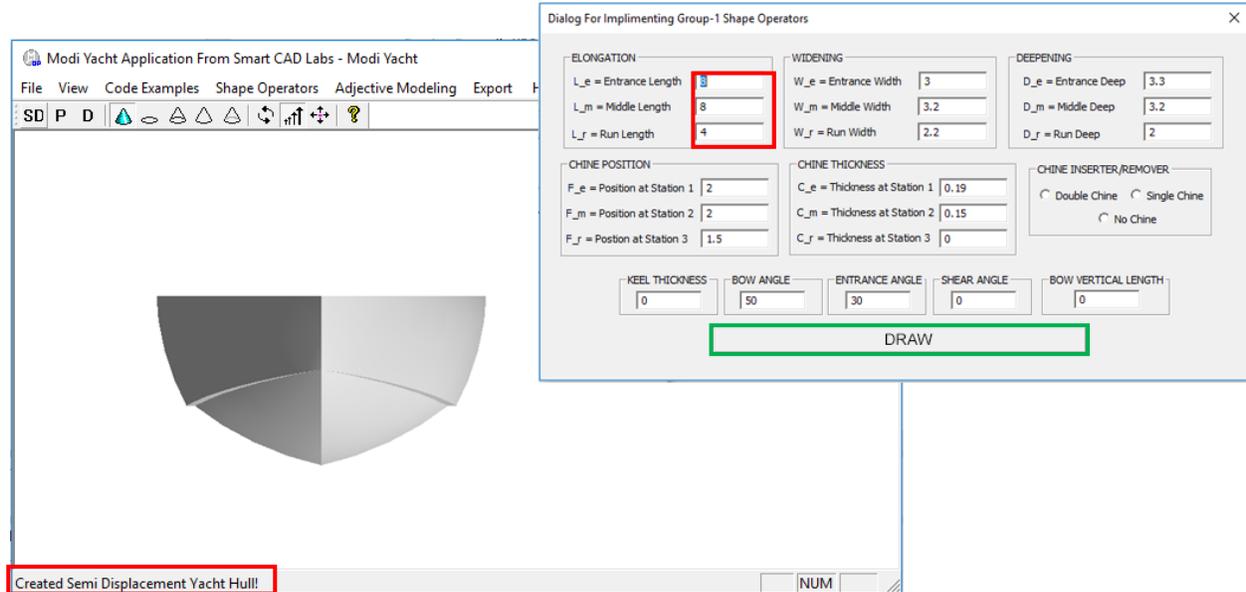


Figure 15: Scenario for parametric modification.

User can change any design parameter from the dialog and can generate modified model by clicking on **DRAW** button on the dialog. If no new design parameter value is entered designer, Modi Yacht will not perform any design modification on clicking the GENERATE button. Figure 16 show an example length modification of planning yacht hull.

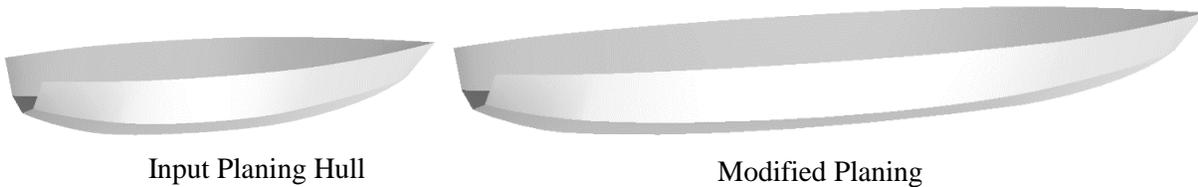


Figure 16: Modification Example.

The second dialog of parametric modification open on clicking Group 2 tab. Using this dialog user can change the concavity and radius of curvature values of stations. This dialog also provides the option to alter radius of curvature of keel line of entrance region. This curvature changes the forefoot radius of hull.

The radius of curvature value of any line can only be altered to a specific value. Application will produce a message shown in Figure 17 if the user entered radius of curvature value is unachievable. This message provides the information about the maximum achievable radius of curvature for that specific curve.

Figure 17 shows that when the value for R_{ek} entered 50 m, message appeared telling that desired radius of curvature is not achievable and the maximum achievable value for R_{ek} is 8.0121 m.

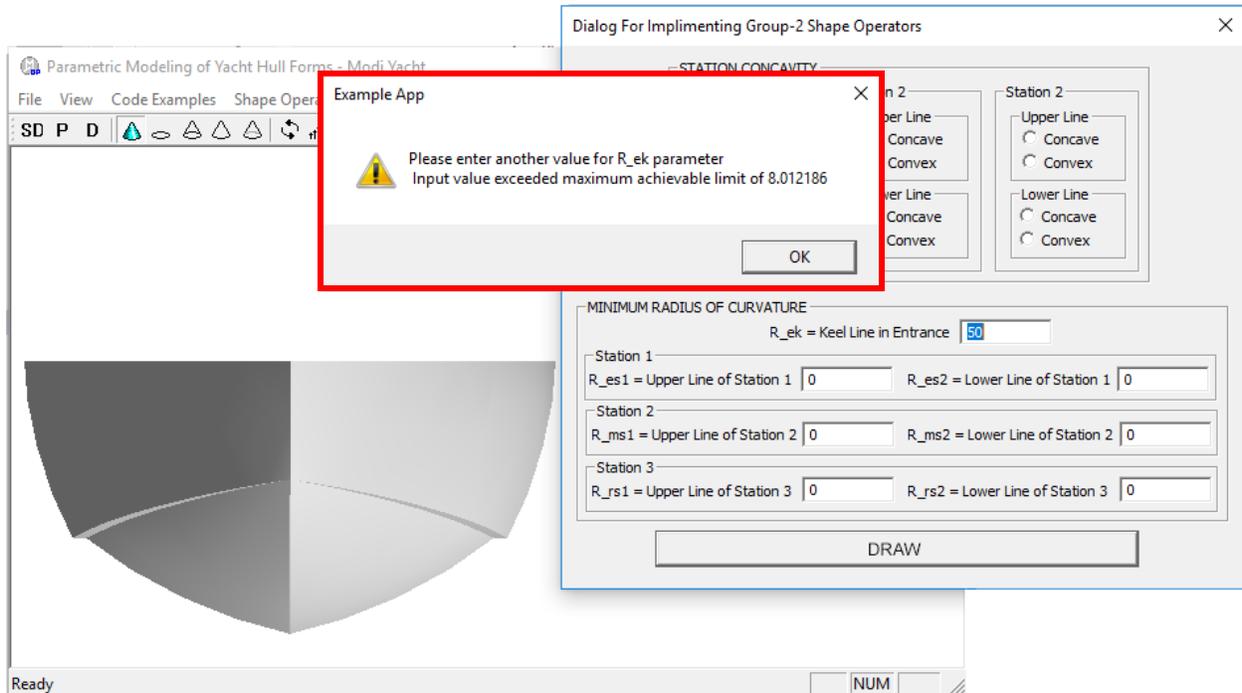


Figure 14: Waring message for radius of curvature.

Note: In case of planing hull design parameters in Group 2 dialog cannot be implemented except R_{ek} .

4.1.2 Adjective Based Modeler

By using Adjective based modeler user can create desired number of designs for specific adjectives. Adjectives have been defined in the Modi Yacht data base. User can create aesthetic, aggressive, charismatic, comfortable, compact, cute, modern, speedy, strong and usual yacht hull designs. The generation of these adjective based design is totally autonomous.

User first have to select desired adjectives and then have to define required **Number of Designs (N)**. After defining number of designs user have to click **SAMPLE DESIGN** button. This button will sample design using S- TLBO sampling approach. User has the ability to select either single adjective or multiple adjectives. During sampling status bar shows the status of “Creating designs in defined design space using S-TLBO”. After sample of design is completed status bar shows the status of “Designs have been created in design space by S-TLBO” (see Figure 18).

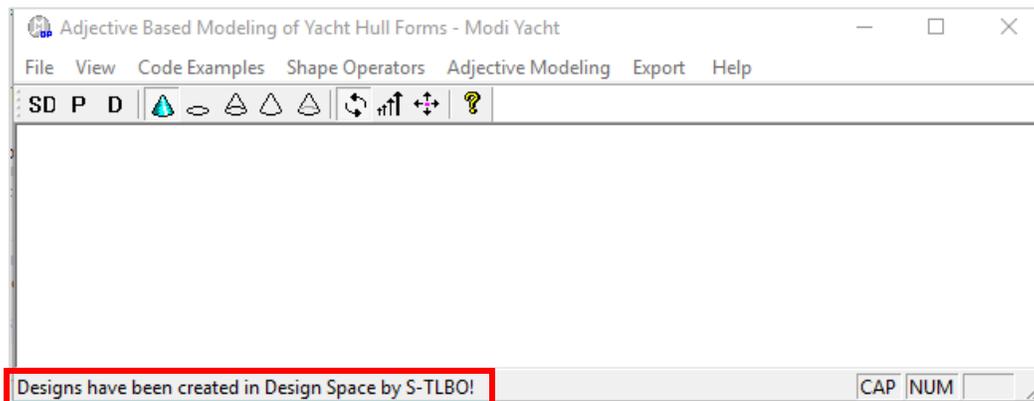
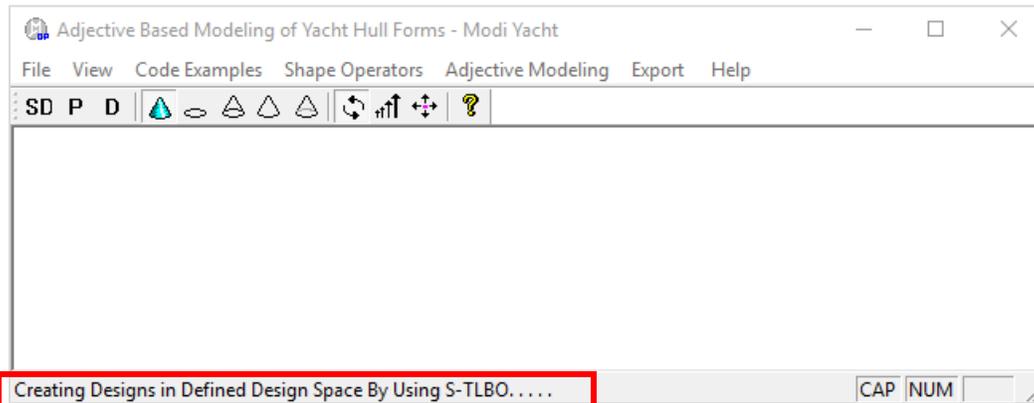
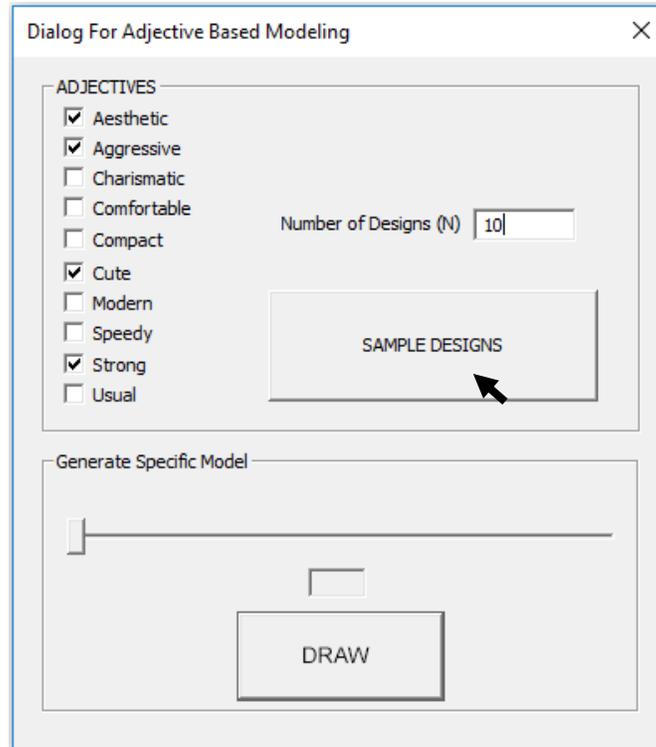


Figure 18: Creating design by performing Sampling.

After the specified number of designs have been created user can specify any number of design using Slider Control and on clicking the GENERATE button that specific design will be drawn on view window (see Figure 19).

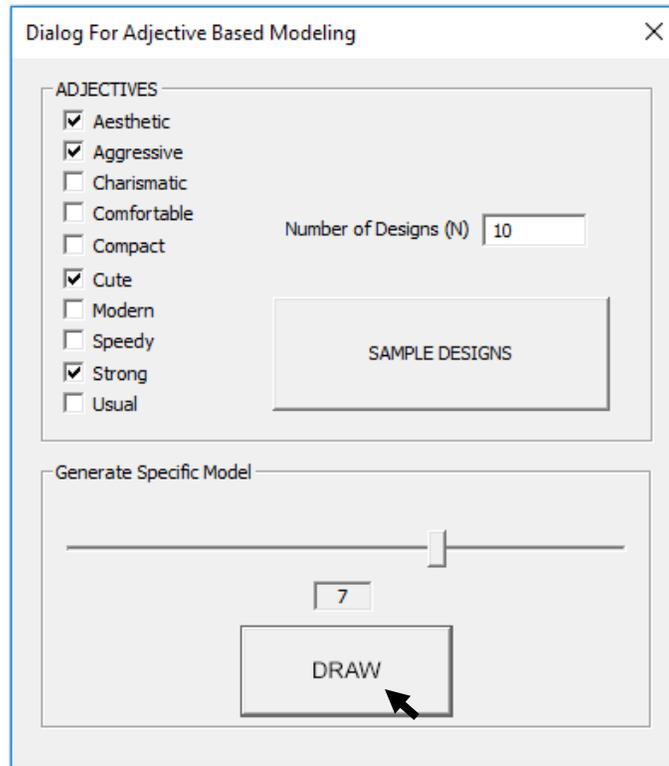


Figure 19

If user try to sample designs with entering the number of designs application produces message shown in Figure 20, if user to generate design without performing sample application gives message shown in Figure 21. No design can be generated if design number is not specified through slider controller. If user tries to do so application produces message shown in Figure 22.

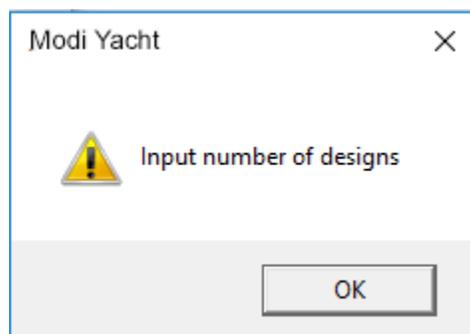


Figure 20: Message generated if sampling is tried to perform without entering Number of Designs (N)

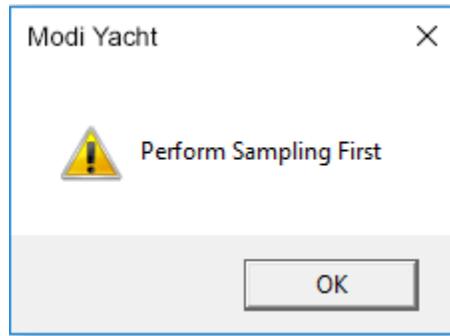


Figure 21: Message generated if user tries to create design without performing sampling

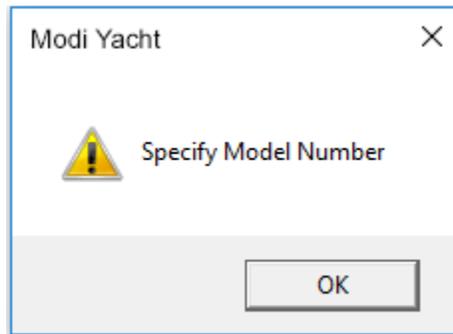


Figure 22: Message generated if user tries to create design without specifying design number

4.1.2.1 Example of Creating Adjective Based design

Figure 23 shows the example of generation three designs with Compact, Modern and Speedy adjectives.

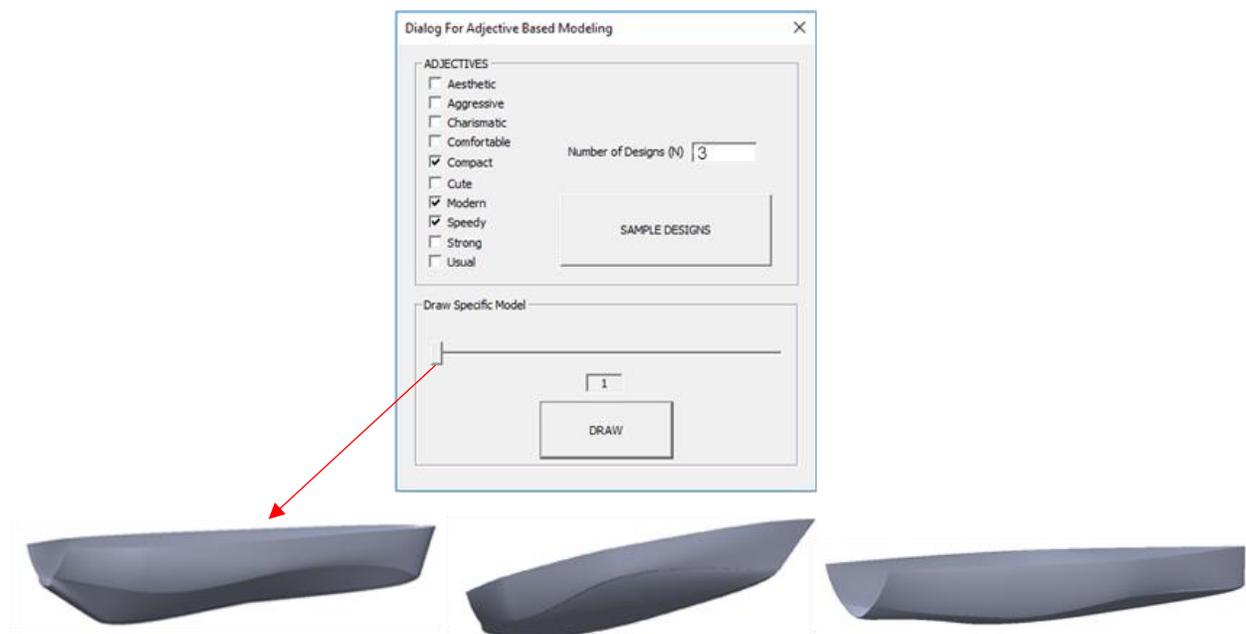


Figure 22: Three design are created for compact, modern and speedy