

Real time object customization in cad software via visual basic programming

Zainal Fahmi Zainol Abidin, Muhammed Nafis Osman Zahid*

Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600, Pekan, Pahang, Malaysia.

Corresponding e-mail: nafis@ump.edu.my

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ABSTRACT – This paper outlines a development of graphical user interface (GUI) for object customization in computer aided design (CAD) by utilizing Visual Basic (VB) programming language in NX10 CAD software. Major works involve development of the object customization tool in the form of new GUI which provides a set of editable parameters section. A customized graphical user interface (GUI) was developed to simplify the manual customization process. Initially, customization work is translated into programming codes via advanced tool available in the NX10. The recorded codes translated into visual basic script files and then is modified to create a functional GUI. The results revealed that the developed programs are capable to simplify drawing work in CAD by reducing the drawing steps and time.

1. INTRODUCTION

In conventional approach, customization process for a model designed in CAD requires user to modify the parameter manually. User needs to reopen the file, select the area that need to be customized and make the editing process by key-in the desired input. For recurring work towards the same model, it consumes a lot of steps needed to complete the sketch. Other than that, in current industrial environment, production time becomes a crucial factor. Considering overall product development cycle, 80% of the production time is wasted in design process [1]. Based on the previous studies [2-7], time saving can be greatly reduced during the designing stage of the product. In this project, real time object customization has been developed by integration of Visual Basic Programming studio and Unigraphics NX 10 software. NX 10 has a smart feature called NX Flow, and NX Open Common Application Programming Interface (API) that allows the integration of custom software applications.

2. METHODOLOGY

In this study, object customization was executed by using Microsoft Visual Basic 2010 (VB). Integration between NX 10 and VB was possible due to NX Open. It works through the Common API of NX 10. NX Open provides all programming languages to assist the development of software to improve automation and fusion of the tasks. The customization work involves four main steps that need to be executed. The block diagram for this process is shown in Figure 1.

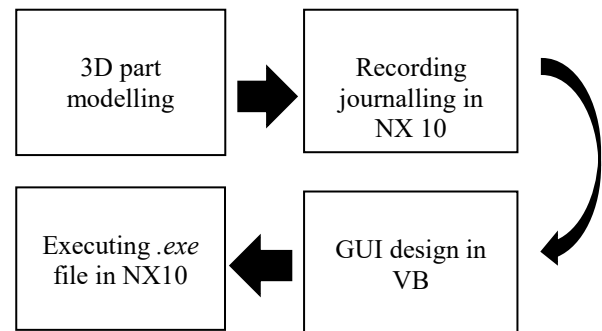


Figure 1 Block diagram for object customization process.

2.1 Journaling

A function inside NX 10 called Journaling allowed a series of actions performed on the interface being recorded. A file of .net language code was automatically produced by NX 10 describing what had been carried out in programming language (visual basic, JAVA or C++) as shown in figure 2. Based on that, it produces a scripted file from an interactive session of NX which can be run and replay again later. These sessions will be edited and enhanced with distinct programming instruction for example to construct graphical user interface component.

```

    NX 10.0.0.24
    * Journal created by Zen on Wed Nov 29 14:41:07 2017 Malay Peninsula Standard Time
    *
    Option Strict Off
    Imports System
    Imports NXOpen

    Module NXJournal
    Sub Main (ByVal args() As String)

    Dim theSession As NXOpen.Session = NXOpen.Session.GetSession()
    Dim workPart As NXOpen.Part = theSession.Parts.Work

    Dim displayPart As NXOpen.Part = theSession.Parts.Display

    -----
    * Menu: Edit->Sketch...
    -----

    Dim markId1 As NXOpen.Session.UndoMarkId
    markId1 = theSession.SetUndoMark(NXOpen.Session.MarkVisibility.Invisible, "Enter Direct Sketch")

    theSession.SetUndoMarkVisibility(markId1, "Enter Direct Sketch", NXOpen.Session.MarkVisibility.Visible)

    Dim sketch1 As NXOpen.Sketch = CType(workPart.Sketches.FindObject("SKETCH_002"), NXOpen.Sketch)
  
```

Figure 2 Sample of VB language programming recorded by NX10 Journaling tool.

2.2 Visual basic studio

Figure 3 below shows the GUI that has been created for the object customization. The GUI has been developed in Visual Basic Studio using windows form application. Visual basic language programming that has

been recorded by NX10 Journaling tool will be open in the Visual Basic software and then the designing process was executed.

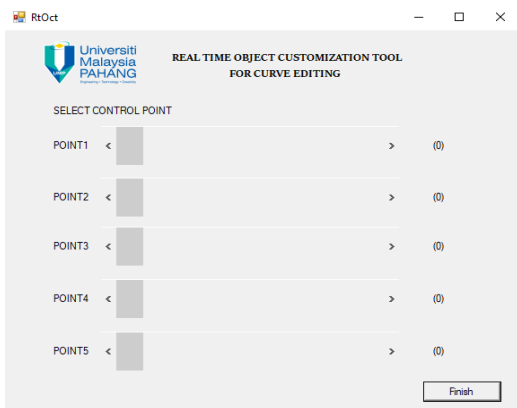


Figure 3 Object customization graphical user interface (GUI) created using visual basic studio.

3. RESULTS AND DISCUSSION

Experiment was conducted using developed program and are classify into two levels which is classified as expert and beginner. Expert user represented by worker with more than 3 years of CAD experience while beginner user represented by worker with below than 3 years of experience in CAD software. Object selected for this customization process is guitar model sketched in NX-10. The guitar’s curve surface will be modified using GUI that has been developed. The curve surface will be adjusted to the most comfortable curve that will fit user body. For this guitar shape, the customization is made on B-spline curve on the guitar model. Developed GUI allow user to customize the B-spline point that has been plotted for the curve shape as shown in Figure 4.

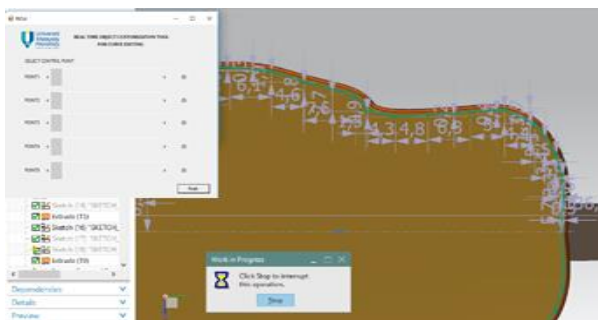


Figure 4 Developed GUI is activated in NX10 system.

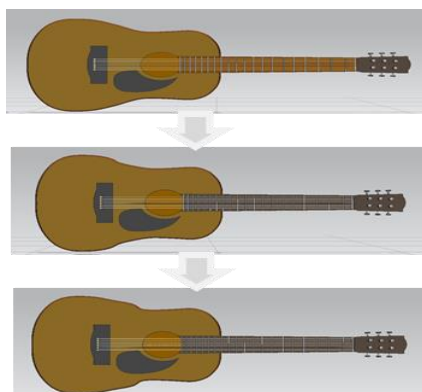


Figure 5 Customization on the B-spline control point.

From Table 4, object customization manages to increase 93% time saving for common user and 50% time saving for daily user in editing a guitar model when using real-time customization method. Time saving efficiency has been measured by dividing time recorded using GUI and without using GUI.

Table 1 Experimental results.

Guitar model	Time recorded without using GUI (sec)	Time recorded with using GUI (sec)	Time saving (%)
Expert	40	20	50
Beginner	300	20	93

4. CONCLUSION

This approach is considered as an alternative way from editing the sketch manually into real time customization that allows user to view real time changes on the object while manipulating the GUI. As conclusion, the developed program managed to improve the efficiency of object customization and shorten the design processing time in CAD system.

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