Development of a Program for the Auto-Generation of “Development of Surface”

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ABSTRACT

This project aims to develop a program for surface development of solids for SolidWorks 2001. The SolidWorks 2001 modeling software is first introduced to students in July 2001 and there arose a need to develop an add-in for SolidWorks to perform surface development for educational as well as commercial use. This paper documents the process of developing this program.

RESULTS

To achieve the desired interface of the dialog box and the necessary operations, programming algorithms are needed. An add-in is considered rather than stand-only software as software complications and conflicts may occur during the development stage and final execution of the program. Based on the SolidWorks 2001 API, two programming languages are considered: Visual Basic (VB) and C++. The latter is used because of the wider range of API available. MS Visual C++ is used to develop the algorithms. As the range of solid is large and the complexity of some solids, the following solids are considered for development: four-sided prism, cone, cylinder, and four-sided pyramid. SolidWorks 2001 is used to create the solids.

INTERFACE

To allow communication between the user and SolidWorks, a dialog box is created. Four main areas of surface development are covered in this project: Primitive, Truncate, Transition and Interpenetration. These sections are placed into four tags. Each section is accessible by clicking on the respective tags. Once a particular section is chosen, the user can select the type of solid from the list, change the parameters and view the unfold state of the solid upon clicking the ‘Apply Changes’ button. To undo the changes, just click on ‘Undo’.

PROGRAM

During the initial stages, the author thought of letting SolidWorks create the part from scratch, i.e. once the necessary parameters are entered, SolidWorks would generate the part drawing. This approach, though simple, requires quite a lots of memory resources of the PC and is time consuming if the part generated is very complicated. Instead, SolidWorks drawings of the solids of interest are generated before hand. C++
programs are written to retrieve the values entered by the user. Once the parameters are received, the C++ algorithms will send to SolidWorks for updating and regeneration of the drawing.

Fig. 1: Interface Outlook

Fig 2: Preview of Solid

Fig 3: Development of Solid
START

Start SolidWorks

Load Add-in to SolidWorks

Wait for user to select solid and enter parameters

Parameters entered?

Yes

Load SolidWorks drawing and update parameters

Refresh SolidWorks drawing

Confirm changes?

Yes

Close dialog and return to normal operation

STOP
OPERATION

The operation of the program is as follows:

The add-in has to be loaded from SolidWorks before using. Once loading is done, ‘ME 1101’ will appear on the status bar as shown in Fig 4. Clicking on the icon will display the sub-menu “Surface Development”.

![Fig 4: Menu Selection](image)

Once the sub-menu is selected, the dialog box will appear. Select the solid of interest, a preview drawing will appear with the active text boxes for data entry. Once the values are entered, the user can choose to preview the solid in its unfold state by clicking ‘Apply Changes’ button. If the user is done with the changes, he/she can return to the drawing by clicking on the OK button. If the changes are not satisfactory in the unfold state, the user can undo the changes by selecting ‘Undo’.

![Fig 5: Dialog with Cylinder selected](image) ![Fig 6: Pyramid with top cut](image)

DISCUSSIONS

This program is developed with the user in mind. As the main target group is the students, it was felt that this is beneficial for those who have no knowledge in this topic to see the actual outlook being generated in front of them. Also, it can be used as a comparison guide for those producing manual drawings of these solids.

Although this program presents a reasonable number of objects, there are some limitations encountered. Firstly, due to the limitation of the SolidWorks 2001 API, the author can only generate one interpenetration object in the part drawing. Secondly,
due to platform configurations, this add-in can only be used in Windows 98 and below. For Windows 2000 and above, the C++ source files have to be built under that platform.

CONCLUSION

Through this project, the author has gained a better understanding of the functions and potential of the software. He has also learnt the new things through problem solving such as debugging of C++ source files, finding drawing steps to attain the object of interest, etc. Although SolidWorks 2001 has its limitations, it is still a good 3D CAD software for learning and commercial purposes. The author hopes this program will be a stepping-stone for future development with later versions of SolidWorks.