Abstract: Design is a very important aspect regarding to the lifecycle of a product. The design of a product has to maintain with the current trend and because of this sometimes a product comes to a slow sales. Redesign of the same product has to be implemented to make it look new. This paper proposed a cost effective time saving method of redesigning a product to catch up with the ever-changing consumer needs. The method requires the recognition of tone gradation of designer’s 2D drawing. This understanding of tone and gradation is important mainly because drawing from designer is very much related with it.

Key words: Redesign, template, life trace

Background
The main aim of this paper is to develop a method of understanding and translating the 2D drawing by designer to the 3D computer data format by relying on the information of the gradation and tone from the drawing. This method is applicable for minor redesign changes that usually occur in the development of any product design. The method will not require any physical model to be developed and this will reduce cost in the process of selecting a suitable design. All the methods requires that it be done in a computer by using 3D and 2D computer program that is commonly available in the market.

1. Gradient tone method
This technique requires initial base design in 3D data to be available as a reference (Figure 1). The base data is needed in 3D data as a reference for precise location and tone reference of the product. Two tone color ranges are use especially black and white contra color for easy understanding of the dept and angle from the light source to the product. Designer can choose from any angle that they want to draw from as long as all the part that needed changes is visible from that particular angle. The drawing angle selection is done on the 3D program that contains the initial base 3D data. After the selection of the angle has been made the next step is the direction of the light source. Light source must be set straight directly from the screen monitor view. The light source must be a direct type of light so that the light will not disperse to the other part of the product. One shot picture is taken from that particular view and one shot of X, Y and Z axis is also taken. The pictures are then transferred to a 2D graphic design editing program for example Adobe Photoshop. All of the pictures are been place in a separate layer in Adobe Photoshop for easy reference.

2. Template as tone reference
A color tone template is created for designer reference. The template is created that cover all the length of the object and from the entire possible light angle (Figure 2). It is created in the 3D program and position at the same direction as the designer chooses. Information of position from the light source is indicated in the template for designer ease of work and for CAD operator to understand the distance of a certain tone color (Figure 3). The 2D picture template is transferred to 2D graphic design editing program in its layer.
3. Designer gradation drawing

In 2D program the designer can now edit the picture freely with their own design. Designer is required to draw the new design by following the base reference from the 3D picture and make changes to the part that they wanted to change. Careful consideration is needed when matching the new design with the main base design. The tone gradation between the main base design and the new design must match smoothly and this requires skill and understanding of light characteristic. Any kind of shape is possible as long as it is visible from the particular view.

It is advisable to use a tablets [drawing pad for computer] when drawing because it is easier to use. Designer has to constantly refer the tone color to the template to prevent misinterpretation of tone depth. This check is conducted using the Adobe Photoshop Eyedropper Tool. (Figure 4).

4. Data translation to 3D program

After finishing the drawing in 2D format, a process of extracting the gradient line by using Adobe Photoshop [tone adjustment curve] is applied. This will generate the differentiation area tone. The gap in between the different tone area is the main gradient line and this information is needed in the 3D model making process. (Figure 5)

4. Data translation to 3D program

The picture from the tone differentiation area is then transferred to Adobe Illustrator to turn it into vector graphic by using [live trace]. The vector graphic lines are smooth and noises reduce before all the vector graphic lines are transferred to 3D program on a flat plane (Figure 5). Position the flat plane directly on the angle that the designer had chosen.

On the flat plane, create points on the lines. By referring to each generated points a position is known. Each point represents their own tone color and the depth is known by referring to tone template. New point can be generated by intersecting the depth of tone by referring to tone template and point from the flat plane. Each point on the 3D space is then connected together to give a rough model.

5. Conclusion

The method requires a very good artist to understand gradient and tone of an object and the capability of using computer tools to draw the shape that they desire. Currently the method cannot deal with the inconsistency of human error and require a perfect drawing. A drawing to be perfect it require a lot of time. A program have to be developed to handle the noise of the tone and gradient of a drawing to make this method suitable for ordinary use. However if the method is done correctly this will resulted in the transfer of idea from designer to the 3D virtual model be done quickly with less misinterpretation.

Reference
1. Lamb D. Bandopadhay, Interpreting a 3D object from a rough 2D line drawing, IEEE conference 1990.