CZ2003 Lab2 Report

Experiment 2: Parametric Curves

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SS2

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| **Curve 1a** | **Curve 1b** | **Curve 1c** |
| Above is the image of “**straightline1.wrl**” defining a straight line with parametric equations x=u, y=u, and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**straightline2.wrl**” defining a straight line with parametric equations x=u, y=u, and z=0 with parameter domain [0,1]. The sampling resolution used is 2. | Above is the image of “**straightline3.wrl**” defining a straight line with parametric equations x=u, y=u, and z=0 with parameter domain [0,0.25]. The sampling resolution used is 100. |
| **Note 1:**  From **Curve 1a** and **Curve 1b**, we see that the sampling resolution does not affect the curve as only 1 line is needed for a straight-line graph. From **Curve 1c**, we reduced the parameter domain which resulted in a shorter graph as shown since the domains for the graph have been shortened. | | |
| **Curve 2a** | **Curve 2b** | **Curve 2c** |
| Above is the image of “**circle1.wrl**” defining a circle graph with parametric equations x = (cos(2\*pi\*u), y= (sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**circle2.wrl**” defining a circle graph with parametric equations x = (cos(2\*pi\*u), y= (sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 15. | Above is the image of “**circle2.wrl**” defining a circle graph with parametric equations x = (cos(2\*pi\*u), y= (sin(2\*pi\*u)) and z=0 with parameter domain [0,0.7]. The sampling resolution used is 100. |
| **Note 2:**  From **Curve 2a** and **Curve 2b**, we see that the sampling resolution now affects the curve and a higher sampling rate makes the curve smoother as more lines are joined together between points defined in the formula. If the sampling resolution is reduced to 2, the system will display a straight line, and in this case, it will be created along the x axis because the next sampling will be at x=0.5. From **Curve 2c**, we reduced the parameter domain which resulted in an incomplete circle graph. | | |
| **Curve 3a** | **Curve 3b** | **Curve 3c** |
| Above is the image of “**circlearc1.wrl**” defining an arc with parametric equations x=cos(u\*pi\*0.5),y=sin(u\*pi\*0.5) and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**circlearc2.wrl**” defining an arc with parametric equations x=cos(u\*pi\*0.5),y=sin(u\*pi\*0.5) and z=0 with parameter domain [0,1]. The sampling resolution used is 2. | Above is the image of “**circlearc3.wrl**” defining an arc with parametric equations x=cos(u\*pi\*0.5), y=sin(u\*pi\*0.5) and z=0 with parameter domain [0,0.75]. The sampling resolution used is 100. |
| **Note 3:**  From **Curve 3a** and **Curve 3b**, we see that the arc looks very different as we only used 2 lines to form the arc in **Curve 3b,** hence it is not smooth. From **Curve 1c**, we reduced the parameter domain which resulted in the arc becoming shortened as well. | | |
| **Curve 4a** | **Curve 4b** | **Curve 4c** |
| Above is the image of “**ellipse1.wrl**” defining an ellipse graph with parametric equations x=1\*(cos(2\*pi\*u), y=0.3\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**ellipse2.wrl**” defining an ellipse graph with parametric equations x=1\*(cos(2\*pi\*u), y=0.3\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 4. | Above is the image of “**ellipse3.wrl**” defining an ellipse graph with parametric equations x=1\*(cos(2\*pi\*u), y=0.3\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,1.5]. The sampling resolution used is 150. |
| **Note 4:**  For an ellipse, as seen from all 3 curves, the coefficients applied to both axes have to be different in order to from an ellipse or else a circle will be formed instead. From **Curve 4c**, we increased the parameter domain this time which resulted in a graph that looks like **Curve 4a**. But, by increasing the domain, it will elongate the number of rotations. The extra rotations cannot be noticed as it rotates on the same axis. However, due to the elongation, the sampling resolution has been increased to generate a smooth curve and compensate for the lack of additional lines needed. | | |
| **Curve 5a** | **Curve 5b** | **Curve 5c** |
| Above is the image of “**ellipsearc1.wrl**” defining an ellipse arc with x=cos(u), y=0.3\*(sin(u)) and z=0, with parameter domain [0,1.57]. The sampling resolution used is 100. | Above is the image of “**ellipsearc2.wrl**” defining an ellipse arc with x=cos(u), y=0.3\*(sin(u)) and z=0, with parameter domain [0,1.57]. The sampling resolution used is 2. | Above is the image of “**ellipsearc3.wrl**” defining an ellipse arc with x=cos(u), y=0.3\*(sin(u)) and z=0, with parameter domain [0,2]. The sampling resolution used is 100. |
| **Note 5:**  From **Curve 5a** and **Curve 5b**, we see that the higher samples mean the ellipse arc will be smoother as more lines are joined together. For **Curve 5c,** the length of the ellipse arc will increase as shown since we increased the parameter domain. By increasing the domain, it will elongate the number of rotations. The extra rotations cannot be noticed as it rotates on the same axis | | |
| **Curve 6a** | **Curve 6b** | **Curve 6c** |
| Above is the image of “**2Dspiral1.wrl**” defining 2D spiral graph with parametric equations x=u\*(cos(2\*pi\*u), y=u\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**2Dspiral2.wrl**” defining 2D spiral graph with parametric equations x=u\*(cos(2\*pi\*u), y=u\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,1]. The sampling resolution used is 3. | Above is the image of “**2Dspiral1.wrl**” defining 2D spiral graph with parametric equations x=u\*(cos(2\*pi\*u), y=u\*(sin(2\*pi\*u)) and z=0 with parameter domain [0,2]. The sampling resolution used is 100. |
| **Note 6:**  For **Curve 2b**, we see with a very low sampling resolution, it does not look like a spiral at all since it has too little lines to be joined to a smooth curve like in **Curve 6a.** For **Curve 6c**, we increased the domain upper limit by 2 times which makes the number of rotations increase by 2 times and the graph also grows outside of the axes limits as well. By increasing the domain, it will elongate the number of rotations. The extra rotations cannot be noticed as it rotates on the same axis. The number of rotations also depends on the coefficient that multiplies by (pi\*u) assuming we do not change the domain. | | |
| **Curve 7a** | **Curve 7b** | **Curve 7c** |
| Above is the image of “**3Dhelix1.wrl**” defining a 3D helix graph with parametric equations x=1\*(cos(2\*pi\*u)), y=1\*(sin(2\*pi\*u)) and z=u with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of “**3Dhelix2.wrl**” defining a 3D helix graph with parametric equations x=1\*(cos(2\*pi\*u)), y=1\*(sin(2\*pi\*u)) and z=u with parameter domain [0,1]. The sampling resolution used is 5. | Above is the image of “**3Dhelix3.wrl**” defining a 3D helix graph with parametric equations x=1\*(cos(2\*pi\*u)), y=1\*(sin(2\*pi\*u)) and z=u with parameter domain [0,2]. The sampling resolution used is 100. |
| **Note 7:**  Same as note 6 about the explanation for parameter domain and sampling resolution. However, for these curves, there is a z component which causes the graph to have a 3D effect which cannot be seen all the previous curves. The number of rotations also depends on the coefficient that multiplies by (pi\*u) assuming we do not change the domain. | | |
| **Curve 8a** | **Curve 8b** | **Curve 8c** |
| Above is the image of **“sin1.wrl**” defining a sine graph with parametric equations x=u, y=sin(u\*2\*pi) and z=0 with parameter domain [0,1]. The sampling resolution used is 100. | Above is the image of **“sin2.wrl**” defining a sine graph with parametric equations x=u, y=sin(u\*2\*pi) and z=0 with parameter domain [0,1]. The sampling resolution used is 3. | Above is the image of **“sin1.wrl**” defining a sine graph with parametric equations x=u, y=sin(u\*2\*pi) and z=0with parameter domain [0,0.5]. The sampling resolution used is 100. |
| **Note 8:**  As explained before, lower sampling results in less smooth and accurate curve as shown in **Curve 8b** and by reducing the domain by half, half the sine graph is displayed as well as shown in **Curve 8c**. | | |