Nanyang Technological University

Lab 2 Report: **Parametric Curves**

CZ2003 Computer Graphics and Visualization

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PT2

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| Curve | Note |
|  | Above is the snapshot of “curve - straight line.wrl” which define a straight line by parametric equations x=u, y=0.5, and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | Above is the snapshot of “curve - straight line\_r2.wrl” which define a straight line by parametric equations x=u, y=0.5, and z=0 with parameter domain [0,1]. The sampling resolution is 2  **Note 1:**  The sampling resolution for straight line can be set as minimum as 1 and nothing will change because it basically only requires one straight line to create a straight line. |

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|  | Above is the snapshot of “curve - straight line\_domain\_elongate.wrl” which define a straight line by parametric equations x=u, y=0.5, and z=0 with parameter domain [0,1.5]. The sampling resolution is 100 |
|  | Above is the snapshot of “curve - straight line\_domain\_shorten.wrl” which define a straight line by parametric equations x=u, y=0.5, and z=0 with parameter domain [0,0.5]. The sampling resolution is 100  **Note 2:**  The length of straight line will be changed as straight-line parameter domain changed. |
|  | This is the snapshot of “curve - circle.wrl” which define a circle with parametric equations x=cos(2\*pi\*u), y=sin(2\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “curve - circle\_r20.wrl” which define the same curve as the picture on the left with the same equation. The sampling resolution is 20.  **Note 3:**  The more the number of samples used, the more accurate and smooth the circle will be. This is because the circle is created by joining multiple straight line 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. |

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|  | This is the snapshot of “curve - circle\_domain\_elongate.wrl” which define a circle with parametric equations x=cos(2\*pi\*u), y=sin(2\*pi\*u), and z=0 with parameter domain [0,2]. The sampling resolution is 100  **Note 4:**  When the parameter domain increased, it will elongate the number of rotation. The elongation is not obvious as it rotates on the same axis. However, due to the elongation, the sampling resolution has to be increased as well to generate a smooth curve. |
|  | This is the snapshot of “curve -circle\_domain\_shorten.wrl” which define a circle with parametric equations x=cos(2\*pi\*u), y=sin(2\*pi\*u), and z=0 with parameter domain [0,0.8]. The sampling resolution is 100  **Note 5:**  The length of curve will be changed as curves parameter domain changed. If domain larger than 1, it will be covered by previous curve. |

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|  | This is the snapshot of “curve - circle arc.wrl” which define a arc with parametric equations x=cos(pi\*u), y=sin(pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100. |
|  | This is the snapshot of “curve - circle arc\_r2.wrl” which define a arc with parametric equations x=cos(pi\*u), y=sin(pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 2.  **Note 6:**  The more the number of samples used, the more accurate and smooth the arc will be. This is because the arc is created by joining multiple straight line together between points defined in the formula. |

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|  | This is the snapshot of “curve - circle arc\_domain\_elongate.wrl” which define an arc with parametric equations x=cos(pi\*u), y=sin(pi\*u), and z=0 with parameter domain [0,1.5]. The sampling resolution is 100.  **Note 7:**  When the parameter domain increased, it will elongate the number of rotation. The elongation is not obvious as it rotates on the same axis. However, due to the elongation, the sampling resolution has to be increased as well to generate a smooth curve. |
|  | This is the snapshot of “curve - circle arc\_domain\_shorten.wrl” which define an arc with parametric equations x=cos(pi\*u), y=sin(pi\*u), and z=0 with parameter domain [0,0.8]. The sampling resolution is 100  **Note 8:**  The length of arc will be changed as arc parameter domain changed. |

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|  | This is the snapshot of “curve - ellipse.wrl” which define an ellipse with parametric equations x=cos(2\*pi\*u), y= 0.5\*sin(2\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “curve – ellipse\_r20.wrl” which define an ellipse with parametric equations x=cos(2\*pi\*u), y= 0.5\*sin(2\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 20  **Note 9:**  The more the number of samples used, the more accurate and smooth the ellipse will be. This is because the ellipse is created by joining multiple straight line together between points defined in the formula. |

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|  | This is the snapshot of “curve - ellipse \_domain\_elongate.wrl” which define an ellipse with parametric equations x=cos(2\*pi\*u), y=0.5\*sin(2\*pi\*u), and z=0 with parameter domain [0,2]. The sampling resolution is 100  **Note 10:**  When the parameter domain increased, it will elongate the number of rotation. The elongation is not obvious as it rotates on the same axis. However, due to the elongation, the sampling resolution has to be increased as well to generate a smooth curve. |
|  | This is the snapshot of “curve \_ellipse\_domain\_shorten.wrl” which define an ellipse with parametric equations x=cos(2\*pi\*u), y=0.5\*sin(2\*pi\*u), and z=0 with parameter domain [0,0.8]. The sampling resolution is 100  **Note 11:**  The length of ellipse will be changed as ellipse parameter domain changed. If domain larger than 1, it will be covered by previous ellipse curve. |

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|  | This is the snapshot of “curve – ellipse arc.wrl” which define a ellipse arc with parametric equations x=cos(pi\*u), y= 0.5\*sin(pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “curve – ellipse arc\_r2.wrl” which define an ellipse arc with parametric equations x=cos(pi\*u), y=0.5\*sin(pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 2.  **Note 12:**  The more the number of samples used, the more accurate and smooth the ellipse arc will be. This is because the ellipse arc is created by joining multiple straight line together between points defined in the formula. |

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|  | This is the snapshot of “curve - ellipse arc\_domain\_elongate.wrl” which define an ellipse arc with parametric equations x=cos(pi\*u), y= 0.5\*sin(pi\*u), and z=0 with parameter domain [0,1.5]. The sampling resolution is 100 |
|  | This is the snapshot of “curve - ellipse arc\_domain\_shorten.wrl” which define an ellipse arc with parametric equations x=cos(pi\*u), y=0.5\*sin(pi\*u), and z=0 with parameter domain [0,0.8]. The sampling resolution is 100.  **Note 13:**  The length of ellipse arc will be changed as ellipse arc parameter domain changed. |

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|  | This is the snapshot of “curve - 3D helix.wrl” which define a 3D helix with parametric equations x= cos(8\*pi\*u), y= sin(8\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “curve - 3D helix\_r20.wrl” which define a 3D helix with parametric equations x= cos(8\*pi\*u), y= sin(8\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 20  **Note 14:**  The more the number of samples used, the more accurate and smooth the helix will be. This is because the helix is created by joining multiple straight line together between points defined in the formula. |

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|  | This is the snapshot of “curve - 3D helix \_domain\_elongate.wrl” which define a 3D helix with parametric equations x= cos(8\*pi\*u), y= sin(8\*pi\*u), and z=0 with parameter domain [0,2]. The sampling resolution is 100.  **Note 15:**  When the parameter domain increased, it will elongate the number of rotation. The elongation is not obvious as it rotates on the same axis. However, due to the elongation, the sampling resolution has to be increased as well to generate a smooth curve. |
|  | This is the snapshot of “curve - 3D helix \_domain\_shorten.wrl” which define a 3D helix with parametric equations x= cos(8\*pi\*u), y= sin(8\*pi\*u), and z=0 with parameter domain [0,0.5]. The sampling resolution is 100  **Note 16:**  The length of ellipse arc will be changed as helix parameter domain changed. |

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|  | This is the snapshot of “curve - 2D spiral.wrl” which define a 2D spiral with parametric equations x= u\*cos(4\*pi\*u), y= u\*sin(4\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “curve - 2D spiral\_r20.wrl” which define a 2D spiral with parametric equations x= u\*cos(4\*pi\*u), y= u\*sin(4\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 20  **Note 17:**  The more the number of samples used, the more accurate and smooth the helix will be. This is because the spiral is created by joining multiple straight line together between points defined in the formula. |

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|  | This is the snapshot of “curve - 2D spiral\_domain\_elongate.wrl” which define a 2D spiral with parametric equations x= u\*cos(4\*pi\*u), y= u\*sin(4\*pi\*u), and z=0 with parameter domain [0,2]. The sampling resolution is 100  **Note 18:**  When the parameter domain increased, it will elongate the number of rotation. The elongation is not obvious as it rotates on the same axis. However, due to the elongation, the sampling resolution has to be increased as well to generate a smooth curve. |
|  | This is the snapshot of “curve - 2D spiral\_domain\_shorten.wrl” which define a 2D spiral with parametric equations x= u\*cos(4\*pi\*u), y= u\*sin(4\*pi\*u), and z=0 with parameter domain [0,0.5]. The sampling resolution is 100  **Note 19:**  The length of ellipse arc will be changed as ellipse arc parameter domain changed. |

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|  | This is the snapshot of “y=sinx.wrl” which define a 2D sin curve with parametric equations x= u, y= sin(2\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 100 |
|  | This is the snapshot of “y=sinx\_r20.wrl” which define a 2D sin curve with parametric equations x= u, y= sin(2\*pi\*u), and z=0 with parameter domain [0,1]. The sampling resolution is 20  **Note 20:**  The more the number of samples used, the more accurate and smooth the helix will be. This is because the helix is created by joining multiple straight line together between points defined in the formula. |