CZ2003 Computer Graphics and Visualization

# Report for Lab 2

In this report creation of parametric functions is described with respect to the attached files consisting of circle, ellipse, spiral, helix among others.

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# Description of files

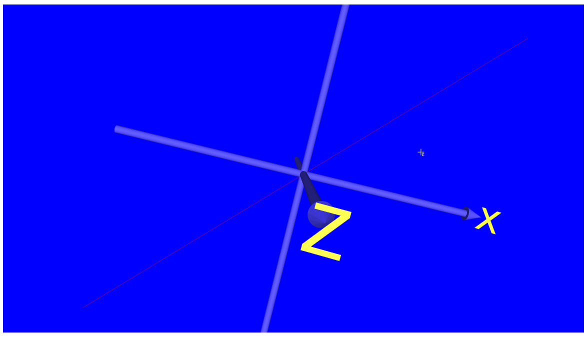
In this lab I have created 8 parametric functions. These are

- Line
- Sin
- Circle and arc
- Ellipse and arc
- 2D Spiral
- Helix

To see the code for each function see the file for the corresponding section.

## Line

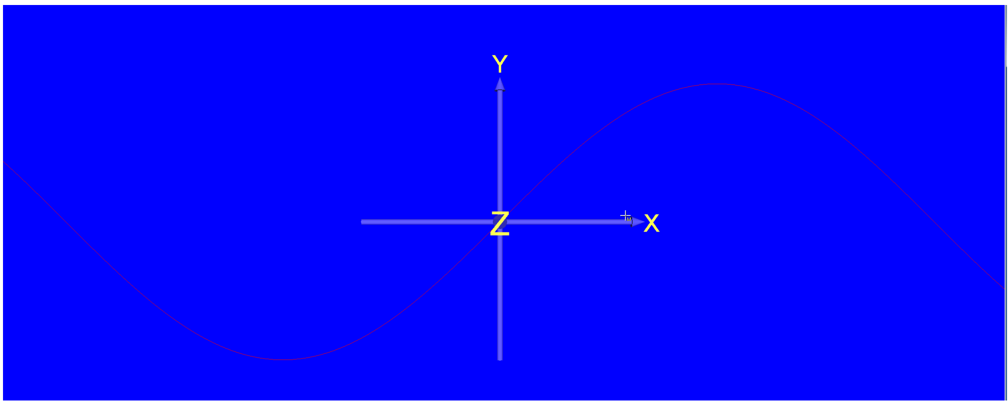
The parametric representation of a line can be as simple as $x = u$, $y = u$ with $u$ having a limited domain as it is sufficient for the observing window.




*A picture of the line*

## Sin

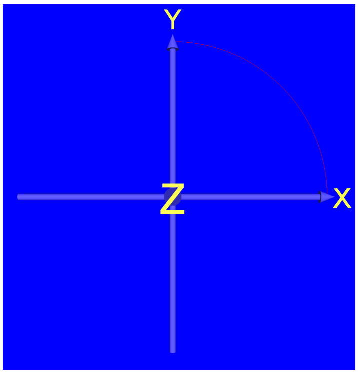
To represent $y$=sin$(x)$ as a parametric function the substitution $u = x$ was done which resulted in $y = \sin(u),\ x = u.$ Since this function in trigonometric $u$ serves as the angle which implies that the domain of $u$ is expressed in radians.



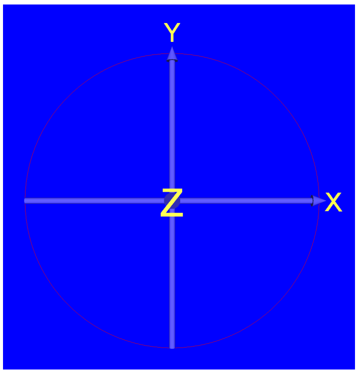

*The sin function with domain* [-2$\pi$, 2$\pi$] on $u$

## Circle and arc

One parametric representation of a circle is $x = \sin(u)$, $y = \cos(u)$. To represent an arc we simply limit the domain of the circle from $[0,\ 2\pi]$ to $[0,\ \pi/2]$.



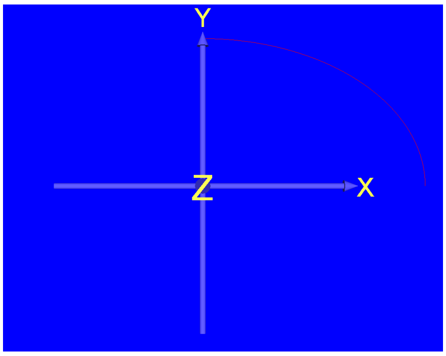

*Arc of circe with domain* $[0,\ \pi/2]$



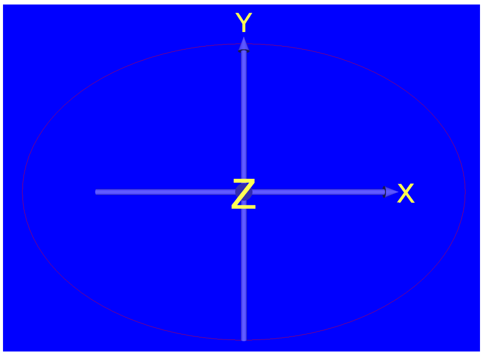

*Circle*

## Ellipse and arc

The parametric representation of an ellipse can be very similar to a circle except that it has a coefficient, it is expressed as $x = a\ \sin(u)$, $y = b\ \sin(u)$ where $a, b\ \in \mathbb{R}$ and $a, b \neq 0$ with $u$ having a limited domain similar to the previous section.



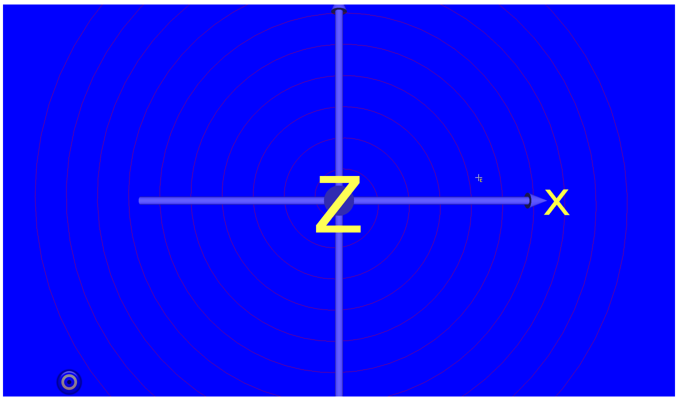

*Arc of ellipse with domain* $[0,\ \pi/2]$




*Ellipse*

## 2D Spiral

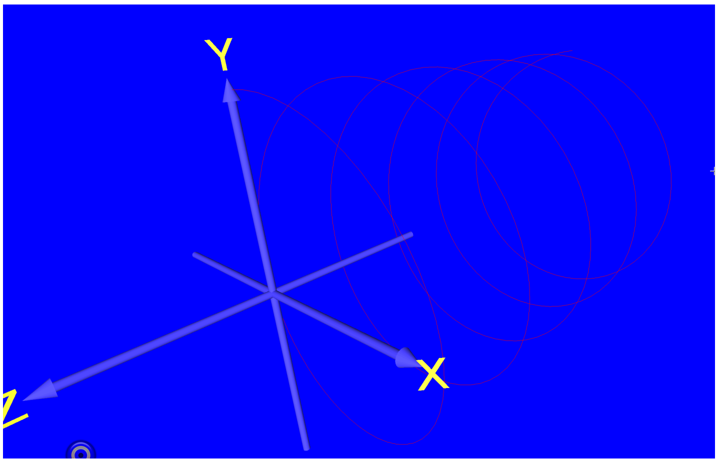
The parametric representation of a 2D spiral can be similar to an ellipse except that it has an additional coefficient $u$ this results in $x = ua\,\sin(u),\ y = ub\,\sin(u)$ where in this case $a = b$. To allow the spiral to form the domain of $u$ should be a rather high multiple of $2\pi$ where the multiple indicates how many turns the spiral will make. To make the spiral display properly an increase of resolution was needed.




*The spiral with a domain of $[0,\ 20\pi]$ on the angle and $a = b = 1/40$ and resolution 600*

## Helix

The parametric representation of a helix can be very similar to a circle. Up until now we have only showed functions which move through the $xy$-plane which was achieved by setting $z = 0$. In this case we need to use $z$ to express the helix properly. For these reasons one parametric representation of a helix is $x = \sin(u)$, $y = \cos(u),\ x = au$ where $a \in \mathbb{R}$ and $a \neq 0$. In this case a is used to control the derivative of the helix in the $z$-axis.




*A picture of the helix with domain $[0,\ 10\pi]$ on the angle and $a = -0.1$*